PHYSICS WALLAH

JEE MAIN 2026

SESSION-01

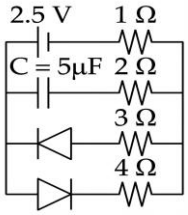
Date: 21-01-2026

Shift-02

SECTION-I (PHYSICS)

Single Correct Type Questions

1. The charge stored by the capacitor C in the given circuit in the steady state is _____μC



(1) 5 (2) 7.5
(3) 10 (4) 12.5

2. Keeping the significant figures in view, the sum of the physical quantities 52.01 m, 153.2 m and 0.123 m is:

(1) 205.333 m (2) 205.3 m
(3) 205 m (4) 205.33 m

3. A spherical body of radius r and density σ falls freely through a viscous liquid having density ρ and viscosity η and attains a terminal velocity v_0. Estimated maximum error in the quantity η is : (Ignore errors associated with σ, ρ and g, gravitational acceleration)

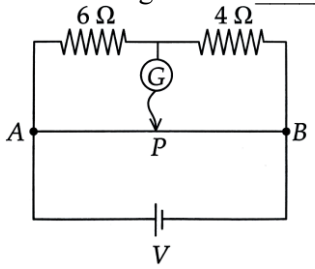
(1) $2\frac{\Delta r}{r}-\frac{\Delta v_o}{v_o}$ (2) $2\left[\frac{\Delta r}{r}+\frac{\Delta v_o}{v_o}\right]$

(3) $\frac{2\Delta r}{r}+\frac{\Delta v_o}{v_o}$ (4) $2\left[\frac{\Delta r}{r}-\frac{\Delta v_o}{v_o}\right]$

4. Two cars A and B each of mass 10^3 kg are moving on parallel tracks separated by a distance of 10 m , in same direction with speeds 72 km/h and 36 km/h. The magnitude of angular momentum of car A with respect to car B is _____ J.s.

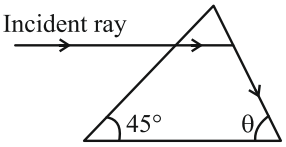
(1) 10^5 (2) 2×10^5
(3) 3×10^5 (4) 3.6×10^5

5. The total length of potentiometer wire AB is 50 cm in the arrangement as shown in figure. If P is the point where the galvanometer shows zero reading, then the length AP is _____ cm.



(1) 30 (2) 20
(3) 15 (4) 25

6. As shown in the diagram, when the incident ray is parallel to base of the prism, the emergent ray grazes along the second surface.



If refractive index of the material of prism is $\sqrt{2}$, the angle θ of prism is.

(1) 75° (2) 45°
(3) 60° (4) 90°

7. Consider two identical metallic spheres of radius R each having charge Q and mass m. Their centers have an initial separation of $4R$. Both the spheres are given an initial speed of u towards each other. The minimum value of u, so that they can just touch each other is :

(Take $k=\frac{1}{4\pi\epsilon_0}$ and assume $kQ^2 > Gm^2$ where G is the Gravitational constant)

(1) $\sqrt{\frac{kQ^2}{4mR}\left(1+\frac{Gm^2}{kQ^2}\right)}$

(2) $\sqrt{\frac{kQ^2}{2mR}\left(1-\frac{Gm^2}{2kQ^2}\right)}$

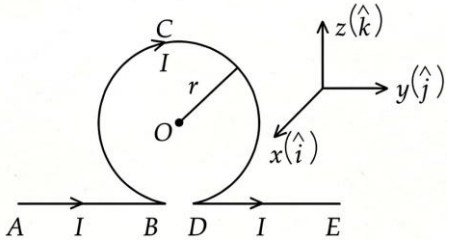
(3) $\sqrt{\frac{kQ^2}{4mR}\left(1-\frac{Gm^2}{kQ^2}\right)}$

(4) $\sqrt{\frac{kQ^2}{2mR}\left(1-\frac{Gm^2}{kQ^2}\right)}$

8. The energy of an electron in an orbit of the Bohr's atom is $-0.04E_0$eV where E_0 is the ground state energy. If L is the angular momentum of the electron in this orbit and h is the Planck's constant, then $\frac{2\pi L}{h}$ is ____ :

(1) 2 (2) 5
(3) 6 (4) 4

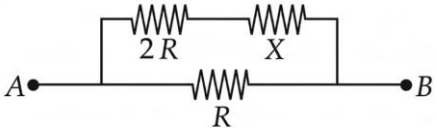
9. An infinitely long straight wire carrying current I is bent in a planar shape as shown in the diagram. The radius of the circular part is r. The magnetic field at the centre O of the circular loop is :



(1) $\frac{\mu_0}{2\pi}\frac{I}{r}(\pi+1)\hat{i}$ (2) $-\frac{\mu_0}{2\pi}\frac{I}{r}(\pi+1)\hat{i}$

(3) $\frac{\mu_0}{2\pi}\frac{I}{r}(\pi-1)\hat{i}$ (4) $-\frac{\mu_0}{2\pi}\frac{I}{r}(\pi-1)\hat{i}$

10. Two known resistances of $R\Omega$ and $2R\Omega$ and one unknown resistance $X\Omega$ are connected in a circuit as shown in the figure. If the equivalent resistance between points A and B in the circuit is $X\Omega$, then the value of X is ____ Ω.



(1) R (2) $\left(\sqrt{3}-1\right)R$

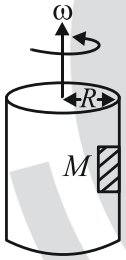
(3) $\left(\sqrt{3}+1\right)R$ (4) $2\left(\sqrt{3}-1\right)R$

11. A battery with EMF E and internal resistance r is connected across a resistance R. The power consumption in R will be maximum when :

(1) $R = 2r$ (2) $R = \frac{r}{2}$

(3) $R = r$ (4) $R = \sqrt{2}r$

12. A large drum having radius R is spinning around its axis with angular velocity ω, as shown in figure. The minimum value of ω so that a body of mass M remains stuck to the inner wall of the drum, taking the coefficient of friction between the drum surface and mass M as μ, is :



(1) $\sqrt{\frac{g}{2\mu R}}$ (2) $\sqrt{\frac{\mu g}{R}}$

(3) $\sqrt{\frac{g}{\mu R}}$ (4) $\sqrt{\frac{2g}{\mu R}}$

13. A river of width 200 m is flowing from west to east with a speed of 18 km/h. A boat, moving with speed of 36 km/h in still water, is made to travel one-round trip (bank to bank of the river). Minimum time taken by the boat for this journey and also the displacement along the river bank are _____ and _____ respectively.

(1) 20 s and 100 m
(2) 40 s and 200 m
(3) 40 s and 100 m
(4) 40 s and 0 m

14. A capacitor C is first charged fully with potential difference of V_0 and disconnected from the battery. The charged capacitor is connected across an inductor having inductance L. In t s, 25% of the initial energy in the capacitor is transferred to the inductor. The value of t is ____ s.

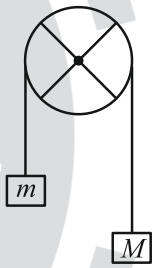
(1) $\pi\sqrt{\frac{LC}{2}}$ (2) $\frac{\pi\sqrt{LC}}{6}$

(3) $\frac{\pi\sqrt{LC}}{3}$ (4) $\frac{\pi\sqrt{LC}}{2}$

15. The r.m.s. speed of oxygen molecules at 47 °C is equal to that of the hydrogen molecules kept at _____°C. (Mass of oxygen molecule/mass of hydrogen molecule = 32/2)

(1) –235 (2) –20
(3) –253 (4) –100

16. The pulley shown in figure is made using a thin rim and two rods of length equal to diameter of the rim. The rim and each rod have a mass of M. Two blocks of mass M and m are attached to two ends of a light string passing over the pulley, which is hinged to rotate freely in vertical plane about its center. The magnitudes of the acceleration experienced by the blocks is _____ (assume no slipping of string on pulley).



(1) $\frac{(M-m)g}{2M+m}$ (2) $\frac{(M-m)g}{M+m}$

(3) $\frac{(M-m)g}{\left[\left(\frac{8}{3}\right)M+m\right]}$ (4) $\frac{(M-m)g}{\left[\left(\frac{13}{6}\right)M+m\right]}$

17. Given below are two statements :

Statement I: In a Young's double slit experiment, the angular separation of fringes will increase as the screen is moved away from the plane of the slits

Statement II: In a Young's double slit experiment, the angular separation of fringes will increase when monochromatic source is replaced by another monochromatic source of higher wavelength

In the light of the above statements, choose the correct answer from the options given below :

(1) Statement I is true but Statement II is false
(2) Both Statement I and Statement II are false
(3) Both Statement I and Statement II are true
(4) Statement I is false but Statement II is true

18. A body of mass 2 kg is moving along x-direction such that its displacement as function of time is given by $x(t) = (\alpha t^2 + \beta t + \gamma)\text{m}$, where $\alpha = 1\ \text{m/s}^2, \beta = 1\ \text{m/s}$ and $\gamma = 1\ \text{m}$. The work done on the body during the time interval $t = 2s$ to $t = 3s$, is____ J.

(1) 42 (2) 12
(3) 24 (4) 49

19. Surface tension of two liquids (having same densities), T_1 and T_2, are measured using capillary rise method utilizing two tubes with inner radii of r_1 and r_2 where $r_1 > r_2$. The measured liquid heights in these tubes are h_1 and h_2 respectively. [Ignore the weight of the liquid about the lowest point of meniscus]. The heights h_1 and h_2 and surfaces tensions T_1 and T_2 satisfy the relation:

(1) $h_1 = h_2$ and $T_1 = T_2$
(2) $h_1 < h_2$ and $T_1 = T_2$
(3) $h_1 > h_2$ and $T_1 < T_2$
(4) $h_1 > h_2$ and $T_1 = T_2$

20. The kinetic energy of a simple harmonic oscillator is oscillating with angular frequency of 176 rad/s. The frequency of this simple harmonic oscillator is _____Hz. [take $\pi = \frac{22}{7}$]

(1) 28 (2) 88
(3) 176 (4) 14

Integer Type Questions

21. In a Young's double slit experiment set up, the two slits are kept 0.4 mm apart and screen is placed at 1 m from slits. If a thin transparent sheet of thickness 20 μm is introduced in front of one of the slits, then central bright fringe shifts by 20 mm on the screen. The refractive index of transparent sheet is given by $\frac{\alpha}{10}$, where α is ____ .

22. A diatomic gas $(\gamma = 1.4)$ does 100 J of work when it is expanded isobarically. Then the heat given to the gas is ____ J.

23. An electromagnetic wave of frequency 100 MHz propagates through a medium of conductivity, $\sigma = 10\text{mho/m}$. The ratio of maximum conduction current density to maximum displacement current density is ____ . [Take $\frac{1}{4\pi\epsilon_0} = 9\times10^9\ \text{Nm}^2/\text{C}^2$]

24. A particle having electric charge 3×10^{-19}C and mass 6×10^{-27} kg is accelerated by applying an electric potential of 1.21 V . Wavelength of the matter wave associated with the particle is $\alpha\times10^{-12}$ m . The value of α is ____ (Take Planck's constant $= 6.6\times10^{-34}$ J.s)

25. The terminal velocity of a metallic ball of radius 6 mm in a viscous fluid is 20 cm/s. The terminal velocity of another ball of same material and having radius 3 mm in the same fluid will be_____ cm/s.

SECTION-II (CHEMISTRY)

Single Correct Type Questions

26. Decomposition of A is a first order reaction at T(K) and is given by $\text{A(g)} \longrightarrow \text{B(g)} + \text{C(g)}$.

In a closed 1 L vessel, 1 bar A(g) is allowed to decompose at T(K) . After 100 minutes, the total pressure was 1.5 bar. What is the rate constant (in min^{-1}) of the reaction ? ($\log 2 = 0.3$)

(1) 6.9×10^{-3}
(2) 6.9×10^{-1}
(3) 6.9×10^{-4}
(4) 6.9×10^{-2}

27. Given below are some of the statements about Mn and Mn_2O_7. Identify the correct statements.

A. Mn forms the oxide Mn_2O_7, in which Mn is in its highest oxidation state.
B. Oxygen stabilizes the Mn in higher oxidation states by forming multiple bonds with Mn .
C. Mn_2O_7 is an ionic oxide.
D. The structure of Mn_2O_7 consists of one bridged oxygen.

Choose the correct answer from the options given below :

(1) A, B and C Only
(2) A, B and D Only
(3) A, B, C and D
(4) A, C and D Only

28. Given below are two statements :

Statement I: The correct order in terms of bond dissociation enthalpy is $Cl_2 > Br_2 > F_2 > I_2$.

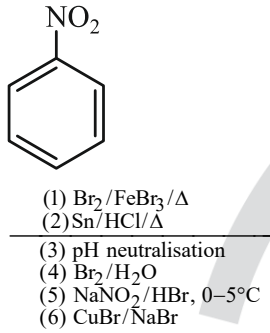
Statement II: The correct trend in the covalent character of the metal halides is

$[SnCl_4 > SnCl_2]$, $[PbCl_4 > PbCl_2]$ and $[UF_4 > UF_6]$.

In the light of the above statements, choose the correct answer from the options given below :

(1) Both Statement I and Statement II are true
(2) Statement I is false but Statement II is true
(3) Statement I is true but Statement II is false
(4) Both Statement I and Statement II are false

29.



Consider the above sequence of reactions. The number of bromine atom(s) in the final product (P) will be :

(1) 1 (2) 5
(3) 6 (4) 3

30. Given below are two statements :

Statement I : The correct order in terms of atomic/ionic radii is $Al > Mg > Mg^{2+} > Al^{3+}$.

Statement II: The correct order in terms of the magnitude of electron gain enthalpy is $Cl > Br > S > O$.

In the light of the above statements, choose the correct answer from the options given below :

(1) Statement I is true but Statement II is false
(2) Both Statement I and Statement II are false
(3) Both Statement I and Statement II are true
(4) Statement I is false but Statement II is true

31. The correct statements are :

A. Activation energy for enzyme catalysed hydrolysis of sucrose is lower than that of acid catalysed hydrolysis.
B. During denaturation, secondary and tertiary structures of a protein are destroyed but primary structure remains intact.
C. Nucleotides are joined together by glycosidic linkage between C_1 and C_4 carbons of the pentose sugar.
D. Quaternary structure of proteins represents overall folding of the polypeptide chain.

Choose the correct answer from the options given below :

(1) A, C and D Only
(2) B and C Only
(3) A, B and D Only
(4) A and B Only

32. The correct increasing order of $C-H(A), C-O(B), C=O(C)$ and $C \equiv N(D)$ bonds in terms of covalent bond length is:

(1) D < C < B < A
(2) A < B < C < D
(3) D < C < A < B
(4) A < D < C < B

33. Match Lis-I with List-II.

List-I Reagents		List-II Reaction Name (Involving aldehydes)	
A	H_2, Pd–$BaSO_4$	I	Etard Reaction
B	$SnCl_2$, HCl	II	Rosenmund Reduction
C	CrO_2Cl_2, CS_2	III	Gatterman - Koch Reaction
D	CO, HCl, Anhyd. $AlCl_3$	IV	Stephen Reaction

Choose the correct answer from the options given below :

(1) A-IV, B-III, C-I, D-II
(2) A-II, B-III, C-IV, D-I
(3) A-IV, B-I, C-II, D-III
(4) A-II, B-IV, C-I, D-III

34. Consider the following data:

$\Delta_f H^{\ominus}$ (methane, g) = –X kJmol^{-1}

Enthalpy of sublimation of graphite = Y kJmol^{-1}

Dissociation enthalpy of H_2 = Z kJ mol^{-1}

The bond enthalpy of C–H bond is given by :

(1) X+Y+Z
(2) $\frac{X+Y+2Z}{4}$
(3) $\frac{X+Y+4Z}{2}$
(4) $\frac{-X+Y+Z}{4}$

35. Match Lis-I with List-II.

List - I Pair of Compounds		List - II Type of Isomers	
A	2-Methylpropene and but-1-ene	I	Stereoisomers
B	Cis-but-2-ene and trans-but-2-ene	II	Position isomers
C	2-Butanol and diethyl ether	III	Chain isomers
D	But-1-ene and but-2-ene	IV	Functional group isomers

Choose the correct answer from the options given below :

(1) A-II, B-I, C-IV, D-III
(2) A-III, B-I, C-IV, D-II
(3) A-III, B-I, C-II, D-IV
(4) A-I, B-IV, C-III, D-II

36. Aqueous HCl reacts with $MnO_2(s)$ to form $MnCl_2(aq)$, $Cl_2(g)$ and $H_2O(l)$. What is the weight (in g) of Cl_2 liberated when 8.7 g of $MnO_2(s)$ is reacted with excess aqueous HCl solution ? (Given Molar mass in g mol^{-1} Mn = 55, Cl = 35.5, O = 16, H = 1)

(1) 7.1
(2) 14.2
(3) 21.3
(4) 71

37. The correct order of the rate of the reaction for the following reaction with respect to nucleophiles is :

$$CH_3Br + Nu^{\ominus} \longrightarrow CH_3Nu + Br^{\ominus}$$

(1) $CH_3COO^- > PhO^- > {}^-OH > ClO_4^-$
(2) $ClO_4^- > CH_3COO^- > {}^-OH > PhO^-$
(3) $PhO^- > {}^-OH > CH_3COO^- > ClO_4^-$
(4) ${}^-OH > PhO^- > CH_3COO^- > ClO_4^-$

38. On heating a mixture of common salt and $K_2Cr_2O_7$ in equal amount along with concentrated H_2SO_4 in a test tube, a gas is evolved. Formula of the gas evolved and oxidation state of the central metal atom in the gas respectively are:

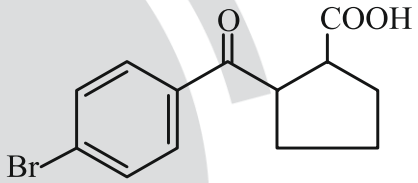
(1) CrO_2Cl_2 and +5
(2) CrO_2Cl_2 and +6
(3) $Cr_2O_2Cl_2$ and +6
(4) $Cr_2O_2Cl_2$ and +3

39. By usual analysis, 1.00 g of compound (X) gave 1.79 g of magnesium pyrophosphate. The percentage of phosphorus in compound (X) is : (nearest integer)
(Given, molar mass in g mol^{-1} : O = 16, Mg = 24, P = 31)

(1) 30
(2) 50
(3) 40
(4) 20

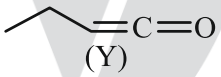
40. Given below are two statements :

Statement I: Compound (X), shown below, dissolves in $NaHCO_3$ solution and has two chiral atoms.



(X)

Statement II: Compound (Y), shown below, has two carbons with sp^3 hybridization, one carbon with sp^2 and one carbon with sp hybridization

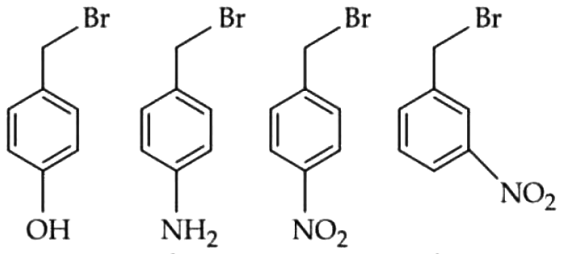


(Y)

In the light of the above statements, choose the correct answer from the options given below :

(1) Statement I is false but Statement II is true
(2) Both Statement I and Statement II are false
(3) Statement I is true but Statement II is false
(4) Both Statement I and Statement II are true

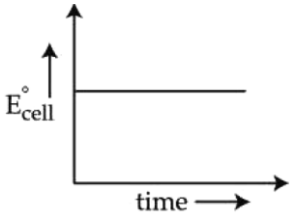
41. The correct order of reactivity of the following benzyl halides towards reaction with KCN is :

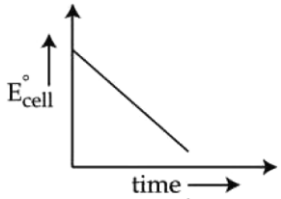


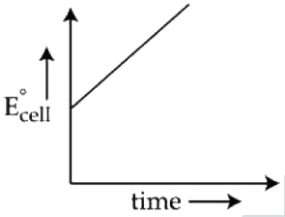
a b c d

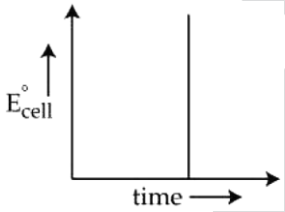
(1) a > b > c > d
(2) a > b > d > c
(3) b > a > d > c
(4) b > a > c > d

42. For a closed circuit Daniell cell, which of the following plots is the accurate one at a given temperature?

(1) 

(2) 

(3) 

(4) 

43. Given below are four compounds :
(a) n-propyl choride
(b) iso-propyl chloride
(c) sec-butyl chloride
(d) neo-pentyl chloride
Percentage of carbon in the one which exhibits optical isomerism is :
(1) 56 (2) 52
(3) 40 (4) 46

44. Consider the following spectral lines for atomic hydrogen :
A. First line of Paschen series
B. Second line of Balmer series
C. Third line of Paschen series
D. Fourth line of Bracket series
The correct arrangement of the above lines in ascending order of energy is :
(1) D < C < A < B
(2) A < B < C < D
(3) D < A < C < B
(4) C < D < B < A

45. Given below are two statements :
Statement I: Crystal Field Stabilization Energy (CFSE) of $\left[Cr(H_2O)_6\right]^{2+}$ is greater than that of $\left[Mn(H_2O)_6\right]^{2+}$.

Statement II: Potassium ferricyanide has a greater spin-only magnetic moment than sodium ferrocyanide.
In the light of the above statements, choose the correct answer from the options given below :
(1) Statement I is false but Statement II is true
(2) Both Statement I and Statement II are false
(3) Both Statement I and Statement II are true
(4) Statement I is true but Statement II is false

Integer Type Questions

46. The osmotic pressure of a living cell is 12 atm at 300 K. The strength of sodium chloride solution that is isotonic with the living cell at this temperature is ____ gL^{-1}. (Nearest integer)
Given: R = 0.08 L atm K^{-1} mol^{-1}
Assume complete dissociation of NaCl
(Given : Molar mass of Na and Cl are 23 and 35.5 g mol^{-1} respectively.)

47. MX is a sparingly soluble salt that follows the given solubility equilibrium at 298 K .
$MX(s) \rightleftharpoons M^+(aq) + X^-(aq); K_{sp} = 10^{-10}$
If the standard reduction potential for $M^+(aq) \xrightarrow{+e^-} M(s)$ is $\left(E^{\ominus}_{M^+/M}\right) = 0.79$ V , then the value of the standard reduction potential for the metal/metal insoluble salt electrode $E^{\ominus}_{X^-/MX(s)/M}$ is ____ mV. (nearest integer)
[Given : $\frac{2.303RT}{F} = 0.059$ V]

48. A substance 'X' (1.5 g) dissolved in 150 g of a solvent 'Y' (molar mass = 300 g mol^{-1}) led to an elevation of the boiling point by 0.5 K . The relative lowering in the vapour pressure of the solvent 'Y' is _____$\times 10^{-2}$. (nearest integer)
[Given : K_b of the solvent = 5.0 K kg mol^{-1}]
Assume the solution to be dilute and no association or dissociation of *X* takes place in solution.

49. The first and second ionization constants of H_2X are 2.5×10^{-8} and 1.0×10^{-13} respectively. The concentration of X^{2-} in 0.1 MH_2X solution is ____$\times 10^{-15}$ M. (Nearest Integer)

50. Identify the metal ions among
$Co^{2+}, Ni^{2+}, Fe^{2+}, V^{3+}$ and Ti^{2+} having a spin-only magnetic moment value more than 3.0 BM .
The sum of unpaired electrons present in the high spin octahedral complexes formed by those metal ions is_____

SECTION-III (MATHEMATICS)

Single Correct Type Questions

51. If the area of the region $\{(x,y): 1-2x \leqslant y \leqslant 4-x^2, x \geqslant 0, y \geqslant 0\}$ is $\frac{\alpha}{\beta}, \alpha, \beta \in N, \gcd(\alpha,\beta)=1$, then the value of $(\alpha+\beta)$ is :

(1) 73 (2) 85
(3) 67 (4) 91

52. Let $A=\{x : |x^2-10| \leq 6\}$ and $B=\{x : |x-2|>1\}$. Then

(1) $A-B=[2,3)$
(2) $A \cup B=(-\infty,1] \cup (2,\infty)$
(3) $B-A=(-\infty,-4) \cup (-2,1) \cup (4,\infty)$
(4) $A \cap B=[-4,-2] \cup [3,4]$

53. For a triangle ABC, let $\vec{p}=\overrightarrow{BC}, \vec{q}=\overrightarrow{CA}$ and $\vec{r}=\overrightarrow{BA}$. If $|\vec{p}|=2\sqrt{3}, |\vec{q}|=2$ and $\cos\theta=\frac{1}{\sqrt{3}}$, where θ is the angle between $\vec{p}$ and $\vec{q}$, then $|\vec{p}\times(\vec{q}-3\vec{r})|^2+3|\vec{r}|^2$ is equal to:

(1) 200 (2) 220
(3) 340 (4) 410

54. Let $f(x)=x^3+x^2f'(1)+2xf''(2)+f'''(3), x \in R$.
Then the value of $f'(5)$ is :

(1) $\frac{62}{5}$ (2) $\frac{657}{5}$
(3) $\frac{117}{5}$ (4) $\frac{2}{5}$

55. Let α and β be the roots of the equation $x^2+2ax+(3a+10)=0$ such that $\alpha<1<\beta$. Then the set of all possible values of a is :

(1) $(-\infty,-3)$
(2) $(-\infty,-2) \cup (5,\infty)$
(3) $\left(-\infty,\frac{-11}{5}\right)$
(4) $\left(-\infty,\frac{-11}{5}\right) \cup (5,\infty)$

56. The positive integer n, for which the solutions of the equation
$x(x+2)+(x+2)(x+4)+\cdots$
$+(x+2n-2)(x+2n)=\frac{8n}{3}$
are two consecutive even Integers, is:

(1) 3 (2) 9
(3) 12 (4) 6

57. If the system of equations
$3x+y+4z=3$
$2x+\alpha y-z=-3$
$x+2y+z=4$
has no solution, then the value of α is equal to :

(1) 13 (2) 23
(3) 19 (4) 4

58. Let z be the complex number satisfying $|z-5| \leq 3$ and having maximum positive principal argument. Then $34\left|\frac{5z-12}{5iz+16}\right|^2$ is equal to :

(1) 12 (2) 16
(3) 26 (4) 20

59. Let the line L pass through the point $(-3,5,2)$ and make equal angles with the positive coordinate axes. If the distance of L from the point $(-2,r,1)$ is $\sqrt{\frac{14}{3}}$, then the sum of all possible values of r is:

(1) 10 (2) 6
(3) 12 (4) 16

60. The largest $n \in N$, for which 7^n divides 101!, is:

(1) 19 (2) 16
(3) 15 (4) 18

61. Let $f: R \to R$ be a twice differentiable function such that $f''(x)>0$ for all $x \in R$ and $f'(a-1)=0$, where a is a real number. Let $g(x)=f(\tan^2 x-2\tan x+a), \ 0<x<\frac{\pi}{2}$.
Consider the following two statements :

(I) g is increasing in $\left(0,\frac{\pi}{4}\right)$

(II) g is deceasing in $\left(\frac{\pi}{4},\frac{\pi}{2}\right)$

Then,

(1) Both (I) and (II) are True
(2) Neither (I) nor (II) is True
(3) Only (I) is True
(4) Only (II) is True

62. Let the line L_1 be parallel to the vector $-3\hat{i}+2\hat{j}+4\hat{k}$ and pass through the point (2, 6, 7), and the line L_2 be parallel to the vector $2\hat{i}+\hat{j}+3\hat{k}$ and pass through the point (4, 3, 5). If the line L_3 is parallel to the vector $-3\hat{i}+5\hat{j}+16\hat{k}$ and intersects the lines L_1 and L_2 at the points C and D , respectively, then $|\overrightarrow{CD}|^2$ is equal to:

(1) 290 (2) 171

(3) 89 (4) 312

63. Let $y = y(x)$ be the solution of the differential equation $\sec x\frac{dy}{dx}-2y=2+3\sin x, x\in\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$, $y(0)=-\frac{7}{4}$. Then $y\left(\frac{\pi}{6}\right)$ is equal to :

(1) $-3\sqrt{2}-7$ (2) $-\frac{5}{2}$

(3) $-\frac{5}{4}$ (4) $-3\sqrt{3}-7$

64. Let one end of a focal chord of the parabola $y^2 = 16x$ be (16, 16). If $P(\alpha, \beta)$ divides this focal chord internally in the ratio 5 : 2, then the minimum value of $\alpha + \beta$ is equal to :

(1) 22 (2) 7

(3) 16 (4) 5

65. A random variable X takes values 0, 1, 2, 3 with probabilities $\frac{2a+1}{30}, \frac{8a-1}{30}, \frac{4a+1}{30}, b$ respectively, where $a, b \in R$. Let μ and σ respectively be the mean and standard deviation of X such that $\sigma^2 + \mu^2 = 2$. Then $\frac{a}{b}$ is equal to :

(1) 3 (2) 60

(3) 12 (4) 30

66. For the matrices $A=\begin{bmatrix}3 & -4\\ 1 & -1\end{bmatrix}$ and $B=\begin{bmatrix}-29 & 49\\ -13 & 18\end{bmatrix}$, if $(A^{15}+B)\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}0\\ 0\end{bmatrix}$, then among the following which one is true?

(1) $x = 11, y = 2$

(2) $x = 16, y = 3$

(3) $x = 5, y = 7$

(4) $x = 18, y = 11$

67. If the line $\alpha x + 4y = \sqrt{7}$, where $\alpha \in R$, touches the ellipse $3x^2 + 4y^2 = 1$ at the point P in the first quadrant, then one of the focal distances of P is :

(1) $\frac{1}{\sqrt{3}}-\frac{1}{2\sqrt{11}}$

(2) $\frac{1}{\sqrt{3}}+\frac{1}{2\sqrt{5}}$

(3) $\frac{1}{\sqrt{3}}-\frac{1}{2\sqrt{5}}$

(4) $\frac{1}{\sqrt{3}}+\frac{1}{2\sqrt{7}}$

68. Let $a_1, \frac{a_2}{2}, \frac{a_3}{2^2}, \ldots, \frac{a_{10}}{2^9}$ be a G.P. of common ratio $\frac{1}{\sqrt{2}}$. If $a_1 + a_2 + \ldots + a_{10} = 62$, then a_1 is equal to:

(1) $2(\sqrt{2}-1)$ (2) $2-\sqrt{2}$

(3) $\sqrt{2}-1$ (4) $2(2-\sqrt{2})$

69. Let $A = \{2, 3, 5, 7, 9\}$. Let R be the relation on A defined by xRy if and only if $2x \le 3y$. Let l be the number of elements in R, and m be the minimum number of elements required to be added in R to make it a symmetric relation. Then $l + m$ is equal to :

(1) 23 (2) 25

(3) 21 (4) 27

70. Let $y^2 = 12x$ be the parabola with its vertex at O . Let P be a point on the parabola and A be a point on the x-axis such that $\angle OPA = 90°$. Then the locus of the centroid of such triangles OPA is:

(1) $y^2 - 9x + 6 = 0$

(2) $y^2 - 6x + 4 = 0$

(3) $y^2 - 2x + 8 = 0$

(4) $y^2 - 4x + 8 = 0$

Integer Type Questions

71. Let $[\cdot]$ denote the greatest integer function and $f(x)=\lim_{n\to\infty}\frac{1}{n^3}\sum_{k=1}^{n}\left[\frac{k^2}{3^x}\right]$. Then $12\sum_{j=1}^{\infty}f(j)$ is equal to

72. If $\int_0^1 4\cot^{-1}\left(1-2x+4x^2\right)dx = a\tan^{-1}(2) - b\log_e(5)$, where $a, b \in N$, then $(2a+b)$ is equal to ____ .

73. If P is a point on the circle $x^2+y^2=4$, Q is a point on the straight line $5x+y+2=0$ and $x-y+1=0$ is the perpendicular bisector of PQ, then 13 times the sum of abscissa of all such points P is ____ .

74. Let the maximum value of $(\sin^{-1}x)^2+(\cos^{-1}x)^2$ for $x \in \left[-\frac{\sqrt{3}}{2}, \frac{1}{\sqrt{2}}\right]$ be $\frac{m}{n}\pi^2$, where $gcd(m, n) = 1$. Then $m+n$ is equal to ____ .

75. If $\left(\frac{1}{{}^{15}C_0}+\frac{1}{{}^{15}C_1}\right)\left(\frac{1}{{}^{15}C_1}+\frac{1}{{}^{15}C_2}\right)\cdots\left(\frac{1}{{}^{15}C_{12}}+\frac{1}{{}^{15}C_{13}}\right) = \frac{\alpha^{13}}{{}^{14}C_0\,{}^{14}C_1\cdots{}^{14}C_{12}}$, then 30α is equal to _____ .

PHYSICS WALLAH

JEE MAIN 2026

SESSION-01

Date: 21-01-2026

Shift-01

SECTION-I (PHYSICS)

Single Correct Type Questions

1. A light wave described by

$E = 60\left[\sin\left(3\times10^{15}\right)t + \sin\left(12\times10^{15}\right)t\right]$

(in SI units) falls on a metal surface of work function 2.8 eV. The maximum kinetic energy of ejected photoelectron is (approximately) ____eV.

($h = 6.6\times10^{-34}$ J.s. and $e = 1.6\times10^{-19}C$)

(1) 3.8 (2) 6.0
(3) 5.1 (4) 7.8

2. A gas based geyser heats water flowing at the rate of 5.0 litres per minute from 27°C to 87°C. The rate of consumption of the gas is _____ g/s.

(Take heat of combustion of gas $= 5.0\times10^4$ J / g)

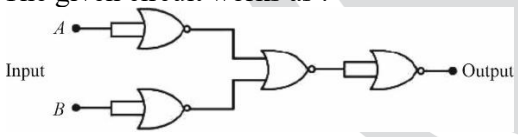
specific heat capacity of water $= 4200$ J / kg.°C

(1) 4.2
(2) 2.1
(3) 0.21
(4) 0.42

3. In an experiment the values of two spring constants were measured as $k_1 = (10\pm0.2)$ N / m and $k_2 = (20\pm0.3)$ N / m . If these springs are connected in parallel, then the percentage error in equivalent spring constant is :

(1) 1.33%
(2) 2.33%
(3) 1.67%
(4) 2.67%

4. The given circuit works as :

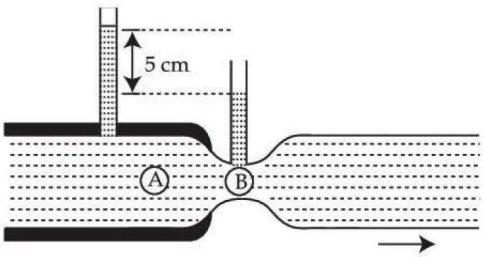


(1) AND gate
(2) NAND gate
(3) OR gate
(4) NOR gate

5. Two strings (*A*, *B*) having linear densities $\mu_A = 2\times10^{-4}$ kg/m and, $\mu_B = 4\times10^{-4}$ kg/m and lengths $L_A = 2.5$ m and $L_B = 1.5$ m respectively are joined. Free ends of *A* and *B* are tied to two rigid supports *C* and *D*, respectively creating a tension of 500 N in the wire. Two identical pulses, sent from *C* and *D* ends, take time t_1 and t_2 , respectively, to reach the joint. The ratio t_1 / t_2 is :

(1) 1.18
(2) 1.67
(3) 1.90
(4) 1.08

6. Water flows through a horizontal tube as shown in the figure. The difference in height between the water columns in vertical tubes is 5 cm and the area of cross-sections at *A* and *B* are 6 cm^2 and 3 cm^2 respectively. The rate of flow will be ____ cm^3 / s . (take $g = 10$ m/s^2)



(1) $200\sqrt{3}$ (2) $\frac{200}{\sqrt{3}}$
(3) $200\sqrt{6}$ (4) $100\sqrt{3}$

7. A point charge of 10^{-8}C is placed at origin. The work done in moving a point charge 2μC from point $A(4,4,2)$m to $B(2,2,1)$m is ____ *J*.

($\frac{1}{4\pi\epsilon_0} = 9\times10^9$ in SI units)

(1) 45×10^{-6} (2) 30×10^{-6}
(3) 0 (4) 15×10^{-6}

8. The electric field in a plane electromagnetic wave is given by :

$E_y = 69\sin\left[0.6\times10^3 x - 1.8\times10^{11}t\right]$ V/m

The expression for magnetic field associated with this electromagnetic wave is _____ *T*.

(1) $B_y = 2.3\times10^{-7}\sin\left[0.6\times10^3 x - 1.8\times10^{11}t\right]$

(2) $B_z = 2.3\times10^{-7}\sin\left[0.6\times10^3 x + 1.8\times10^{11}t\right]$

(3) $B_y = 69\sin\left[0.6\times10^3 x + 1.8\times10^{11}t\right]$

(4) $B_z = 2.3\times10^{-7}\sin\left[0.6\times10^3 x - 1.8\times10^{11}t\right]$

9. A parallel plate capacitor has capacitance *C*, when there is vacuum within the parallel plates. A sheet having thickness $\left(\frac{1}{3}\right)^{rd}$ of the separation between the plates and relative permittivity *K* is introduced between the plates. The new capacitance of the system is :

(1) $\frac{3KC}{2K+1}$ (2) $\frac{3CK^2}{(2K+1)^2}$
(3) $\frac{CK}{2+K}$ (4) $\frac{4KC}{3K-1}$

10. Consider a modified Bernoulli equation.

$$\left(P+\frac{A}{Bt^2}\right)+\rho g(h+Bt)+\frac{1}{2}\rho V^2 = \text{ constant}$$

If t has the dimension of time then the dimensions of A and B are _____ , _____ respectively.

(1) $\left[ML^0\ T^{-1}\right]$ and $\left[M^0LT\right]$

(2) $\left[ML^0\ T^{-2}\right]$ and $\left[M^0LT^{-1}\right]$

(3) $\left[ML^0\ T^{-2}\right]$ and $\left[M^0LT^{-2}\right]$

(4) $\left[ML^0\ T^{-1}\right]$ and $\left[M^0LT^{-1}\right]$

11. An aluminium and a steel rod having same lengths and cross-sections are joined to make total length of 120 cm at 30°C. The coefficient of linear expansion of aluminium and steel are $24\times10^{-6}/^\circ C$ and $1.2\times10^{-5}/^\circ C$, respectively. The length of this composite rod when its temperature is raised to 100°C, is _____ cm.

(1) 120.03 (2) 120.20

(3) 120.15 (4) 120.06

12. Initially a satellite of 100 kg is in a circular orbit of radius $1.5R_E$. This satellite can be moved to a circular orbit of radius $3R_E$ by supplying $\alpha\times10^6$ J of energy. The value of α is _____.

(Take Radius of Earth $R_E = 6\times10^6$ m and g = 10 m/s^2)

(1) 500 (2) 150

(3) 100 (4) 1000

13. A 4 kg mass moves under the influence of a force $\vec{F}=\left(4t^3\hat{i}-3t\,\hat{j}\right)$N where t is the time in second.

If mass starts from origin at t = 0, the velocity and position after t = 2s will be : (in SI units)

(1) $\left(\vec{v}=4\hat{i}-\frac{3}{2}\hat{j}\right),\left(\vec{r}=\frac{6}{5}\hat{i}-\hat{j}\right)$

(2) $\left(\vec{v}=3\hat{i}+\frac{3}{2}\hat{j}\right),\left(\vec{r}=\frac{6}{5}\hat{i}+\hat{j}\right)$

(3) $\left(\vec{v}=4\hat{i}+\frac{5}{2}\hat{j}\right),\left(\vec{r}=\frac{8}{5}\hat{i}+2\hat{j}\right)$

(4) $\left(\vec{v}=4\hat{i}-\frac{3}{2}\hat{j}\right),\left(\vec{r}=\frac{8}{5}\hat{i}-\hat{j}\right)$

14. If an alpha particle with energy 7.7 MeV is bombarded on a thin gold foil, the closest distance from nucleus it can reach is ____ m. (Atomic number of gold = 79 and $\frac{1}{4\pi\epsilon_0}=9\times10^9$ in SI units)

(1) 2.95×10^{-14} (2) 3.85×10^{-16}

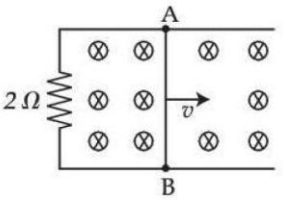
(3) 2.95×10^{-16} (4) 3.85×10^{-14}

15. In a double slit experiment the distance between the slits is 0.1 cm and the screen is placed at 50 cm from the slit's plane. When one slit is covered with a transparent sheet having thickness t and refractive index $n(=1.5)$, the central fringe shifts by 0.2 cm. The value of t is ____ cm.

(1) 6.0×10^{-3} (2) 5.0×10^{-3}

(3) 8×10^{-4} (4) 5.6×10^{-4}

16. A 1 m long metal rod AB completes the circuit as shown in figure. The area of circuit is perpendicular to the magnetic field of 0.10 T. If the resistance of the total circuit is 2Ω then the force needed to move the rod towards right with constant speed (v) of 1.5 m/s is _____ N.



(1) 7.5×10^{-3} (2) 5.7×10^{-2}

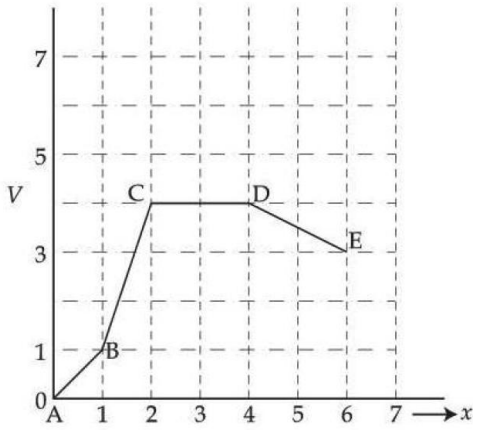
(3) 5.7×10^{-3} (4) 7.5×10^{-2}

17. A conducting circular loop of area 1.0 m^2 is placed perpendicular to a magnetic field which varies as $B=\sin(100t)$ Tesla. If the resistance of the loop is 100Ω, then the average thermal energy dissipated in the loop in one period is _____ J.

(1) 2π (2) π^2

(3) π (4) $\frac{\pi}{2}$

18. Potential energy (V) versus distance (x) is given by the graph. Rank various regions as per the magnitudes of the force (F) acting on a particle from high to low.



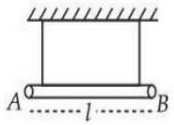
(1) $F_{BC} > F_{CD} > F_{DE} > F_{AB}$

(2) $F_{CD} > F_{AB} > F_{BC} > F_{DE}$

(3) $F_{CD} > F_{DE} > F_{AB} > F_{BC}$

(4) $F_{BC} > F_{AB} > F_{DE} > F_{CD}$

19. A uniform rod of mass m and length l suspended by means of two identical inextensible light strings as shown in figure. Tension in one string immediately after the other string is cut, is. (g acceleration due to gravity)



(1) $mg/3$ (2) mg
(3) $mg/2$ (4) $mg/4$

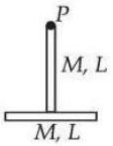
20. A current carrying solenoid is placed vertically and a particle of mass m with charge Q is released from rest. The particle moves along the axis of solenoid. If g is acceleration due to gravity then the acceleration (a) of the charged particle will satisfy :

(1) $a = 0$ (2) $0 < a < g$
(3) $a = g$ (4) $a > g$

Integer Type Questions

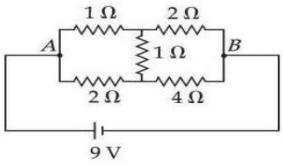
21. In a microscope the objective is having focal length $f_o = 2$ cm and eye-piece is having focal length $f_e = 4$ cm. The tube length is 32 cm. The magnification produced by this microscope for normal adjustment is _____.

22. Two identical thin rods of mass M kg and length L m are connected as shown in figure. Moment of inertia of the combined rod system about an axis passing through point P and perpendicular to the plane of the rods is $\frac{x}{12}ML^2$ kg m^2. The value of x is _____.



23. A collimated beam of light of diameter 2 mm is propagating along x-axis. The beam is required to be expanded in a collimated beam of diameter 14 mm using a system of two convex lenses. If first lens has focal length 40 mm , then the focal length of second lens is _____ mm.

24. The heat generated in 1 minute between points A and B in the given circuit, when a battery of 9 V with internal resistance of 1Ω is connected across these points is _____ J.



25. 10 mole of oxygen is heated at constant volume from 30°C to 40°C. The change in the internal energy of the gas is ____cal. (The molecular specific heat of oxygen at constant pressure, $C_P = 7\text{cal/mol.°C}$ and $R = 2\text{cal./mol.°C}$.)

SECTION-II (CHEMISTRY)

Single Correct Type Questions

26. Given below are two statements :

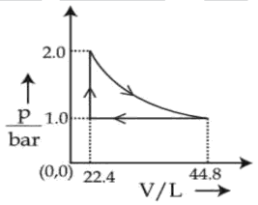
Statement I: When an electric discharge is passed through gaseous hydrogen, the hydrogen molecules dissociate and the energetically excited hydrogen atoms produce electromagnetic radiation of discrete frequencies.

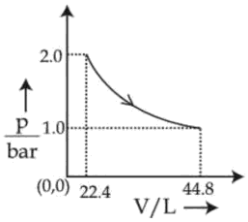
Statement II: The frequency of second line of Balmer series obtained from He^+ is equal to that of first line of Lyman series obtained from hydrogen atom.

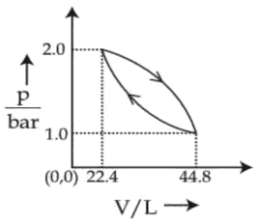
In the light of the above statements, choose the correct answer from the options given below :

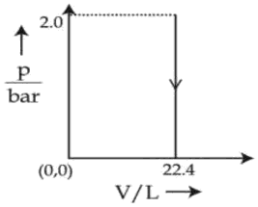
(1) Statement I is true but Statement II is false
(2) Statement I is false but Statement II is true
(3) Both Statement I and Statement II are true
(4) Both Statement I and Statement II are false

27. Which of the following graphs between pressure 'p' versus volume 'V' represents the maximum work done?

(1)


(2)


(3)


(4)


28. Given below are two statements:

Statement I: Among $\left[Cu(NH_3)_4\right]^{2+}$, $[Ni(en)_3]^{2+}$, $\left[Ni(NH_3)_6\right]^{2+}$ and $\left[Mn(H_2O)_6\right]^{2+}$, $\left[Mn(H_2O)_6\right]^{2+}$ has the maximum number of unpaired electrons.

Statement II: The number of pairs among $\left\{[NiCl_4]^{2-}, [Ni(CO)_4]\right\}$, $\left\{[NiCl_4]^{2-}, [Ni(CN)_4]^{2-}\right\}$ and $\left\{[Ni(CO)_4], [Ni(CN)_4]^{2-}\right\}$ that contain only diamagnetic species is two.

In the light of the above statements, choose the correct answer from the options given below :

(1) Statement I is true but Statement II is false
(2) Both Statement I and Statement II are false
(3) Statement I is false but Statement II is true
(4) Both Statement I and Statement II are true

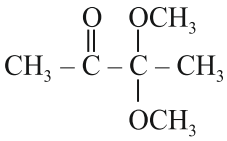
29. 14.0 g of calcium metal is allowed to react with excess HCl at 1.0 atm pressure and 273 K.

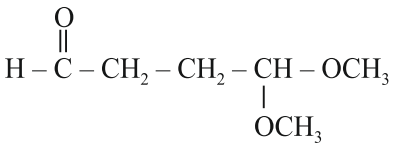
Which of the following statements is incorrect?

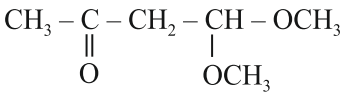
[Given: Molar mass in $gmol^{-1}$ of $Ca-40$, $Cl-35.5$, $H-1$]

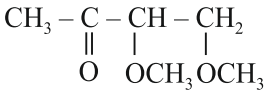
(1) 0.35 mol of H_2 gas is evolved.
(2) The limiting reagent is calcium metal.
(3) 33.3 g of $CaCl_2$ is produced.
(4) 7.84 L of H_2 gas is evolved.

30. An organic compound "P" of molecular formula $C_6H_{12}O_3$ gives positive Iodoform test but negative Tollen's test. When "P" is treated with dilute acid, it produces "Q". "Q" gives positive Tollen's test and also iodoform test. The structure of "P" is :

(1) 

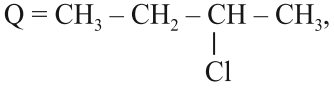
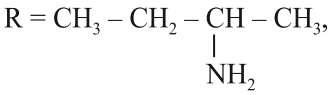
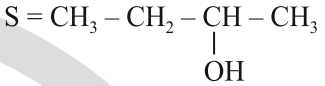
(2) 

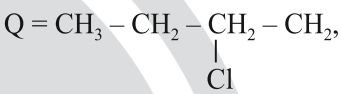
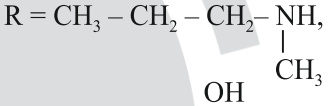
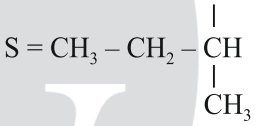
(3) 

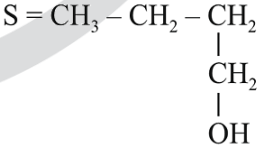
(4) 

31. A hydrocarbon 'P' (C_4H_8) on reaction with HCl gives an optically active compound 'Q' (C_4H_9Cl) which on reaction with one mole of ammonia gives compound 'R' $(C_4H_{11}N)$. 'R' on diazotization followed by hydrolysis gives 'S'. Identify P, Q, R and S.

(1) P = CH_3—△,
Q = Cl – CH_2—△,
R = H_2N – CH_2—△,
S = 

(2) P = $CH_3 - CH = CH - CH_3$,
Q = 
R = 
S = 

(3) P = $CH_3 - CH_2 - CH = CH_2$,
Q = 
R = 
S = 

(4) P = $CH_3 - CH = CH - CH_3$,
Q = $CH_3 - CH_2 - CH_2 - CH_2 - Cl$,
R = 
S = 

32. Identify the correct statements.

A. Arginine and Tryptophan are essential amino acids.
B. Histidine does not contain heterocyclic ring in its structure.
C. Proline is a six membered cyclic ring amino acid.
D. Glycine does not have chiral centre.
E. Cysteine has characteristic feature of side chain as $MeS - CH_2 - CH_2 -$.

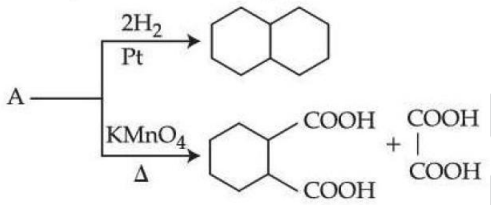
Choose the correct answer from the options given below :

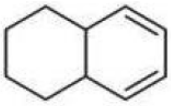
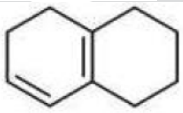
(1) C and D Only (2) C and E Only
(3) A and D Only (4) B and E Only

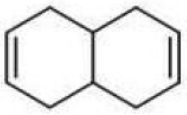
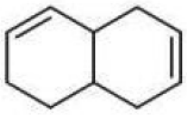
33. Elements P and Q form two types of non-volatile, non-ionizable compounds PQ and PQ_2. When 1 g of PQ is dissolved in 50 g of solvent 'A', ΔT_b was 1.176 K while when 1 g of PQ_2 is dissolved in 50 g of solvent ' A′, ΔT_b was 0.689 K. (K_b of 'A' $= 5$ K kg mol^{-1}). The molar masses of elements P and Q (in $gmol^{-1}$) respectively, are :

(1) 60, 25
(2) 25, 60
(3) 65, 145
(4) 70, 110

34. Identify A in the following reaction.



(1)  (2) 

(3)  (4) 

35. Given below are two statements :
Statement I: The number of species among $SF_4, NH_4^+, [NiCl_4]^{2-}, XeF_4, [PtCl_4]^{2-}, SeF_4$ and $[Ni(CN)_4]^{2-}$, that have tetrahedral geometry is 3.
Statement II: In the set $[NO_2, BeH_2, BF_3, AlCl_3]$, all the molecules have incomplete octet around central atom.
In the light of the above statements, choose the correct answer from the options given below:

(1) Both Statement I and Statement II are true
(2) Statement I is true but Statement II is false
(3) Both Statement I and Statement II are false
(4) Statement I is false but Statement II is true

36. Which of the following represents the correct trend for the mentioned property?

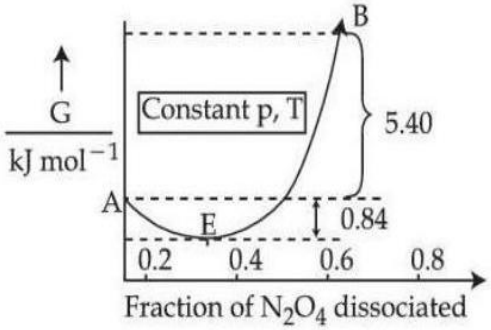
A. $F > P > S > B$ - First Ionization Energy
B. $Cl > F > S > P$ - Electron Affinity
C. $K > Al > Mg > B$ - Metallic character
D. $K_2O > Na_2O > MgO > Al_2O_3$ - Basic character

Choose the correct answer from the options given below :

(1) A, B and D only (2) A and B only
(3) A, B, C and D (4) B and C only

37. For the reaction, $N_2O_4 \rightleftharpoons 2NO_2$, graph is plotted as shown below. Identify correct statements.

A. Standard free energy change for the reaction is -5.40 kJ mol^{-1}.
B. As $\Delta G^{\ominus}$ in graph is positive, N_2O_4 will not dissociate into NO_2 at all.
C. Reverse reaction will go to completion.
D. When 1 mole of N_2O_4 changes into equilibrium mixture, value of $\Delta G^{\ominus} = -0.84$ kJ mol^{-1}
E. When 2 mole of NO_2 changes into equilibrium mixture, $\Delta G^{\ominus}$ for equilibrium mixture is -6.24 kJ mol^{-1}.



Choose the correct answer from the options given below :

(1) D and E only (2) C and E only
(3) B and C only (4) A and D only

38. Consider the following reactions.

$PbCl_2 + K_2CrO_4 \rightarrow A + 2KCl$
(Hot solution)
$A + NaOH \rightleftharpoons B + Na_2CrO_4$
$PbSO_4 + 4CH_3COONH_4 \rightarrow (NH_4)_2SO_4 + X$

In the above reactions, A, B and X are respectively.

(1) $Na_2[Pb(OH)_2]$, $PbCrO_4$ and $[Pb(NH_3)_4]SO_4$
(2) $Na_2[Pb(OH)_2]$, $PbCrO_4$ and $(NH_4)_2[Pb(CH_3COO)_4]$
(3) $PbCrO_4$, $Na_2[Pb(OH)_4]$ and $(NH_4)_2[Pb(CH_3COO)_4]$
(4) $PbCrO_4$, $Na_2[Pb(OH)_4]$ and $[Pb(NH_3)_4]SO_4$

39. In Carius method, 0.75 g of an organic compound gave 1.2 g of barium sulphate, find percentage of sulphur (molar mass 32 g mol^{-1}). Molar mass of barium sulphate is 233 g mol^{-1}.

(1) 21.97% (2) 16.48%
(3) 4.55% (4) 10.30%

40. Given below are two statements :

Statement I: The number of pairs among $[SiO_2, CO_2], [SnO, SnO_2], [PbO, PbO_2]$ and $[GeO, GeO_2]$, which contain oxides that are both amphoteric is 2.

Statement II: BF_3 is an electron deficient molecule, can act as a Lewis acid, forms adduct with NH_3 and has a trigonal planar geometry.

In the light of the above statements, choose the correct answer from the options given below :

(1) Statement I is true but Statement II is false
(2) Both Statement I and Statement II are true
(3) Statement I is false but Statement II is true
(4) Both Statement I and Statement II are false

41. 80 mL of a hydrocarbon on mixing with 264 mL of oxygen in a closed U-tube undergoes complete combustion. The residual gases after cooling to 273 K occupy 224 mL. When the system is treated with KOH solution, the volume decreases to 64 mL. The formula of the hydrocarbon is:

(1) C_2H_4 (2) C_2H_2
(3) C_2H_6 (4) C_4H_{10}

42. An organic compound (P) on treatment with aqueous ammonia under hot condition forms compound (Q) which on heating with Br_2 and KOH forms compound (R) having molecular formula C_6H_7N . Names of P, Q and R respectively are.

(1) Benzoic acid, 4-methylbenzamide, 4-methylaniline
(2) Benzoic acid, benzamide, aniline
(3) Toluic acid, methylbenzamide, 2-methylaniline
(4) Phenylethanoic acid, phenylethanamide, benzamine

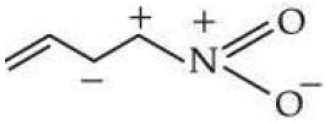
43. Identify correct statements from the following :

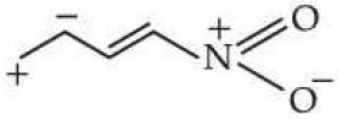
A. Propanal and propanone are functional isomers.
B. Ethoxyethane and methoxypropane are metamers.
C. But-2-ene shows optical isomerism.
D. But-1-ene and but-2-ene are functional isomers.
E. Pentane and 2, 2-dimethyl propane are chain isomers.

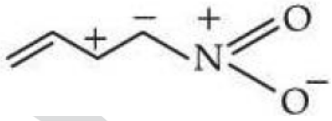
Choose the correct answer from the options given below :

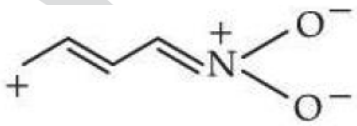
(1) C, D and E only
(2) A, B and E only
(3) A, B and C only
(4) B, C and D only

44. From the following, the least stable structure is :

(1) 

(2) 

(3) 

(4) 

45. MnO_4^{2-}, in acidic medium, disproportionates to:

(1) MnO_4^- and MnO_2
(2) MnO_4^- and MnO
(3) Mn_2O_7 and MnO
(4) Mn_2O_7 and MnO_2

Integer Type Questions

46. Consider the following reactions :

$$NaCl + K_2Cr_2O_7 + H_2SO_4 \rightarrow A + KHSO_4 + NaHSO_4 + H_2O$$

$$A + NaOH \rightarrow B + NaCl + H_2O$$

$$B + H_2SO_4 + H_2O_2 \rightarrow C + Na_2SO_4 + H_2O$$

In the product 'C', 'X' is the number of O_2^{2-} units, 'Y' is the total number oxygen atoms present and 'Z' is the oxidation state of Cr . The value of $X + Y + Z$ is _____.

47. The pH and conductance of a weak acid (HX) was found to be 5 and 4×10^{-5} S , respectively. The conductance was measured under standard condition using a cell where the electrode plates having a surface area of 1 cm^2 were at a distance of 15 cm apart. The value of the limiting molar conductivity is ___ $Sm^2\ mol^{-1}$. (nearest integer)
(Given: degree of dissociation of the weak acid $(\alpha) \ll 1$)

48. Us the following data:

Substance	$\frac{\Delta_f H^{\ominus}(500\ \mathrm{K})}{\mathrm{kJmol^{-1}}}$	$\frac{S^{\ominus}(500\ \mathrm{K})}{\mathrm{JK^{-1}\ mol^{-1}}}$
$AB(g)$	32	222
$A_2(g)$	6	146
$B_2(g)$	x	280

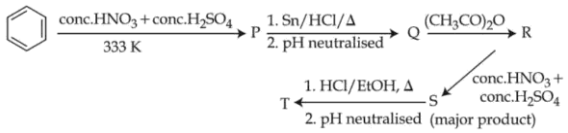
One mole each of $A_2(g)$ and $B_2(g)$ are taken in a 1 L closed flask and allowed to establish the equilibrium at 500 K.

$A_2(g)+B_2(g) \rightleftharpoons 2AB(g)$

The value of $x(\text{in kJ mol}^{-1})$ is _____. (Nearest integer)

(Given: $\log K = 2.2$ $R = 8.3\ \mathrm{J\ K^{-1}\ mol^{-1}}$)

49. Consider the following reaction sequence



The percentage of nitrogen in product 'T' formed is ____ %. (Nearest integer)

(Given molar mass in $\mathrm{gmol^{-1}}$ H : 1, C : 12, N : 14, O : 16)

50. Pre-exponential factors of two different reactions of same order are identical. Let activation energy of first reaction exceeds the activation energy of second reaction by $20\ \mathrm{kJ\ mol^{-1}}$. If k_1 and k_2 are the rate constants of first and second reaction respectively at 300 K, then $\ln\frac{k_2}{k_1}$ will be _____. (nearest integer) $\left[R = 8.3\ \mathrm{J\ K^{-1}\ mol^{-1}}\right]$

SECTION-III (MATHEMATICS)

Single Correct Type Questions

51. Let $f:R\to(0,\infty)$ be a twice differentiable function such that $f(3)=18, f'(3)=0$ and $f''(3)=4$. Then $\lim\limits_{x\to 1}\left(\log_e\left(\frac{f(2+x)}{f(3)}\right)^{\frac{18}{(x-1)^2}}\right)$ is equal to:

(1) 2 (2) 1

(3) 9 (4) 18

52. Let PQ and MN be two straight lines touching the circle $x^2+y^2-4x-6y-3=0$ at the points A and B respectively. Let O be the centre of the circle and $\angle AOB=\pi/3$. Then the locus of the point of intersection of the lines PQ and MN is:

(1) $x^2+y^2-18x-12y-25=0$

(2) $3(x^2+y^2)-12x-18y-25=0$

(3) $3(x^2+y^2)-18x-12y+25=0$

(4) $x^2+y^2-12x-18y-25=0$

53. The value of $\int\limits_{-\pi/6}^{\pi/6}\left(\frac{\pi+4x^{11}}{1-\sin(|x|+\pi/6)}\right)dx$ is equal to:

(1) 6π (2) 2π

(3) 4π (4) 8π

54. Let a point A lie between the parallel lines L_1 and L_2 such that its distances from L_1 and L_2 are 6 and 3 units, respectively. Then the area (in sq. units) of the equilateral triangle ABC, where the points B and C lie on the lines L_1 and L_2, respectively, is :

(1) $12\sqrt{2}$ (2) $15\sqrt{6}$

(3) $21\sqrt{3}$ (4) 27

55. Let the mean and variance of 7 observations $2,4,10,x,12,14,y, x>y$ be 8 and 16 respectively. Two numbers are chosen from $\{1,2,3,x-4,y,5\}$ one after another without replacement, then the probability, that the smaller number among the two chosen numbers is less than 4, is :

(1) $\frac{4}{5}$ (2) $\frac{3}{5}$

(3) $\frac{1}{3}$ (4) $\frac{2}{5}$

56. The value of $\mathrm{cosec}10^\circ-\sqrt{3}\sec 10^\circ$ is equal to :

(1) 6 (2) 8

(3) 2 (4) 4

57. Let $\vec{a}=-\hat{i}+2\hat{j}+2\hat{k}, \vec{b}=8\hat{i}+7\hat{j}-3\hat{k}$ and $\vec{c}$ be a vector such that $\vec{a}\times\vec{c}=\vec{b}$. If $\vec{c}\cdot(\hat{i}+\hat{j}+\hat{k})=4$, then $|\vec{a}+\vec{c}|^2$ is equal to :

(1) 33 (2) 35

(3) 30 (4) 27

58. Let the foci of a hyperbola coincide with the foci of the ellipse $\frac{x^2}{36}+\frac{y^2}{16}=1$. If the eccentricity of the hyperbola is 5, then the length of its latus rectum is :

(1) 16

(2) $24\sqrt{5}$

(3) 12

(4) $\frac{96}{\sqrt{5}}$

59. If $x^2+x+1=0$, then the value of $\left(x+\frac{1}{x}\right)^4$ $+\left(x^2+\frac{1}{x^2}\right)^4+\left(x^3+\frac{1}{x^3}\right)^4+\ldots+\left(x^{25}+\frac{1}{x^{25}}\right)^4$ is :

(1) 145 (2) 162

(3) 128 (4) 175

60. Let (α,β,γ) be the co-ordinates of the foot of the perpendicular drawn from the point $(5,4,2)$ on the line $\vec{r}=\left(-\hat{i}+3\hat{j}+\hat{k}\right)+\lambda\left(2\hat{i}+3\hat{j}-\hat{k}\right)$.

Then the length of the projection of the vector $\alpha\hat{i}+\beta\hat{j}+\gamma\hat{k}$ on the vector $6\hat{i}+2\hat{j}+3\hat{k}$ is :

(1) 4 (2) $\frac{18}{7}$

(3) 3 (4) $\frac{15}{7}$

61. If the domain of the function $f(x)=\cos^{-1}\left(\frac{2x-5}{11-3x}\right)+\sin^{-1}\left(2x^2-3x+1\right)$ is the interval $[\alpha,\beta]$, then $\alpha+2\beta$ is equal to :

(1) 5 (2) 1

(3) 3 (4) 2

62. Let O be the vertex of the parabola $x^2=4y$ and Q be any point on it. Let the locus of the point P, which divides the line segment OQ internally in the ratio $2:3$ be the conic C. Then the equation of the chord of C, which is bisected at the point $(1,2)$, is :

(1) $5x-4y+3=0$

(2) $5x-y-3=0$

(3) $x-2y+3=0$

(4) $4x-5y+6=0$

63. Let $y=y(x)$ be the solution curve of the differential equation $\left(1+x^2\right)dy+\left(y-\tan^{-1}x\right)dx=0, y(0)=1$. Then the value of $y(1)$ is :

(1) $\frac{2}{e^{\pi/4}}+\frac{\pi}{4}-1$ (2) $\frac{4}{e^{\pi/4}}-\frac{\pi}{2}-1$

(3) $\frac{2}{e^{\pi/4}}-\frac{\pi}{4}-1$ (4) $\frac{4}{e^{\pi/4}}+\frac{\pi}{2}-1$

64. The sum of all the roots of the equation $(x-1)^2-5|x-1|+6=0$, is :

(1) 4 (2) 5

(3) 3 (4) 1

65. The number of relations, defined on the set $\{a, b, c, d\}$, which are both reflexive and symmetric, is equal to:

(1) 64 (2) 256

(3) 16 (4) 1024

66. If the coefficient of x in the expansion of $\left(ax^2+bx+c\right)(1-2x)^{26}$ is –56 and the coefficients of x^2 and x^3 are both zero, then $a+b+c$ is equal to :

(1) 1483 (2) 1300

(3) 1500 (4) 1403

67. The area of the region, inside the ellipse $x^2+4y^2=4$ and outside the region bounded by the curves $y=|x|-1$ and $y=1-|x|$, is :

(1) $2\pi-1$ (2) $3(\pi-1)$

(3) $2(\pi-1)$ (4) $2\pi-\frac{1}{2}$

68. Let $\vec{c}$ and $\vec{d}$ be vectors such that $|\vec{c}+\vec{d}|=\sqrt{29}$ and $\vec{c}\times\left(2\hat{i}+3\hat{j}+4\hat{k}\right)=\left(2\hat{i}+3\hat{j}+4\hat{k}\right)\times\vec{d}$. If $\lambda_1,\lambda_2(\lambda_1>\lambda_2)$ are the possible values of $\left(\vec{c}+\vec{d}\right)\cdot\left(-7\hat{i}+2\hat{j}+3\hat{k}\right)$, then the equation $K^2x^2+\left(K^2-5K+\lambda_1\right)xy+\left(3K+\frac{\lambda_2}{2}\right)y^2-8x+12y+\lambda_2=0$ represents a circle, for K equal to :

(1) –1 (2) 1

(3) 4 (2) 2

69. The number of strictly increasing functions f from the set {1, 2, 3, 4, 5, 6} to the set {1, 2, 3, ….., 9} such that $f(i)\neq i$ for $1\le i\le 6$, is equal to :

(1) 21 (2) 22

(3) 27 (4) 28

70. Let $a_1, a_2, a_3, \ldots$ be a G.P. of increasing positive terms such that $a_2 \cdot a_3 \cdot a_4 = 64$ and $a_1 + a_3 + a_5 = \frac{813}{7}$. Then $a_3 + a_5 + a_7$ is equal to :

(1) 3248 (2) 3244
(3) 3256 (4) 3252

Integer Type Questions

71. Let $a_1 = 1$ and for $n \geq 1, a_{n+1} = \frac{1}{2}a_n + \frac{n^2 - 2n - 1}{n^2(n+1)^2}$.

Then $\left|\sum_{n=1}^{\infty}\left(a_n - \frac{2}{n^2}\right)\right|$ is equal to_____.

72. For some $\alpha, \beta \in \mathrm{R}$, let $A = \begin{bmatrix} \alpha & 2 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 \\ 1 & \beta \end{bmatrix}$ be such that $A^2 - 4A + 2I = B^2 - 3B + I = O$. Then $\left(\det\left(\mathrm{adj}\left(A^3 - B^3\right)\right)\right)^2$ is equal to _____.

73. $6\int_0^{\pi}\left|(\sin 3x + \sin 2x + \sin x)\right| dx$ is equal to _____.

74. Let $S = \{(m,n) : m, n \in \{1,2,3,\ldots..,50\}\}$. If the number of elements (m,n) in S such that $6^m + 9^n$ is a multiple of 5 is p and the number of elements (m,n) in S such that $m+n$ is a square of a prime number is q , then $\mathrm{p} + \mathrm{q}$ is equal to _____.

75. Let $f : \mathrm{R} \to \mathrm{R}$ be a twice differentiable function such that the quadratic equation $f(x)\mathrm{m}^2 - 2f'(x)\mathrm{m} + f''(x) = 0$ in m , has two equal roots for every $x \in \mathrm{R}$. If $f(0) = 1, f'(0) = 2,$ and (α, β) is the largest interval in which the function $f(\log_e x - x)$ is increasing, then $\alpha + \beta$ is equal to _____.

PHYSICS WALLAH

JEE MAIN 2026

SESSION-01

Date: 22-01-2026

Shift-02

SECTION-I (PHYSICS)

Single Correct Type Questions

1. Given below are two statements:

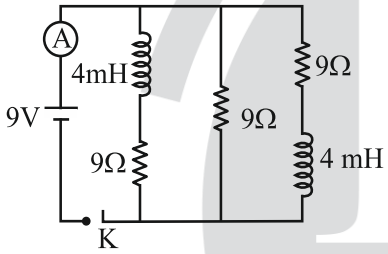
Statement I: For a mechanical system of many particles total kinetic energy is the sum of kinetic energies of all the particles

Statement II: The total kinetic energy can be the sum of kinetic energy of the center of mass w.r.t. to the origin and the kinetic energy of all the particles w.r.t. the center of mass as the reference.

In the light of the above statements, choose the correct answer from the options given below:

(1) Statement I is false but Statement II is true
(2) Statement I is true but Statement II is false
(3) Both Statement I and Statement II are false
(4) Both Statement I and Statement II are true

2. Figure shows the circuit that contains three resistances (9Ω each) and two inductors (4 mH each). The reading of ammeter at the moment switch K is turned ON, is _____A.



(1) 3 (2) zero
(3) 2 (4) 1

3. An electric power line having total resistance of 2Ω, delivers 1 kW of power at 250V. The percentage efficiency of transmission line is_____

(1) 92.5 (2) 86.5
(3) 100 (4) 96.9

4. If $\in$, E and t represent the free space permittivity, electric field and time respectively, then the unit of $\frac{\in E}{t}$ will be:

(1) Am^2 (2) A/m
(3) A/m^2 (4) Am

5. Which of the following are true for a single slit diffraction?

A. Width of central maxima increases with increase in wavelength keeping slit width constant
B. Width of central maxima increases with decrease in wavelength keeping slit width constant
C. Width of central maxima increases with decrease in slit width at constant wavelength.
D. Width of central maxima increases with increase in slit width at constant wavelength.
E. Brightness of central maxima increases for decrease in wavelength at constant slit width.

(1) A, C, E only (2) B, C only
(3) B, D only (4) A, D only

6. Three small identical bubbles of water having same charge on each coalesce to form a bigger bubble. Then the ratio of the potentials on one initial bubble and that on the resultant bigger bubble is:

(1) $1: 2^{2/3}$ (2) $3^{2/3} : 1$
(3) $1 : 3^{2/3}$ (4) $1 : 3^{1/3}$

7. Consider two boxes containing ideal gases A and B such that their temperatures, pressures and number densities are same. The molecular size of A is half of that of B and mass of molecule A is four times that of B. If the collision frequency in gas B is 32×10^{18}/s then collision frequency in gas A is _____/s.

(1) 4×10^8 (2) 32×10^8
(3) 2×10^8 (4) 8×10^8

8. In an open organ pipe v_3 and v_6 are 3rd and 6th harmonic frequencies, respectively. If $v_3 - v_6 =$ 2200 Hz then length of the pipe is_____mm. (Take velocity of sound in air is 330 m/s.)

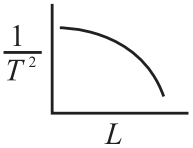
(1) 225 (2) 275
(3) 200 (4) 250

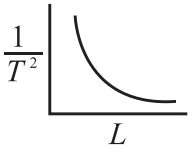
9. A laser beam has intensity of 4.0×10^{14} W/m^2. The amplitude of magnetic field associated with beam is _____T.

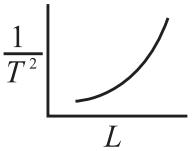
(Take $\in_0 = 8.85 \times 10^{-12} C^2/Nm^2$ and $c = 3 \times 10^8$ m/s)

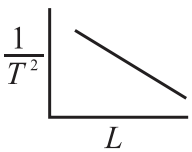
(1) 18.3 (2) 5.5
(3) 1.83 (4) 2.0

10. Using a simple pendulum experiment g is determined by measuring its time period T. Which of the following plots represent the correct relation between the pendulum length L and time period T?

(1) 

(2) 

(3) 

(4) 

11. The smallest wavelength of Lyman series is 91 nm. The difference between the largest wavelengths of Paschen and Balmer series is nearly _____nm.

(1) 1550 (2) 1784

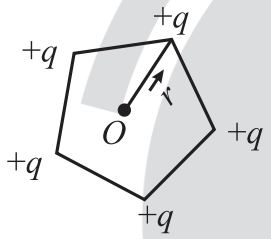
(3) 1217 (4) 1875

12. Light is incident on a metallic plate having work function 110×10^{-20}J. If the produced photoelectrons have zero kinetic energy then the angular frequency of the incident light is _____rad/s. ($h = 6.63 \times 10^{-34}$ J.s).

(1) 1.04×10^{13} (2) 1.66×10^{16}

(3) 1.66×10^{15} (4) 1.04×10^{16}

13. Five positive charges each having charge q are placed at the vertices of a pentagon as shown in the figure. The electric potential (V) and the electric field ($\vec{E}$) at the center O of the pentagon due to these five positive charges are:



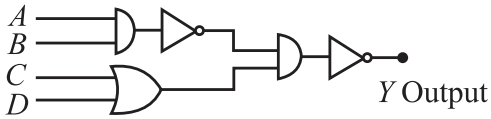
(1) $V = \frac{5q}{4\pi\varepsilon_{0r}}$ and $\vec{E} = \frac{5\sqrt{3}q}{8\pi\varepsilon_0 r^2}\hat{r}$

(2) $V = 0$ and $\vec{E} = 0$

(3) $V = \frac{5q}{4\pi\varepsilon_0 r}$ and $\vec{E} = \frac{5q}{4\pi\varepsilon_0 r^2}\hat{r}$

(4) $V = \frac{5q}{4\pi\varepsilon_0 r}$ and $\vec{E} = 0$

14. The correct truth table for the given input data of the following logic gate is:



(1)

Inputs				Outputs
A	*B*	*C*	*D*	*Y*
1	1	0	1	1
0	0	1	1	0
1	0	1	0	1
1	1	1	1	0

(2)

Inputs				Outputs
A	*B*	*C*	*D*	*Y*
1	1	0	1	0
0	0	1	1	0
1	0	1	0	1
1	1	1	1	1

(3)

Inputs				Outputs
A	*B*	*C*	*D*	*Y*
1	1	0	1	0
0	0	1	1	1
1	0	1	0	1
1	1	1	1	1

(4)

Inputs				Outputs
A	*B*	*C*	*D*	*Y*
1	1	0	1	1
0	0	1	1	0
1	0	1	0	0
1	1	1	1	1

15. In parallax method for the determination of focal length of a concave mirror, the object should always be placed:

(1) between the focus (F) and the centre of curvature (C) of the miror only

(2) beyond the centre of the curvature (C) of the mirror only

(3) between the pole (P) and the focus (F) of the concave mirror only

(4) at any point beyond the focus (F) of the mirror

16. When a part of a straight capillary tube is placed vertically in a liquid, the liquid raises upto certain height h. If the inner radius of the capillary tube, density of the liquid and surface tension of the liquid decrease by 1% each, then the height of the liquid in the tube will change by _____%.

(1) –3

(2) –1

(3) +3

(4) +1

17. Given below are two statements:

Statement I: A satellite is moving around earth in the orbit very close to the earth surface. The time period of revolution of satellite depends upon the density of earth.

Statement II: The time period of revolution of the satellite is $T = 2\pi\sqrt{\frac{R_e}{g}}$ (for satellite very close to the earth surface), where R_e radius of earth and g acceleration due to gravity.

In the light of the above statements, choose the correct answer from the options given below:

(1) Statement I is true but Statement II is false

(2) Both statement I and Statement II are false

(3) Statement I is false but Statement II is true

(4) Both statement I and Statement II are true

18. Given below are two statements:

Statement I: An object moves from position r_1 to position r_2 under a conservative force field $\vec{F}$. The work done by the force is $W = -\int_{r_1}^{r_2} \vec{F} \cdot \vec{dr}$

Statement II: Any object moving from one location to another location can follow infinite number of paths. Therefore, the amount of work done by the object changes with the path it follows for a conservative force.

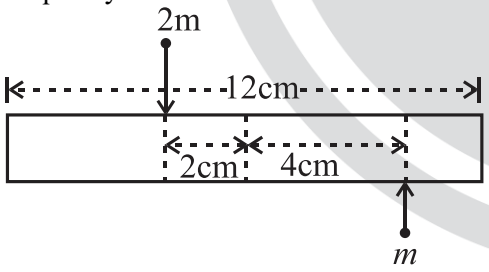
In the light of the above statements, choose the correct answer from the options given below:

(1) Statement I is true but Statement II is false
(2) Both statement I and Statement II are false
(3) Statement I is false but Statement II is true
(4) Both statement I and Statement II are true

19. The wavelength of light, while it is passing through water is 540 nm. The refractive index of water is $\frac{4}{3}$. The wavelength of the same light when it is passing through a transparent medium having refractive index of $\frac{3}{2}$ is_____nm.

(1) 540 (2) 380
(3) 480 (4) 840

20. A uniform bar of length 12 cm and mass 20 *m* lies on a smooth horizontal table. Two points masses *m* and 2*m* are moving in opposite directions with same speed of *v* and in the same plane as the bar, as shown in figure. These masses strike the bar simultaneously and get stuck to it. After collision the entire system is rotating with angular frequency ω. The ratio of *v* and ω is:



(1) $2\sqrt{88}$ (2) 66
(3) 32 (4) 33

Integer Type Questions

21. A capacitor *P* with capacitance 10×10^{-6} F is fully charged with a potential difference of 6.0 V and disconnected from the battery. The charged capacitor *P* is connected across another capacitor *Q* with capacitance 20×100^{-6} F. The charge on capacitor *Q* when equilibrium is established will be $\alpha \times 10^{-5}$C (assume capacitor *Q* does not have any charge initially), the value of α is_____.

22. An insulated cylinder of volume 60 cm^3 is filled with a gas at 27°C and 2 atmospheric pressure. Then the gas is compressed making the final volume as 20 cm^3 while allowing the temperature to rise to 77°C. The final pressure is_____atmospheric pressure.

23. A cylindrical conductor of length 2 m and area of cross-section 0.2 mm^2 carries an electric current of 1.6 A when its ends are connected to a 2V battery. Mobility of electrons in the conductor is $\alpha \times 10^{-3}$ $m^2/V.s$. The value of α is:
(electron concentration = $5 \times 10^{28}/m^3$ and electron charge = 1.6×10^{-19}C)

24. Two masses m and 2m are connected by a light string going over a pulley (disc) of mass 30m with radius r = 0.1 m. The pulley is mounted in a vertical plane and it is free to rotate about its axis. The 2m mass is released from rest and its speed when it has descended through a height of 3.6 m is _____ m/s. (Assume string does not slip and $g = 10\ m/s^2$)

25. A conducting circular loop is rotated about its diameter at a constant angular speed of 100 rad/s in a magnetic field of 0.5 T perpendicular to the axis of rotation. When the loop is rotated by 30° from the horizontal position, the induced EMF is 15.4 mV. The radius of the loop is _____mm.
$\left(\text{Take } \pi = \frac{22}{7}\right)$

SECTION-II (CHEMISTRY)

Single Correct Type Questions

26. Among H_2S, H_2O, NF_3, NH_3 and $CHCl_3$, identify the molecule (X) with lowest dipole moment value. The number of lone pairs of electrons present on the cental atom of the molecule (X) is:

(1) 0
(2) 1
(3) 3
(4) 2

27. Which of the following mixture gives a buffer solution with pH = 9.25?
Given : $pK_b(NH_4OH) = 4.75$

(1) 0.5 M NH_4OH (0.2 L) + 0.2 M HCl (0.5 L)
(2) 0.2 M NH_4OH (0.4 L) + 0.1 M HCl (1 L)
(3) 0.4 M NH_4OH (1 L) + 0.1 M HCl (1 L)
(4) 0.2 M NH_4OH (0.5 L) + 0.1 M HCl (0.5 L)

28. Given below are two statements:

Statement I: C < O < N < F is the correct order in terms of first ionization enthalpy values.

Statement II: S > Se > Te > Po > O is the correct order in terms of the magnitude of electron gain enthalpy values.

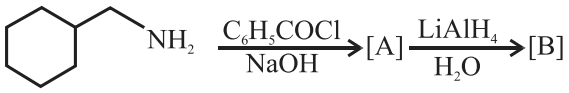
In the light of the above statements, choose the correct answer from the options given bleow:

(1) Both statement I and statement II are true

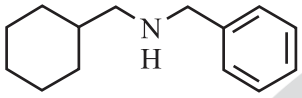
(2) Both statement I and staement II are false

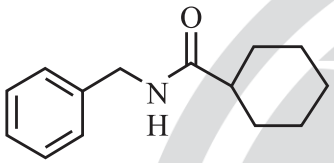
(3) Statement I is true but Statement II is false

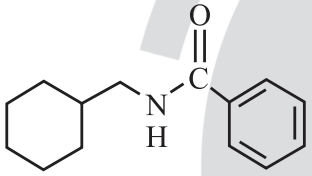
(4) Statement I is false but Statement II is true

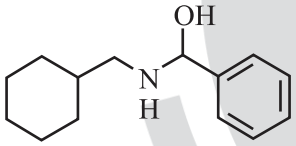
29. 

The final product [B] is:

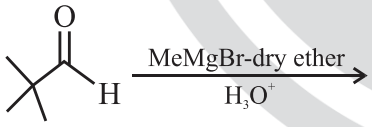
(1) 

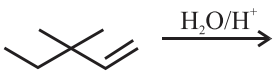
(2) 

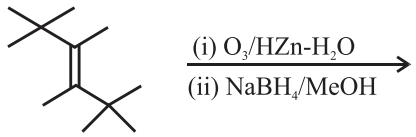
(3) 

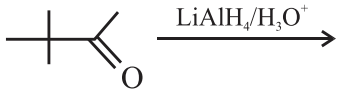
(4) 

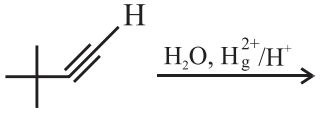
30. 3, 3-Dimethyl-2-butanol cannot be prepared by:

A. 

B. 

C. 

D. 

E. 

Choose the correct answer from the options given below:

(1) B, C and E only (2) B only

(3) B and E only (4) B and C only

31. The energy of first (lowest) Balmer line of H atom is x J. The energy (in J) of second Balmer line of H atom is:

(1) x^2 (2) $2x$

(3) $\frac{x}{1.35}$ (4) $1.35x$

32. Correct statement regarding Arrhenius equation among the following are:

A. Factor $e^{-Ea/RT}$ corresponds to fraction of molecules having kinetic energy less than Ea.

B. At given temperature, lower the Ea, faster is the reaction.

C. Increase in temperature by about 10°C doubles the rate of reaction.

D. Plot of log k vs $\frac{1}{T}$ gives a straight line with slope = $-\frac{Ea}{R}$

Choose the correct answer from the options given below:

(1) A and C only (2) A and B only

(3) B and C only (4) B and D only

33. $[Ni(PPh_3)_2Cl_2]$ is a paramagnetic complex. Identify the incorrect statements about this complex.

A. The complex exhibits geometrical Isomerism

B. The complex is white in colour.

C. The calculated spin-only magnetic moment of the complex is 2.84 BM.

D. The calculated CFSE (Crystal Field Stabilization Energy) of Ni in this complex is $-0.8\ \Delta_0$.

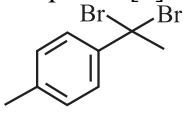
E. The geometrical arrangement of ligands in this complex is similar to that in $Ni(CO)_4$.

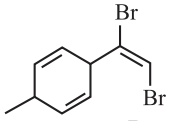
Choose the correct answer from the options given below:

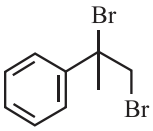
(1) A, B and D only (2) C and D only

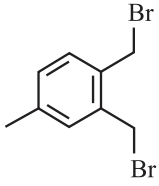
(3) A and B only (4) C, D and E only

34. The dibromo compound [P] (molecular formula: $C_9H_{10}Br_2$) when heated with excess sodamide followed by treatment with dilute HCl gives [Q]. On warming [Q] with mercuric sulphate and dilute sulphuric acid yield [R] which gives positive Iodoform test but negative Tollen's test. The compound [P] is:

(1) 

(2) 

(3) 

(4) 

35. Given below are two statements:

Statement I: Elements 'X' and 'Y' are the most and least electronegative elements, respectively among N, As, Sb and P. The nature of the oxides X_2O_3 and Y_2O_3 is acidic and amphoteric, respectively.

Statement II: BCl_3 is covalent in nature and get hydrolysed in water. It produces $[B(OH)_4]^-$ and $[B(H_2O)_6]^{3+}$ in aqueous medium.

In the light of the above statements, choose the correct answer from the options given below:

(1) Both statement I and statement II are true
(2) Statement I is false but statement II is true
(3) Statement I is true but Statement II is false
(4) Both statement I and statement II are false

36. Identify the correct statements:

A. Hydrated salts can be used as primary standard.
B. Primary standard should not unergo any reaction with air.
C. Reactions of primary standard with another substance should be instantaneous and stoichiometric.
D. Primary standard should not be soluble in water
E. Primary standard should have low relative molar mass.

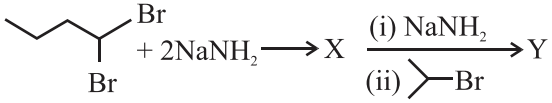
Choose the correct answer from the options given below:

(1) D and E only (2) A, B, C and E only
(3) A, B and C only (4) A, B and E only

37. The compound A, $C_8H_8O_2$ reacts with acetophenone to form a single product via cross-Aldol condensation. The compound A on reaction with conc. NaOH forms a substituted benzyl alcohol as one of the two products. The compound A is:

(1) 4-methoxy benzaldehyde
(2) 2-hydroxy acetophenone
(3) 4-methyl benzoic acid
(4) 4-hydroxy benzylaldehyde

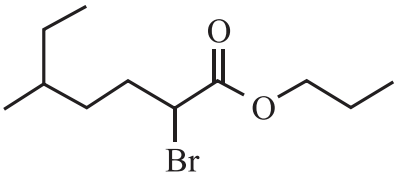
38. Consider the following reaction:



The product Y formed is:

(1) 2-methylhex-3-yne
(2) Isopropylbut-1-yne
(3) 5-methylhex-2-yne
(4) 2-methylhex-2-yne

39. The IUPAC name of the following compound is



(1) n-propyl-2-bromo-5-methylheptanoate
(2) 2-bromo-5-methylhexylpropanoate
(3) 2-bromo-5-methylpropanoate
(4) n-propyl-1-bromo-4-methylhexanoate

40. $A + 2B \longrightarrow AB_2$

360.0 g of 'A' (Molar mass : 60 g mol^{-1}) and 56.0 g of 'B' (Molar mass : 80 g mol^{-1}) are allowed to react. Which of the following statements are correct?

A. 'A' is the limiting reagent
B. 77.0 g of AB_2 is formed
C. Molar mass of AB_2 is 140 g mol^{-1}.
D. 15.0 g of A is left unreacted after the completion of reaction.

Choose the correct answer from the options given below:

(1) B and D only (2) C and D only
(3) A and C only (4) A and B only

41. When 1 g of compound (X) is subjected to Kjeldahl's method for estimation of nitrogen, 15 mL 1 M H_2SO_4 was neutralized by ammonia evolved. The percentage of nitrogen in compound (X) is:

(1) 42 (2) 0.21
(3) 21 (4) 0.42

42. Match Column-I with Column-II

Column-I Reaction of Glucose with		**Column-I Product formed**	
A.	Hydroxylamine	I.	Gluconic acid
B.	Br_2 water	II.	Glucose pentacetate
C.	Excess acetic anhydride	III.	Saccharic acid
D.	Concentrated HNO_3	IV.	Glucoxime

Choose the correct answer from the options given below:

	A	**B**	**C**	**D**
(1)	IV	I	II	III
(2)	IV	III	II	I
(3)	I	III	IV	II
(4)	III	I	IV	II

43. Given below are two statements:

Statement I : The first ionization enthalpy of Cr is lower than that of Mn.

Statement II: The second and third ionization enthalpies of Cr are higher than those of Mn.

In the light of the above statements, choose the correct answer from the options given below:

(1) Both statement I and statement II are false

(2) Both statement I and statement II are true

(3) Statement I is false but statement II is true

(4) Statement I is true but statement II is false

44. At T(K), 100 g of 98% H_2SO_4 (w/w) aqueous solution is mixed with 100 g of 49% H_2SO_4 (w/w) aqueous solution. What is the mole fraction of H_2SO_4 in the resultant solution?

(Given: Atomic mass H = 1 u; S = 32u; O = 16 u)

(Assume that temperature after mixing remains constant)

(1) 0.1 (2) 0.9

(3) 0.663 (4) 0.337

45. Consider the following reduction process:

$Al^{3+} + 3e^- \longrightarrow Al(s),\ E^\circ = -1.66V$

$Fe^{3+} + e^- \longrightarrow Fe^{2+},\ E^\circ = +0.77V$

$Co^{3+} + e^- \longrightarrow Co^{2+},\ E^\circ = +1.81V$

$Cr^{3+} + 3e^- \longrightarrow Cr(s),\ E^\circ = -0.74V$

The tendency to act as reducing agent decreases in the order:

(1) $Al > Cr > Fe^{2+} > Co^{2+}$

(2) $Al > Cr > Co^{2+} > Fe^{2+}$

(3) $Al > Fe^{2+} > Cr > Co^{2+}$

(4) $Cr > Fe^{2+} > Al > Co^{2+}$

Integer Type Questions

46. Consider the following electrochemical cell:

$Pt|O_2(g)(1\ bar)|HCl(aq)||\ M^{2+}(aq,\ 1.0\ M)|\ M(s)$

The pH above which, oxygen gas would start to evolve at anode is _____(nearest integer)

Given:

$\left.\begin{aligned} E^\circ_{M^{2+}/M} &= 0.994V \\ E^\circ_{O_2/H_2O} &= 1.23V \end{aligned}\right\}$ standard reduction potential

And $\frac{RT}{F}(2.303) = 0.059V$ at the given condition

47. If the enthalpy of sublimation of Li is 155 kJ mol^{-1}, enthalpy of dissociation of F_2 is 150 kJ mol^{-1}, ionizaation enthalpy of Li is 520 kJ mol^{-1}, electron gain enthalpy of F is –313 kJ mol^{-1}, standard enthalpy of formation of LiF is –594 kJ mol^{-1}. The magnitude of lattice enthalpy of LiF is kJ mol^{-1}. (Nearest Integer)

48. Among the followng oxides of 3d elements, the number of mixed oxides are_____.

Ti_2O_3, V_2O_4, Cr_2O_3, Mn_3O_4, Fe_3O_4, Fe_2O_3, Co_3O_4

49. Consider $A \xrightarrow{k_1} B$ and $C \xrightarrow{k_2} D$ are two reactions. If the rate constant (k_1) of the $A \longrightarrow B$ reaction can be expressed by the following equation $\log_{10} k = 14.34 - \frac{1.5 \times 10^4}{T/K}$ and activation energy of $C \longrightarrow D$ reaction (Ea_2) is $\frac{1}{5}$th of the $A \longrightarrow B$ reaction (Ea_1), then the value of (Ea_2 is _____kJ mol^{-1}). (Nearest Integer)

50. The mass of benzanilide obtained from the benzoylation reaction of 5.8 g of aniline, if yield of product is 82% is_____g (nearest integer).

(Given molar mass in g mol^{-1} H : 1, C : 12, N : 14, O : 16)

SECTION-III (MATHEMATICS)

Single Correct Type Questions

51. Let the locus of the mid-point of the chord through the origin *O* of the parabola $y^2 = 4x$ be the curve *S*. Let *P* be any point on S. Then the locus of the point, which internally divides *OP* in the ratio 3 : 1, is:

(1) $3y^2 = 2x$ (2) $3x^2 = 2y$

(3) $2y^2 = 3x$ (4) $2x^2 = 3y$

52. Among the statements

(S_1) : If $A(5, -1)$ and $B(-2, 3)$ are two vertices of a triangle, whose orthocentre is (0, 0), then its third vertex is (–4, –7) and

(S_2) : If positive numbers 2a, b, c are three consecutive terms of an A.P., then the lines $ax + by + c = 0$ are concurrent at (2, –2),

(1) both are correct

(2) only (S1) is correct

(3) both are incorrect

(4) only (S_2) is correct

53. Let [.] denote the greatest integer function, and let $f(x) = \min\{\sqrt{2}x, x^2\}$. Let $S = \{x \in (-2, 2) :$ the function $g(x) = |x|[x^2]$ is discontinuous at $x\}$. Then $\sum_{x \in S} f(x)$ equals

(1) $\sqrt{6} - 2\sqrt{2}$ (2) $2\sqrt{6} - 3\sqrt{2}$

(3) $2 - \sqrt{2}$ (4) $1 - \sqrt{2}$

54. Let $f(x)=[x]^2-[x+3]-3,\ x\in R,$ where [.] is the greatest integer function. Then

(1) $f(x)=0$ for finitely many values of x

(2) $f(x)<0$ only for $x\in[-1, 3)$

(3) $f(x)=0$ only for $x\in[4, \infty)$

(4) $\int_0^2 f(x)dx=-6$

55. If $\lim\limits_{x\to 0}\dfrac{e^{(a-1)x}+2\cos bx+(c-2)e^{-x}}{x\cos x-\log_e(1+x)}=2,$ then $a^2+b^2+c^2$ is equal to:

(1) 7 (2) 9

(3) 5 (4) 3

56. let C_r denote the coefficient of x^r in the binomial expansion of $(1+x^n),\ n\in N,\ 0\le r\le n.$

If $P_n=C_0-C_1+\dfrac{2^2}{3}C_2-\dfrac{2^3}{4}C_3+\ldots+\dfrac{(-2)^n}{n+1}C_n,$ then the value of $\sum\limits_{n=1}^{25}\dfrac{1}{P_{2n}}$ equals

(1) 675 (2) 650

(3) 580 (4) 525

57. If the mean deviation about the median of the numbers k, $2k$, $3k$, …., $1000k$ is 500, then k^2 is equal to:

(1) 9 (2) 4

(3) 16 (4) 1

58. The area of the region $A=\{(x, y): 4x^2+y^2\le 8$ and $y^2\le 4x\}$ is

(1) $\pi+4$ (2) $\dfrac{\pi}{2}+\dfrac{1}{3}$

(3) $\dfrac{\pi}{2}+2$ (4) $\pi+\dfrac{2}{3}$

59. The number of elements in the relation $R=\{(x, y): 4x^2+y^2<52,\ x, y\in Z\}$ is

(1) 86 (2) 67

(3) 77 (4) 89

60. Let L, be the line $\dfrac{x+1}{2}=\dfrac{y+1}{3}=\dfrac{z+3}{6}$ and let S be the set of all points (a, b, c) on L, whose distance from the line $\dfrac{x+1}{2}=\dfrac{y+1}{3}=\dfrac{z-9}{0}$ along the line L is 7. Then $\sum\limits_{(a,b,c)\in S}(a+b+c)$ is equal to:

(1) 40 (2) 34

(3) 28 (4) 6

61. If $y=y(x)$ satisfies the differential equation $16\left(\sqrt{x+9\sqrt{x}}\right)\left(4+\sqrt{9+\sqrt{x}}\right)\cos y\ dy=(1+2\sin y)dx,\ x>0$ and $y(256)=\dfrac{\pi}{2},\ y(49)=\alpha,$ then $2\sin\alpha$ is equal to

(1) $\sqrt{2}-1$

(2) $2(\sqrt{2}-1)$

(3) $2\sqrt{2}-1$

(4) $3(\sqrt{2}-1)$

62. Let $P(10, 2\sqrt{15})$ be a point on the hyperbola $\dfrac{x^2}{a^2}-\dfrac{y^2}{b^2}=1,$ whose foci are S and S'. If the length of its latus rectum is 8, then the square of the area of $\Delta PSS'$ is equal to

(1) 2700 (2) 900

(3) 4200 (4) 1462

63. If $X=\begin{bmatrix}x\\y\\z\end{bmatrix}$ is a solution of the system of equation $AX=B,$ where adj A $=\begin{bmatrix}4&2&2\\-5&0&5\\1&-2&3\end{bmatrix}$ and $B=\begin{bmatrix}4\\0\\2\end{bmatrix},$ then $|x+y+z|$ is equal to:

(1) 1 (2) $\dfrac{3}{2}$

(3) 3 (4) 2

64. Let n be the number obtained on rolling a fair die. If the probability that the system

$x-ny+z=6$

$x+(n-2)y+(n+1)z=8$

$(n-1)y+z=1$

Has a unique solution is $\dfrac{k}{6},$ then the sum of k and all possible values of n is:

(1) 24 (2) 21

(3) 20 (4) 22

65. Let α, β be the roots of the quadratic equation $12x^2-20x+3\lambda=0,\ \lambda\in Z.$ If $\dfrac{1}{2}\le|\beta-\alpha|\le\dfrac{3}{2},$ then the sum of all possible values of λ is:

(1) 3 (2) 4

(3) 6 (4) 1

66. Let the domain of the function $f(x)=\log_3\log_5(7-\log_2(x^2-10x+85))+\sin^{-1}\left(\left|\frac{3x-7}{17-x}\right|\right)$ be $(\alpha,\beta]$. Then $\alpha+\beta$ is equal to:

(1) 12 (2) 9
(3) 10 (4) 8

67. Let f and g be functions satisfying $f(x+y)=f(x)f(y), f(1)=7$ and $g(x+y)=g(xy,)$ $g(1)=1$, for all $x, y\in N$. If $\sum_{x=1}^{n}\left(\frac{f(x)}{g(x)}\right)=19607$, then n is equal to:

(1) 4 (2) 6
(3) 5 (4) 7

68. Let $\vec{a}=2\hat{i}-\hat{j}+\hat{k}$ and $\vec{b}=\lambda\hat{j}+2\hat{k}, \lambda\in Z$ be the two vectors. Let $\vec{c}=\vec{a}\times\vec{b}$ and $\vec{d}$ be the vector of magnitude 2 in yz-plane. If $|\vec{c}|=\sqrt{53}$, then the maximum possible value of $(\vec{c}\cdot\vec{d})^2$ is equal to:

(1) 208 (2) 26
(3) 104 (4) 52

69. Let $S=\{z\in\mathbb{C}:4z^2+\bar{z}=0\}$. Then $\sum_{z\in S}|z|^2$ is equal to

(1) $\frac{5}{64}$ (2) $\frac{7}{64}$
(3) $\frac{3}{16}$ (4) $\frac{1}{16}$

70. Let S and S' be the foci of the ellipse $\frac{x^2}{25}+\frac{y^2}{9}=1$ and $P(\alpha,\beta)$ be a point on the ellipse in the first quadrant. If $(SP)^2+(S'P)^2-SP\cdot S'P=37$, then $\alpha^2+\beta^2$ is equal to

(1) 17 (2) 13
(3) 15 (4) 11

Integer Type Questions

71. Let S be the set of the 11 natural numbers. Then the number of elements in $A=\{B\subseteq S:n(B)\geq 2$ and the product of all elements of B is even$\}$ is

72. Let $\cos(\alpha+\beta)=-\frac{1}{10}$ and $\sin(\alpha-\beta)=-\frac{3}{8}$, where $0<\alpha<\frac{\pi}{3}$ and $0<\beta<\frac{\pi}{4}$.

If $\tan 2\alpha=\frac{3(1-r\sqrt{5})}{\sqrt{11}(s+\sqrt{5})}$, $r, s\in N$, then $r+s$ is equal to

73. Let a vector $\vec{a}=\sqrt{2}\hat{i}-\hat{j}+\lambda\hat{k}, \lambda>0$, make an obtuse angle with the vector $\vec{b}=-\lambda^2\hat{i}+4\sqrt{2}\hat{j}+4\sqrt{2}\hat{k}$ and an angle $\theta, \frac{\pi}{6}<\theta<\frac{\pi}{2}$, with the positive z-axis. If the set of all possible values of λ is $(\alpha,\beta)-\{\gamma\}$, then $\alpha+\beta+\gamma$ is equal to

74. Suppose a, b, c are in A.P. and a^2, $2b^2$, c^2 are in G.P. If $a<b<c$ and $a+b+c=1$, then $9(a^2+b^2+c^2)$ is equal to

75. Let [.] be the greatest integer function. If $\alpha=\int_0^{64}(x^{1/3}-[x^{1/3}])dx$, then $\frac{1}{\pi}\int_0^{\alpha\pi}\left(\frac{\sin^2\theta}{\sin^6\theta+\cos^6\theta}\right)d\theta$ is equal to

PHYSICS WALLAH

JEE MAIN 2026

SESSION-01

Date: 22-01-2026

Shift-01

SECTION-I (PHYSICS)

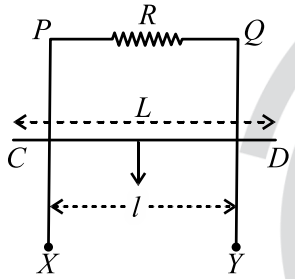
Single Correct Type Questions

1. A projectile is thrown upward at an angle 60° with the horizontal. The speed of the projectile is $20\ \text{m/s}$ when its direction of motion is 45° with the horizontal. The initial speed of the projectile is___ m/s.

(1) $20\sqrt{3}$ (2) $20\sqrt{2}$

(3) $40\sqrt{2}$ (4) 40

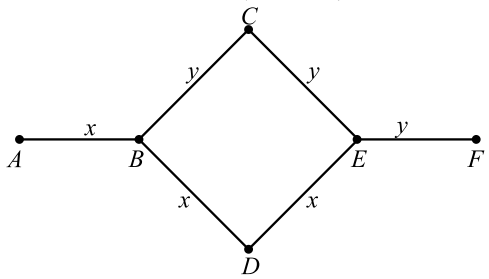
2. *XPQY* is a vertical smooth long loop having a total resistance R where PX is parallel to QY and separation between them is l. A constant magnetic field B perpendicular to the plane of the loop exists in the entire space. A rod CD of length $L(L>l)$ and mass m is made to slide down from rest under the gravity as shown in figure. The terminal speed acquired by the rod is ____ m/s. (g = acceleration due to gravity)



(1) $\frac{2mgR}{B^2l^2}$ (2) $\frac{2mgR}{B^2L^2}$

(3) $\frac{8mgR}{B^2l^2}$ (4) $\frac{m\ gR}{B^2l^2}$

3. Rods x and y of equal dimensions but of different materials are joined as shown in figure. Temperatures of end points A and F are maintained at $100^\circ C$ and $40^\circ C$ respectively. Given the thermal conductivity of rod x is three times of that of rod y, the temperature at junction points B and E are (close to):



(1) 80°C and $60^\circ C$ respectively

(2) $80^\circ C$ and $70^\circ C$ respectively

(3) $89^\circ C$ and $73^\circ C$ respectively

(4) 60°C and 45°C respectively

4. A thin convex lens of focal length 5 cm and a thin concave lens of focal length 4 cm are combined together (without any gap) and this combination has magnification m_1 when an object is placed 10 cm before the convex lens. Keeping the positions of convex lens and object undisturbed, a gap of 1 cm is introduced between the lenses by moving the concave lens away, which lead to a change in magnification of total lens system to m_2. The value of $\left|\frac{m_1}{m_2}\right|$ is _____.

(1) $\frac{5}{6}$ (2) $\frac{25}{27}$

(3) $\frac{3}{2}$ (4) $\frac{5}{27}$

5. The volume of an ideal gas increases 8 times and temperature becomes $(1/4)^{\text{th}}$ of initial temperature during a reversible change. If there is no exchange of heat in this process $(\Delta Q = 0)$ then identify the gas from the following options (Assuming the gases given in the options are ideal gases):

(1) He (2) O_2

(3) NH_3 (4) CO_2

6. A simple pendulum has a bob with mass m and charge q. The pendulum string has negligible mass. When a uniform and horizontal electric field $\vec{E}$ is applied, the tension in the string changes. The final tension in the string, when pendulum attains an equilibrium position is____. (g: acceleration due to gravity)

(1) $mg - qE$

(2) $\sqrt{m^2g^2 + q^2E^2}$

(3) $m\ g + qE$

(4) $\sqrt{m^2g^2 - q^2E^2}$

7. Given below are two statements:

Statement I: Pressure of a fluid is exerted only on a solid surface in contact as the fluid-pressure does not exist everywhere in a still fluid.

Statement II: Excess potential energy of the molecules on the surface of a liquid, when compared to interior, results in surface tension.

In the light of the above statements, choose the correct answer from the options given below

(1) Statement I is false but Statement II is true

(2) Both Statement I and Statement II are true

(3) Statement I is true but Statement II is false

(4) Both Statement I and Statement II are false

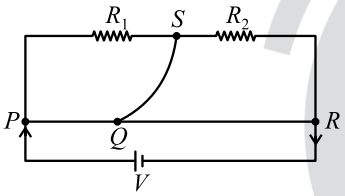
8. A solid sphere of mass 5 kg and radius 10 cm is kept in contact with another solid sphere of mass 10 kg and radius 20 cm. The moment of inertia of this pair of spheres about the tangent passing through the point of contact is _____ $kg \cdot m^2$.

(1) 0.63 (2) 0.72
(3) 0.36 (4) 0.18

9. The minimum frequency of photon required to break a particle of mass 15.348 amu into 4 α particles is _____ kHz.
[mass of He nucleus = $4.002\,amu, 1\ amu = 1.66\times10^{-27}$ kg, $h = 6.6\times10^{-34}$ J.s and $c = 3\times10^{8}$ m/s]

(1) 9×10^{20} (2) 14.94×10^{20}
(3) 9×10^{19} (4) 14.94×10^{19}

10. A meter bridge with two resistances R_1 and R_2 as shown in figure was balanced (null point) at 40 cm from the point P. The null point changed to 50 cm from the point P, when 16Ω resistance is connected in parallel to R_2. The values of resistances R_1 and R_2 are _____.



(1) $R_2 = 12\Omega, R_1 = \frac{12}{3}\Omega$

(2) $R_2 = 4\Omega, R_1 = \frac{4}{3}\Omega$

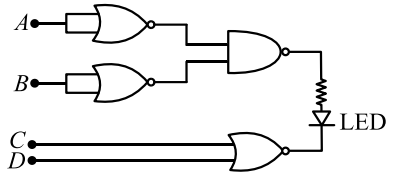
(3) $R_2 = 8\Omega, R_1 = \frac{16}{3}\Omega$

(4) $R_2 = 16\Omega, R_1 = \frac{16}{3}\Omega$

11. Consider an equilateral prism (refractive index $\sqrt{2}$). A ray of light is incident on its one surface at a certain angle i. If the emergent ray is found to graze along the other surface then the angle of refraction at the incident surface is close to _____.

(1) 15° (2) 20°
(3) 40° (4) 30°

12. Find the correct combination of A, B, C and D inputs which can cause the LED to glow.

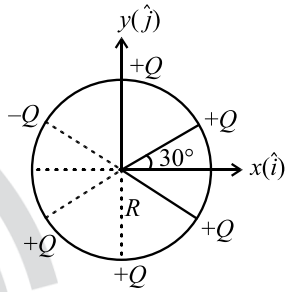


(1) 0100 (2) 1000
(3) 1101 (4) 0011

13. Three identical coils C_1, C_2 and C_3 are closely placed such that they share a common axis. C_2 is exactly midway. C_1 carries current I in anti-clockwise direction while C_3 carries current I in clockwise direction. An induced current flowing through C_2 will be in clockwise direction when

(1) C_1 and C_3 move with equal speeds away from C_2
(2) C_1 and C_3 move with equal speeds towards C_2
(3) C_1 moves towards C_2 and C_3 moves away from C_2
(4) C_1 moves away from C_2 and C_3 moves towards C_2

14. Six point charges are kept 60° apart from each other on the circumference of a circle of radius R as shown in figure. The net electric field at the center of the circle is _____.
(ϵ_0 is permittivity of free space)



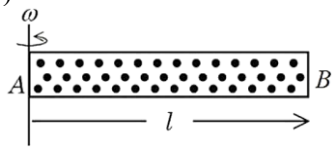
(1) $-\frac{Q}{4\pi\epsilon_o R^2}\left(\sqrt{3}\hat{i} - \hat{j}\right)$

(2) $\frac{Q}{4\pi\epsilon_o R^2}\left(\sqrt{3}\hat{i} - \hat{j}\right)$

(3) $-\left(\frac{5Q}{8\pi\epsilon_o R^2}\right)\left(\hat{i} - 3\hat{j}\right)$

(4) $-\frac{5Q}{8\pi\epsilon_o R^2}\left(\hat{i} + \sqrt{3}\hat{j}\right)$

15. A cylindrical tube AB of length l, closed at both ends contains an ideal gas of 1 mol having molecular weight M. The tube is rotated in a horizontal plane with constant angular velocity ω about an axis perpendicular to AB and passing through the edge at end A, as shown in the figure. If P_A and P_B are the pressures at A and B respectively, then
(Consider the temperature is same at all points in the tube)



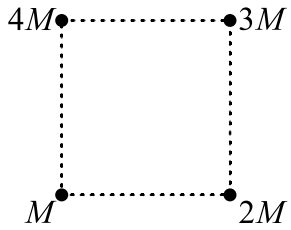
(1) $P_B = P_A \exp\left(M\omega^2 l^2 / 3RT\right)$

(2) $P_B = P_A \exp\left(M\omega^2 l^2 / RT\right)$

(3) $P_B = P_A$

(4) $P_B = P_A \exp\left(M\omega^2 l^2 / 2RT\right)$

16. Net gravitational force at the center of a square is found to be F_1 when four particles having mass $M, 2M, 3M$ and $4M$ are placed at the four corners of the square as shown in figure and it is F_2 when the positions of $3M$ and $4M$ are interchanged. The ratio $\frac{F_1}{F_2}$ is $\frac{\alpha}{\sqrt{5}}$. The value of α is ____.



(1) $2\sqrt{5}$ (2) 3
(3) 2 (4) 1

17. 7.9 MeV α-particle scatters from a target material of atomic number 79. From the given data the estimated diameter of nuclei of the target material is (approximately) ____ m..

$\left[\frac{1}{4\pi\epsilon_o} = 9\times10^9 \text{ Nm}^2/\text{C}^2 \text{ and electron charge} = 1.6\times10^{-19}\text{C}\right]$

(1) 5.76×10^{-14} (2) 1.69×10^{-12}
(3) 1.44×10^{-13} (4) 2.88×10^{-14}

18. Match the Column-I with Column-II

	Column-I		Column-II
A	Spring constant	P	$ML^2\ T^{-2}\ K^{-1}$
B	Thermal conductivity	Q	$ML^0\ T^{-2}$
C	Boltzmann constant	R	$ML^2\ T^{-3}\ A^{-2}$
D	Inductive reactance	S	$MLT^{-3}\ K^{-1}$

Choose the correct answer from the options given below:

(1) $A \to Q; B \to P; C \to S; D \to R$
(2) $A \to P; B \to S; C \to Q; D \to R$
(3) $A \to R; B \to Q; C \to S; D \to P$
(4) $A \to Q; B \to S; C \to P; D \to R$

19. The escape velocity from a spherical planet A is 10 km / s . The escape velocity from another planet B whose density and radius are 10% of those of planet A, is ____ m / s .

(1) $1000\sqrt{2}$ (2) 1000
(3) $100\sqrt{10}$ (4) $200\sqrt{5}$

20. Electric field in a region is given by $\vec{E} = Ax\hat{i} + By\hat{j}$, where $A = 10\text{ V/m}^2$ and $B = 5\text{ V/m}^2$. If the electric potential at a point $(10, 20)$ m is 500 V, then the electric potential at origin is ____ V.

(1) 1000 (2) 0
(3) 500 (4) 2000

Integer Type Questions

21. Inductance of a coil with 10^4 turns is 10 mH and it is connected to a dc source of 10 V with internal resistance of 10Ω . The energy density in the inductor when the current reaches $\left(\frac{1}{e}\right)$ of its maximum value is $\alpha\pi\times\frac{1}{e^2}\text{ J/m}^3$. The value of α is___
$\left(\mu_0 = 4\pi\times10^{-7}\text{ Tm/A}\right)$

22. A parallel beam of light travelling in air (refractive index 1.0) is incident on a convex spherical glass surface of radius of curvature 50 cm. Refractive index of glass is 1.5. The rays converge to a point at a distance x cm from the centre of the curvature of the spherical surface. The value of x is ____ cm.

23. A circular disc has radius R_1 and thickness T_1. Another circular disc made of the same material has radius R_2 and thickness T_2. If the moment of inertia of both discs are same and $\frac{R_1}{R_2} = 2$ then $\frac{T_1}{T_2} = \frac{1}{\alpha}$. The value of α is ____.

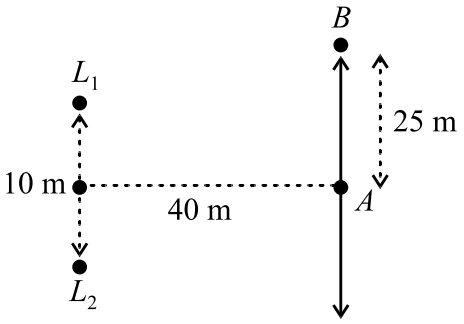
24. The electric field of a plane electromagnetic wave, travelling in an unknown nonmagnetic medium is given by,

$E_y = 20\sin\left(3\times10^6 x - 4.5\times10^{14}\text{t}\right)\text{V/m}$

(where x, t and other values have S.I. units). The dielectric constant of the medium is ____

(speed of light in free space is 3×10^8 m / s)

25. Two loudspeakers $(L_1$ and $L_2)$ are placed with a separation of 10 m, as shown in figure. Both speakers are fed with an audio input signal of same frequency with constant volume. A voice recorder, initially at point A, at equidistance to both loud speakers, is moved by 25 m along the line AB while monitoring the audio signal. The measured signal was found to undergo 10 cycles of minima and maxima during the movement. The frequency of the input signal is ____ Hz (Speed of sound in air is $324\ \text{m/s}$ and $\sqrt{5}=2.23$)



SECTION-II (CHEMISTRY)

Single Correct Type Questions

26. The correct order of reactivity of CH_3Br in methanol with the following nucleophiles is

$F^-, I^-, C_2H_5O^-$ and $C_6H_5O^-$

(1) $I^- > C_6H_5O^- > F^- > C_2H_5O^-$

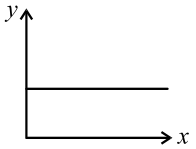
(2) $I^- > C_2H_5O^- > F^- > C_6H_5O^-$

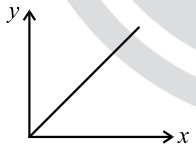
(3) $I^- > C_2H_5O^- > C_6H_5O^- > F^-$

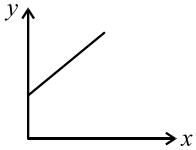
(4) $I^- > F^- > C_6H_5O^- > C_2H_5O^-$

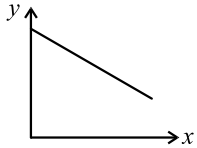
27. Consider a solution of $CO_2(g)$ dissolved in water in a closed container.

Which one of the following plots correctly represents variation of log (partial pressure of CO_2 in vapour phase above water) [y -axis] with log (mole fraction of CO_2 in water) [x -axis] at $25^\circ C$?

(1) 

(2) 

(3) 

(4) 

28. Match the Column-I with Column-II

Column-I Thermodynamic Process		Column-II Magnitude in kJ	
A	Work done in reversible, isothermal expansion of 2 mol of ideal gas from $2dm^3$ to $20dm^3$ at 300 K.	P	4
B	Work done in irreversible isothermal expansion of 1 mol ideal gas from $1\ m^3$ to $3\ m^3$ at 300 K against a constant pressure of 3 kPa.	Q	11.5
C	Change in internal energy for adiabatic expansion of a 1 mol ideal gas with change of temperature $=320$ K and $\bar{C}_V=\frac{3}{2}R$.	R	6
D	Change in enthalpy at constant pressure of 1 mol ideal gas with change of temperature $=337$ K and $\bar{C}_p=\frac{5}{2}R$.	S	7

Choose the correct answer from the options given below:

(1) $A \to R; B \to Q; C \to S; D \to P$

(2) $A \to Q; B \to P; C \to R; D \to S$

(3) $A \to P; B \to Q; C \to R; D \to S$

(4) $A \to Q; B \to R; C \to P; D \to S$

29. A 'p'-block element (E) and hydrogen form a binary cation $(EH_x)^+$, while EH_3 on treatment with K_2HgI_4 in alkaline medium gives a precipitate of basic mercury(II)amido-iodine. Given below are first ionisation enthalpy values $(kJmol^{-1})$ for first element each from group 13, 14, 15 and 16. Identify the correct first ionisation enthalpy value for element E.

(1) 801 (2) 1086

(3) 1312 (4) 1402

30. A first row transition metal (M) does not liberate H_2 gas from dilute HCl.1 mol of aqueous solution of MSO_4 is treated with excess of aqueous KCN and then $H_2S(g)$ is passed through the solution. The amount of MS (metal sulphide) formed from the above reaction is ____ mol.

(1) 1 (2) 3

(3) 2 (4) 0

31. In the reaction,

$2Al(s) + 6HCl(aq) \rightarrow 2Al^{3+}(aq) + 6Cl^{-}(aq) + 3H_2(g)$

(1) 12L HCl(aq) is consumed for every $6LH_2(g)$ produced.
(2) 11.2L $H_2(g)$ at STP is produced for every mole of HCl consumed.
(3) 67.2L $H_2(g)$ at STP is produced for every mole of Al that reacts.
(4) 33.6L $H_2(g)$ is produced regardless of temperature and pressure for every mole of Al that reacts.

32. Given below are two statements:

Statement I: The Henry's law constant K_H is constant with respect to variations in solution's concentration over the range for which the solution is ideally dilute.

Statement II: K_H does not differ for the same solute in different solvents.

In the light of the above statements, choose the correct answer from the options given below

(1) Both Statement I and Statement II are true
(2) Both Statement I and Statement II are false
(3) Statement I is true but Statement II is false
(4) Statement I is false but Statement II is true

33. Consider the transition metal ions $Mn^{3+}, Cr^{3+}, Fe^{3+}$ and Co^{3+} and all form low spin octahedral complexes. The correct decreasing order of unpaired electrons in their respective d-orbitals of the complexes is

(1) $Cr^{3+} > Mn^{3+} > Fe^{3+} > Co^{3+}$
(2) $Fe^{3+} > Co^{3+} > Mn^{3+} > Cr^{3+}$
(3) $Mn^{3+} > Fe^{3+} > Co^{3+} > Cr^{3+}$
(4) $Cr^{3+} > Fe^{3+} > Co^{3+} > Mn^{3+}$

34. Two p-block elements X and Y form fluorides of the type EF_3. The fluoride compound XF_3 is a Lewis acid and YF_3 is a Lewis base. The hybridizations of the central atoms of XF_3 and YF_3 respectively are

(1) sp^2 and sp^3 (2) Both sp^3
(3) sp^3 and sp^2 (4) Both sp^2

35. Given below are two statements:

Statement I: The halogen that makes longest bond with hydrogen in HX, has the smallest covalent radius in its group.

Statement II: A group 15 element's hydride EH_3 has the lowest boiling point among corresponding hydrides of other group 15 elements. The maximum covalency of that element E is 4.

In the light of the above statements, choose the correct answer from the options given below

(1) Both Statement I and Statement II are false
(2) Both Statement I and Statement II are true
(3) Statement I is false but Statement II is true
(4) Statement I is true but Statement II is false

36. $A \rightarrow$ product (First order reaction).

Three sets of experiment were performed for a reaction under similar experimental conditions:

Run $1 \Rightarrow 100$ mL of 10 M solution of reactant A
Run $2 \Rightarrow 200$ mL of 10 M solution of reactant A
Run $3 \Rightarrow 100$ mL of 10 M solution of reactant A + 100 mL of H_2O added.

The correct variation of rate of reaction is

(1) Run 1 < Run 2 < Run 3
(2) Run 1 = Run 2 = Run 3
(3) Run 3 < Run 1 < Run 2
(4) Run 3 < Run 1 = Run 2

37. Given below are two statements:

Statement I: Sucrose is dextrorotatory. However, sucrose upon hydrolysis gives a solution having mixture of products. This solution shows laevorotation.

Statement II: Hydrolysis of sucrose gives glucose and fructose. Since the laevorotation of glucose is more than the dextrorotation of fructose, the resulting solution becomes laevorotatory.

In the light of the above statements, choose the correct answer from the options given below

(1) Both Statement I and Statement II are true
(2) Statement I is false but Statement II is true
(3) Statement I is true but Statement II is false
(4) Both Statement I and Statement II are false

38. Match the Column-I with Column-II

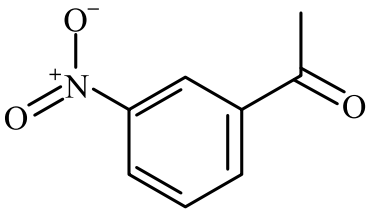
	Column-I Reagents		**Column-II Name of Reaction involving carbonyl compounds**
A	$NH_2 - NH_2, KOH$	P	Tollen's Test
B	$Ag(NH_3)_2OH$	Q	Clemmensen Reduction
C	Aq. $CuSO_4$, Sodium Potassium tartarate, KOH	R	Wolff - Kishner Reduction
D	$Zn - Hg, HCl$	S	Fehling's Test

Choose the correct answer from the options given below:

(1) $A \rightarrow R; B \rightarrow S; C \rightarrow P; D \rightarrow Q$
(2) $A \rightarrow S; B \rightarrow R; C \rightarrow Q; D \rightarrow P$
(3) $A \rightarrow Q; B \rightarrow P; C \rightarrow S; D \rightarrow R$
(4) $A \rightarrow R; B \rightarrow P; C \rightarrow S; D \rightarrow Q$

39. Given below are two statements:

Statement I: Benzene is nitrated to give nitrobenzene, which on further treatment with $CH_3COCl / AlCl_3$ will give



Statement II: $-NO_2$ group is a *m* -directing, and deactivating group.

In the light of the above statements, choose the most appropriate answer from the options given below

(1) Statement I is correct but Statement II is incorrect

(2) Both Statement I and Statement II are correct

(3) Both Statement I and Statement II are incorrect

(4) Statement I is incorrect but Statement II is correct

40. Given below are two statements:

Statement I: Phenol on treatment with $CHCl_3$ / aq. KOH under refluxing condition, followed by acidification produces *p* -hydroxy benzaldehyde as the major product and *o*-hydroxy benzaldehyde as the minor product.

Statement II: The mixture of *p*-hydroxybenzaldehyde and *o* hydroxybenzaldehyde can be easily separated through steam distillation.

In the light of the above statements, choose the correct answer from the options given below

(1) Both Statement I and Statement II are true

(2) Statement I is true but Statement II is false

(3) Statement I is false but Statement II is true

(4) Both Statement I and Statement II are false

41. As compared with chlorocyclohexane, which of the following statements correctly apply to chlorobenzene?

A. The magnitude of negative charge is more on chlorine atom.

B. The $C-Cl$ bond has partial double bond character.

C. $C-Cl$ bond is less polar.

D. $C-Cl$ bond is longer due to repulsion between delocalised electrons of the aromatic ring and lone pairs of electrons of chlorine.

E. The $C-Cl$ bond is formed using sp^2 hybridised orbital of carbon.

Choose the correct answer from the options given below:

(1) B, C and E Only

(2) B, C and D Only

(3) A, D and E Only

(4) A, C and E Only

42. The energy required by electrons, present in the first Bohr orbit of hydrogen atom to be excited to second Bohr orbit is ____ $Jmol^{-1}$.

(Given: $R_H = 2.18 \times 10^{-11}$ ergs)

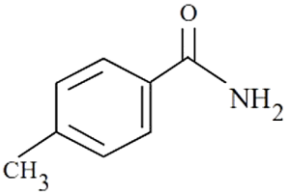
(1) 9.835×10^5

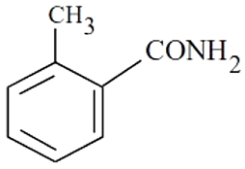
(2) 1.635×10^{-18}

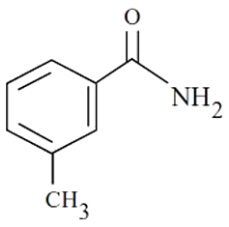
(3) 9.835×10^{12}

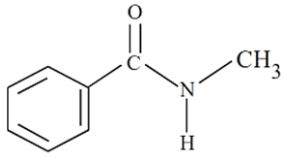
(4) 1.635×10^{-11}

43. 'A' is a neutral organic compound (M. F: C_8H_9ON). On treatment with aqueous $Br_2 / HO^{(-)}$, ' A ' forms a compound ' B ' which is soluble in dilute acid. ' B ' on treatment with aqueous $NaNO_2 / HCl(0-5^\circ C)$ produces a compound ' C ' which on treatment with $CuCN / NaCN$ produces ' D '. Hydrolysis of ' D ' produces ' E ' which is also obtainable from the hydrolysis of ' A '. ' E ' on treatment with acidified $KMnO_4$ produces ' *F* '. ' *F* ' contains two different types of hydrogen atoms. The structure of ' A ' is

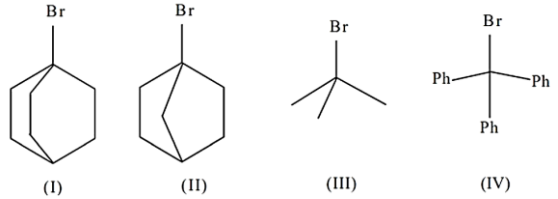
(1) 

(2) 

(3) 

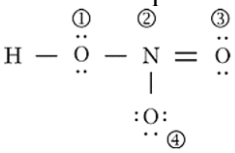
(4) 

44. The correct order of the rate of reaction of the following reactants with nucleophile by S_N1 mechanism is:
(Given: Structures I and II are rigid)



(1) III < I < II < IV
(2) IV < III < II < I
(3) I < II < III < IV
(4) II < I < III < IV

45. The formal charges on the atoms marked as (1) to (4) in the Lewis representation of HNO_3 molecule respectively are



(1) 0, –1, 0, +1 (2) 0, +1, 0, –1
(3) 0, 0, –1, +1 (4) +1, 0, 0, –1

Integer Type Questions

46. The cycloalkene (X) on bromination consumes one mole of bromine per mole of (X) and gives the product (Y) in which C : Br ratio is 3:1. The percentage of bromine in the product (Y) is _____ %. (Nearest integer)
(Given: molar mass in $gmol^{-1}$ H : 1, C : 12, O : 16, Br : 80)

47. Sodium fusion extract of an organic compound (Y) with $CHCl_3$ and chlorine water gives violet color to the $CHCl_3$ layer. 0.15 g of (Y) gave 0.12 g of the silver halide precipitate in Carius method. Percentage of halogen in the compound (Y) is _____. (Nearest integer)
(Given: molar mass $gmol^{-1}$ C : 12, H : 1, Cl : 35.5, Br : 80, I : 127)

48. Consider the following electrochemical cell at 298 K

$$Pt\left|HSnO_2^-(aq)\right|Sn(OH)_6^{2-}(aq)\left|OH^-(aq)\right|Bi_2O_3(s)\left|Bi(s)\right.$$

If the reaction quotient at a given time is 10^6, then the cell EMF (E_{cell}) is _____ $\times 10^{-1}$V (Nearest integer).
Given the standard half-cell reduction potential as $E^\circ_{Bi_2O_3/Bi,OH^-} = -0.44$ V and

$E^\circ_{Sn(OH)_6^{2-}/HSnO_2^-,OH^-} = -0.90$ V

49. Dissociation of a gas A_2 takes place according to the following chemical reaction. At equilibrium, the total pressure is 1 bar at 300 K.

$$A_2(g) \rightleftharpoons 2A(g)$$

The standard Gibbs energy of formation of the involved substances has been provided below:

Substance	ΔG_f° / kJmol^{-1}
A_2	–100.00
A	–50.832

The degree of dissociation of $A_2(g)$ is given by $\left(x \times 10^{-2}\right)^{1/2}$ where $x =$ _____. (Nearest integer).
[Given:
$R = 8$ J mol^{-1} K^{-1}, log2 = 0.3010, log3 = 0.48]
Assume degree of dissociation is not negligible.

50. The temperature at which the rate constants of the given below two gaseous reactions become equal is _____ K. (Nearest integer)

$$X \longrightarrow Y \; k_1 = 10^6 e^{\frac{-30000}{T}}$$

$$P \longrightarrow Q \; k_2 = 10^4 e^{\frac{-24000}{T}}$$

Given: ln10 = 2.303

SECTION-III (MATHEMATICS)

Single Correct Type Questions

51. Let $f(x) = x^{2025} - x^{2000}, x \in [0,1]$ and the minimum value of the function $f(x)$ in the interval $[0,1]$ be $(80)^{80}(n)^{-81}$. Then n is equal to
(1) –81
(2) –41
(3) –80
(4) –40

52. Let $f:[1,\infty) \to \mathbb{R}$ be a differentiable function. If $6\int_1^x f(t)dt = 3xf(x) + x^3 - 4$ for all $x \geq 1$, then the value of $f(2) - f(3)$ is
(1) –3
(2) 4
(3) 3
(4) –4

53. If the domain of the function $f(x)=\sin^{-1}\left(\frac{5-x}{3+2x}\right)+\frac{1}{\log_e(10-x)}$ is $(-\infty,\alpha]\cup[\beta,\gamma)-\{\delta\}$, then $6(\alpha+\beta+\gamma+\delta)$ is equal to

(1) 68 (2) 70
(3) 66 (4) 67

54. If $A=\begin{bmatrix}2 & 3\\ 3 & 5\end{bmatrix}$, then the determinant of the matrix $\left(A^{2025}-3A^{2024}+A^{2023}\right)$ is

(1) 12 (2) 28
(3) 16 (4) 24

55. If the image of the point $P(1,2,a)$ in the line $\frac{x-6}{3}=\frac{y-7}{2}=\frac{7-z}{2}$ is $Q(5,b,c)$, then $a^2+b^2+c^2$ is equal to

(1) 264 (2) 293
(3) 283 (4) 298

56. If a random variable x has the probability distribution

x	0	1	2	3	4	5	6	7
$P(x)$	0	$2k$	k	$3k$	$2k^2$	$2k$	k^2+k	$7k^2$

then $P(3<x\le 6)$ is equal to

(1) 0.33 (2) 0.22
(3) 0.64 (4) 0.34

57. Two distinct numbers a and b are selected at random from $1,2,3,\ldots,50$. The probability, that their product ab is divisible by 3, is

(1) $\frac{8}{25}$ (2) $\frac{561}{1225}$
(3) $\frac{664}{1225}$ (4) $\frac{272}{1225}$

58. If the chord joining the points $P_1(x_1,y_1)$ and $P_2(x_2,y_2)$ on the parabola $y^2=12x$ subtends a right angle at the vertex of the parabola, then $x_1x_2-y_1y_2$ is equal to

(1) 280 (2) 292
(3) 284 (4) 288

59. Let the solution curve of the differential equation $xdy-ydx=\sqrt{x^2+y^2}\,dx, x>0$, $y(1)=0$, be $y=y(x)$. Then $y(3)$ is equal to

(1) 2 (2) 1
(3) 6 (4) 4

60. The coefficient of x^{48} in $(1+x)+2(1+x)^2+3(1+x)^3+\ldots+100(1+x)^{100}$ is equal to

(1) $100\cdot{}^{100}C_{49}-{}^{100}C_{50}$
(2) $100\cdot{}^{100}C_{49}-{}^{100}C_{48}$
(3) $100\cdot{}^{101}C_{49}-{}^{101}C_{50}$
(4) ${}^{100}C_{50}+{}^{101}C_{49}$

61. Let the line $x=-1$ divide the area of the region $\{(x,y):1+x^2\le y\le 3-x\}$ in the ratio $m:n, \gcd(m,n)=1$. Then $m+n$ is equal to

(1) 25 (2) 27
(3) 28 (4) 26

62. Let the relation R on the set $M=\{1,2,3,\ldots,16\}$ be given by $R=\{(x,y):4y=5x-3, x,y\in M\}$.
Then the minimum number of elements required to be added in R, in order to make the relation symmetric, is equal to

(1) 3 (2) 2
(3) 1 (4) 4

63. The number of solutions of $\tan^{-1}4x+\tan^{-1}6x=\frac{\pi}{6}$, where $-\frac{1}{2\sqrt{6}}<x<\frac{1}{2\sqrt{6}}$, is equal to

(1) 0 (2) 2
(3) 1 (4) 3

64. Let $\overrightarrow{AB}=2\hat{i}+4\hat{j}-5\hat{k}$ and $\overrightarrow{AD}=\hat{i}+2\hat{j}+\lambda\hat{k}, \lambda\in\mathbb{R}$. Let the projection of the vector $\vec{v}=\hat{i}+\hat{j}+\hat{k}$ on the diagonal $\overrightarrow{AC}$ of the parallelogram $ABCD$ be of length one unit. If α,β, where $\alpha>\beta$, be the roots of the equation $\lambda^2x^2-6\lambda x+5=0$, then $2\alpha-\beta$ is equal to

(1) 1 (2) 4
(3) 3 (4) 6

65. If the line $\alpha x+2y=1$, where $\alpha\in\mathbb{R}$, does not meet the hyperbola $x^2-9y^2=9$, then a possible value of α is:

(1) 0.7 (2) 0.5
(3) 0.8 (4) 0.6

66. Let $P(\alpha,\beta,\gamma)$ be the point on the line $\frac{x-1}{2}=\frac{y+1}{-3}=z$ at a distance $4\sqrt{14}$ from the point $(1,-1,0)$ and nearer to the origin. Then the shortest distance, between the lines $\frac{x-\alpha}{1}=\frac{y-\beta}{2}=\frac{z-\gamma}{3}$ and $\frac{x+5}{2}=\frac{y-10}{1}=\frac{z-3}{1}$, is equal to

(1) $4\sqrt{\frac{5}{7}}$ (2) $2\sqrt{\frac{7}{4}}$

(3) $7\sqrt{\frac{5}{4}}$ (4) $4\sqrt{\frac{7}{5}}$

67. The value of $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}}\left(\frac{1}{[x]+4}\right)dx$, where $[\cdot]$ denotes the greatest integer function, is

(1) $\frac{7}{60}(\pi-3)$ (2) $\frac{1}{60}(\pi-7)$

(3) $\frac{7}{60}(3\pi-1)$ (4) $\frac{1}{60}(21\pi-1)$

68. The number of distinct real solutions of the equation $x|x+4|+3|x+2|+10=0$ is

(1) 2 (2) 0

(3) 1 (4) 3

69. Let the set of all values of r, for which the circles $(x+1)^2+(y+4)^2=r^2$ and $x^2+y^2-4x-2y-4=0$ intersect at two distinct points be the interval (α,β). Then $\alpha\beta$ is equal to

(1) 21 (2) 24

(3) 20 (4) 25

70. If the sum of the first four terms of an A.P. is 6 and the sum of its first six terms is 4, then the sum of its first twelve terms is

(1) –24 (2) –26

(3) –22 (4) –20

Integer Type Questions

71. Let A be a 3×3 matrix such that $A+A^T=O$. If $A\begin{bmatrix}1\\-1\\0\end{bmatrix}=\begin{bmatrix}3\\3\\2\end{bmatrix}, A^2\begin{bmatrix}1\\-1\\0\end{bmatrix}=\begin{bmatrix}-3\\19\\-24\end{bmatrix}$ and $\det\left(\text{adj}\left(2\text{adj}(A+I)\right)\right)=(2)^{\alpha}\cdot(3)^{\beta}\cdot(11)^{\gamma},\alpha,\beta,\gamma$ are non-negative integers, then $\alpha+\beta+\gamma$ is equal to ____

72. Let $\alpha=\frac{-1+i\sqrt{3}}{2}$ and $\beta=\frac{-1-i\sqrt{3}}{2}, i=\sqrt{-1}$. If $(7-7\alpha+9\beta)^{20}+(9+7\alpha-7\beta)^{20}$, $+(-7+9\alpha+7\beta)^{20}+(14+7\alpha+7\beta)^{20}=m^{10}$ then m is ____

73. If $\int(\sin x)^{\frac{-11}{2}}(\cos x)^{\frac{-5}{2}}dx=-\frac{p_1}{q_1}(\cot x)^{\frac{9}{2}}-\frac{p_2}{q_2}(\cot x)^{\frac{5}{2}}-\frac{p_3}{q_3}(\cot x)^{\frac{1}{2}}+\frac{p_4}{q_4}(\cot x)^{\frac{-3}{2}}+C$, where p_i and q_i are positive integers with $\gcd(p_i,q_i)=1$ for $i=1,2,3,4$ and C is the constant of integration, then $\frac{15p_1p_2p_3p_4}{q_1q_2q_3q_4}$ is equal to ____

74. If $\frac{\cos^2 48^\circ-\sin^2 12^\circ}{\sin^2 24^\circ-\sin^2 6^\circ}=\frac{\alpha+\beta\sqrt{5}}{2}$, where $\alpha,\beta\in\mathbb{N}$, then $\alpha+\beta$ is equal to___

75. Let ABC be a triangle. Consider four points p_1,p_2,p_3,p_4 on the side AB, five points p_5,p_6,p_7,p_8,p_9 on the side BC, and four points $p_{10},p_{11},p_{12},p_{13}$ on the side AC. None of these points is a vertex of the triangle ABC. Then the total number of pentagons, that can be formed by taking all the vertices from the points $p_1,p_2,\ldots,p_{13}$, is____

PHYSICS WALLAH

JEE MAIN 2026

SESSION-01

Date: 23-01-2026

Shift-01

SECTION-I (PHYSICS)

Single Correct Type Questions

1. The moment of inertia of a square loop made of four uniform solid cylinders, each having radius R and length $L(R < L)$ about an axis passing through the mid points of opposite sides, is (Take the mass of the entire loop as M):

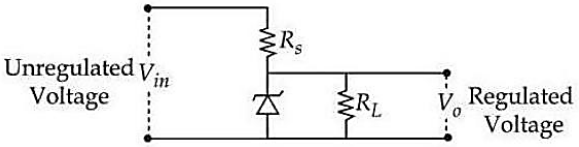
(1) $\frac{3}{8}MR^2 + \frac{7}{12}ML^2$

(2) $\frac{3}{8}MR^2 + \frac{1}{6}ML^2$

(3) $\frac{3}{4}MR^2 + \frac{7}{12}ML^2$

(4) $\frac{3}{4}MR^2 + \frac{1}{6}ML^2$

2. The following diagram shows a Zener diode as a voltage regulator. The Zener diode is rated at V_z = 5 V and the desired current in load is 5 mA. The unregulated voltage source can supply upto 25 V. Considering the Zener diode can withstand four times of the load current, the value of resistor R_s (shown in circuit) should be_____ Ω.



(1) 800 (2) 10

(3) 100 (4) 4000

3. A simple pendulum of string length 30 cm performs 20 oscillations in 10 s. The length of the string required for the pendulum to perform 40 oscillations in the same time duration is____ cm. [Assume that the mass of the pendulum remains same.]

(1) 120 (2) 15

(3) 7.5 (4) 0.75

4. In a perfectly inelastic collision, two spheres made of the same material with masses 15 kg and 25 kg, moving in opposite directions with speeds of 10 m / s and 30 m / s, respectively, strike each other and stick together. The rise in temperature (in °C), if all the heat produced during the collision is retained by these spheres, is: (specific heat of sphere material 31 cal/kg °C and 1 cal = 4.2 J)

(1) 1.15 (2) 1.75

(3) 1.44 (4) 1.95

5. A thin prism with angle 5° of refractive index 1.72 is combined with another prism of refractive index 1.9 to produce dispersion without deviation. The angle of second prism is____.

(1) 6° (2) 4.5°

(3) 5° (4) 4°

6. The de Broglie wavelength of an oxygen molecule at 27°C is $x \times 10^{-12}$ m. The value of x is (take Planck's constant = 6.63×10^{-34} J.s, Boltzmann constant = 1.38×10^{-23} J/K, mass of oxygen molecule = 5.31×10^{-26} kg)

(1) 26 (2) 30

(3) 24 (4) 20

7. In hydrogen atom spectrum, (R → Rydberg's constant)

A. the maximum wavelength of the radiation of Lyman series is $\frac{4}{3R}$

B. the Balmer series lies in the visible region of the spectrum

C. the minimum wavelength of the radiation of Paschen series is $\frac{9}{R}$

D. the minimum wavelength of Lyman series is $\frac{5}{4R}$

Choose the correct answer from the options given below:

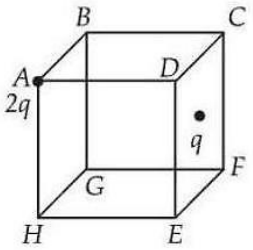
(1) B, D Only

(2) A, B and C Only

(3) A, B and D Only

(4) A, B Only

8. Two point charges $2q$ and q are placed at vertex A and centre of face $CDEF$ of the cube as shown in figure. The electric flux passing through the cube is:



(1) $\frac{q}{\epsilon_0}$

(2) $\frac{3q}{2\epsilon_0}$

(3) $\frac{3q}{\epsilon_0}$

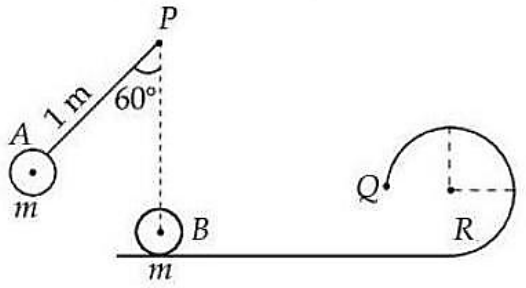
(4) $\frac{3q}{4\epsilon_0}$

9. Four persons measure the length of a rod as 20.00 cm, 19.75 cm. 17.01 cm and 18.25 cm. The relative error in the measurement of average length of the rod is:

(1) 0.24 (2) 0.08

(3) 0.06 (4) 0.18

10. A small bob A of mass m is attached to a massless rigid rod of length 1 m pivoted at point P and kept at an angle of 60° with vertical as shown in figure. At distance of 1 m below point P, an identical bob B is kept at rest on a smooth horizontal surface that extends to a circular track of radius R as shown in figure. If bob B just manages to complete the circular path of radius R upto a point Q after being hit elastically by bob$A$, then radius R is _____ m.



(1) $\frac{2-\sqrt{3}}{5}$ (2) $\frac{3}{5}$

(3) $\frac{1}{5}$ (4) $\frac{2+\sqrt{3}}{5}$

11. Match Column-I with Column-II.

Column-I (Relation)		Column-II (Law)	
A	$\oint \vec{E}\cdot\vec{dl}=-\frac{d}{dt}\oint \vec{B}\cdot\vec{da}$	I	Ampere's circuital law
B	$\oint \vec{B}\cdot\vec{dl}=\mu_0\left(I+\epsilon_0\frac{d\phi_E}{dt}\right)$	II	Faraday's laws of electromagnetic induction
C	$\oint \vec{E}\cdot\vec{da}=\frac{1}{\epsilon_0}\int_V \rho dv$	III	Ampere - Maxwell law
D	$\oint \vec{B}\cdot\vec{dl}=\mu_0 I$	IV	Gauss's law of electrostatics

Choose the correct answer from the options given below:

(1) A-II, B-III, C-IV, D-I
(2) A-IV, B-I, C-II, D-III
(3) A-I, B-IV, C-III, D-II
(4) A-II, B-III, C-I, D-IV

12. In a screw gauge, the zero of the circular scale lies 3 divisions above the horizontal pitch line when their metallic studs are brought in contact. Using this instrument thickness of a sheet is measured. If pitch scale reading is 1 mm and the circular scale reading is 51 then the correct thickness of the sheet is_____ mm.

[Assume least count is 0.01 mm]

(1) 1.51 (2) 1.48
(3) 1.50 (4) 1.54

13. Consider light travelling from a medium A to medium B separated by a plane interface. If the light undergoes total internal reflection during its travel from medium A to B and the speed of light in media A and B are 2.4×10^8 m/s and 2.7×10^8 m/s, respectively, then the value of critical angle is:

(1) $\tan^{-1}\left(\frac{8}{\sqrt{17}}\right)$ (2) $\cot^{-1}\left(\frac{3}{\sqrt{13}}\right)$

(3) $\cos^{-1}\left(\frac{8}{9}\right)$ (4) $\sin^{-1}\left(\frac{9}{8}\right)$

14. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

Consider a ferromagnetic material:

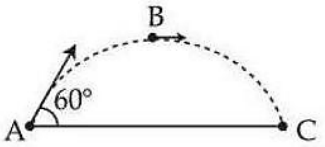
Assertion (A): The individual atoms in a ferromagnetic material possess a magnetic dipole moment and interact with one another in such a way that they spontaneously align themselves forming domains.

Reason (R): At high enough temperature, the domain structure of ferromagnetic material disintegrates. Thus, magnetization will disappear at high enough temperature known as Curie temperature.

In the light of the above statements, choose the correct answer from the options given below:

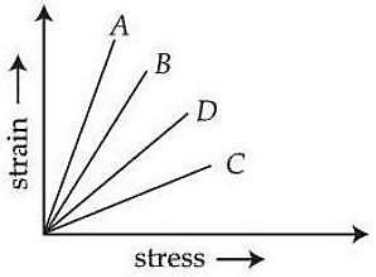
(1) Both (A) and (R) are true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(3) (A) is false but (R) is true
(4) (A) is true but (R) is false

15. An object is projected with kinetic energy K from a point A at an angle 60° with the horizontal. The ratio of the difference in kinetic energies at points B and C to that at point A (see figure), in the absence of air friction is:



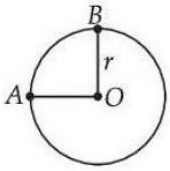
(1) 1 : 4 (2) 2 : 3
(3) 3 : 4 (4) 1 : 2

16. The strain-stress plot for materials A, B, C and D is shown in the figure. Which material has the largest Young's modulus?



(1) D (2) A
(3) C (4) B

17. A wire of uniform resistance $\lambda\Omega/\text{m}$ is bent into a circle of radius r and another piece of wire with length $2r$ is connected between points A and $B(AOB)$ as shown in figure. The equivalent resistance between points A and B is____ Ω.



(1) $\frac{3\pi\lambda r}{8}$ (2) $(\pi+1)2r\lambda$

(3) $2\pi\lambda r$ (4) $\frac{6\pi\lambda r}{3\pi+16}$

18. Two small balls with masses m and 2 m are attached to both ends of a rigid rod of length d and negligible mass. If angular momentum of this system is L about an axis (A) passing through its centre of mass and perpendicular to the rod then angular velocity of the system about A is:

(1) $\frac{3}{2}\frac{L}{md^2}$ (2) $\frac{4}{3}\frac{L}{md^2}$

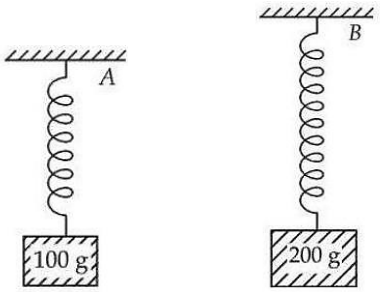
(3) $\frac{2L}{md^2}$ (4) $\frac{2L}{5md^2}$

19. A 20 m long uniform copper wire held horizontally is allowed to fall under the gravity (g = 10 m/s^2) through a uniform horizontal magnetic field of 0.5 Gauss perpendicular to the length of the wire. The induced EMF across the wire when it travells a vertical distance of 200 m is____ mV.

(1) $20\sqrt{10}$ (2) $0.2\sqrt{10}$

(3) $200\sqrt{10}$ (4) $2\sqrt{10}$

20. Two blocks with masses 100 g and 200 g are attached to the ends of springs A and B as shown in figure. The energy stored in A is E. The energy stored in B, when spring constants k_A, k_B of A and B, respectively satisfy the relation $4k_A = 3k_{B'}$, is:

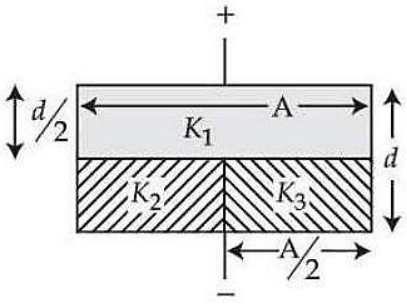


(1) $2E$ (2) $\frac{4}{3}E$

(3) $4E$ (4) $3E$

Integer Type Questions

21. The space between the plates of a parallel plate capacitor of capacitance C (without any dielectric) is now filled with three dielectric slabs of dielectric constants $K_1 = 2, K_2 = 3$ and $K_3 = 5$ (as shown in figure). If new capacitance is $\frac{n}{3}C$ then the value of n is_____.



22. A simple pendulum made of mass 10 g and a metallic wire of length 10 cm is suspended vertically in a uniform magnetic field of 2 T . The magnetic field direction is perpendicular to the plane of oscillations of the pendulum. If the pendulum is released from an angle of 60° with vertical, then maximum induced EMF between the point of suspension and point of oscillation is ____ mV. (Take $g = 10\ \text{m/s}^2$)

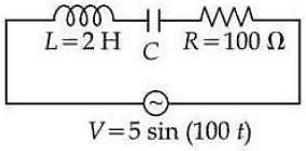
23. The equation of the electric field of an electromagnetic wave propagating through free space is given by:

$E = \sqrt{377}\sin\left(6.27\times10^3 t - 2.09\times10^{-5}x\right)\text{N/C}$

The average power of the electromagnetic wave is $\left(\frac{1}{\alpha}\right)\text{W/m}^2$. The value of α is_____

(Take $\sqrt{\frac{\mu_0}{\varepsilon_o}} = 377$ in SI units)

24. Using a variable frequency a.c. voltage source the maximum current measured in the given LCR circuit is 50 mA for $V = 5\sin(100t)$ The values of L and R are shown in the figure. The capacitance of the capacitor (C) used is____ μF.

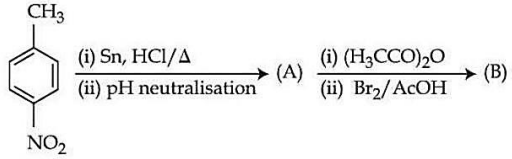


25. In two separate Young's double-slit experimental set-ups and two monochromatic light sources of different wavelengths are used to get fringes of equal width. The ratios of the slits separations and that of the wavelengths of light used are 2 : 1 and 1 : 2 respectively. The corresponding ratio of the distances between the slits and the respective screens (D_1/D_2) is _____.

SECTION-II (CHEMISTRY)

Single Correct Type Questions

26. Consider the following sequence of reactions.



4-Nitrotoluene

Assuming that the reaction proceeds to completion, then 137 mg of 4-nitrotoluene will produce_____ mg of *B*.

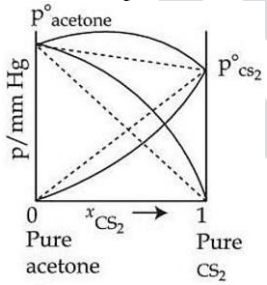
(Given molar mass in $gmol^{-1}$ H:1, C:12, N:14, O:16, Br:80)

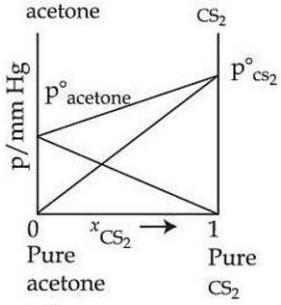
(1) 208 (2) 228
(3) 146 (4) 301

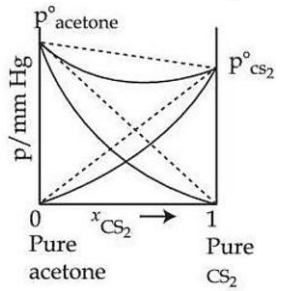
27. '*x*' is the product which is obtained from propane nitrile and stannous chloride in the presence of hydrochloric acid followed by hydrolysis. '*y*' is the product which is obtained from the but-2-ene by the ozonolysis followed by hydrolysis. From the following, which product is not obtained when one mole of '*x*' and one mole of '*y*' react with each other in the presence of alkali followed by heating?

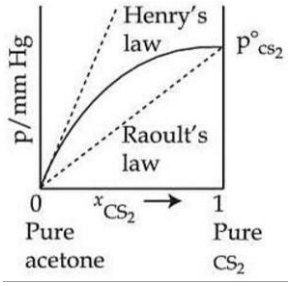
(1) Pent-2-enal
(2) 2-Methylbut-2-enal
(3) 2-Methylpent-2-enal
(4) 3-Methylbut-2-enal

28. Which one of the following graphs accurately represents the plot of partial pressure of CS_2 vs its mole fraction in a mixture of acetone and CS_2 at constant temperature?

(1)


(2)


(3)


(4)


29. The correct trend in the first ionization enthalpies of the elements in the 3rd period of periodic table is:

(1) Al < Si < S < P < Cl
(2) Al < S < P < Si < Cl
(3) Si < S < Al < P < Cl
(4) S < Si < Al < P < Cl

30. Match Column-I with Column-II.

Column-I Functional group (detection)		Column-II Change observed during detection	
A	Unsaturation (Baeyer's test)	I	Red colour appears
B	Alcoholic group (Ceric ammonium nitrate test)	II	Silver mirror appears
C	Aldehyde group (Tollen's reagent)	III	Violet colour appears
D	Phenolic group ($FeCl_3$ test)	IV	Discharge of pink colour

Choose the correct answer from the options given below:

(1) A-III, B-IV, C-II, D-I
(2) A-III, B-IV, C-I, D-II
(3) A-IV, B-I, C-II, D-III
(4) A-IV, B-III, C-II, D-I

31. Consider the general reaction given below at 400 K

$$x\,A(g) \rightleftharpoons y\,B(g)$$

The values of K_p and K_c are studied under the same condition of temperature but variation in x and y.

(i) $K_p = 85.87$ and $K_c = 2.586$ appropriate units

(ii) $K_p = 0.862$ and $K_c = 28.62$ appropriate units

The values of x and y in (i) and (ii) respectively are:

	(i)	(ii)
(1)	4, 1	4, 1
(2)	1, 3	2, 1
(3)	3, 1	3, 1
(4)	1, 2	2, 1

32. Identify the molecule (X) with maximum number of lone pairs of electrons (obtained using Lewis dot structure) among HNO_3, H_2SO_4, NF_3 and O_3. Choose the correct bond angle made by the central atom of the molecule (X).

(1) 116° (2) 102°
(2) 120° (4) 107°

33. A cup of water at 5°C (system) is placed in a microwave oven and the oven is turned on for one minute during which the water begins to boil. Which of the following option is true?

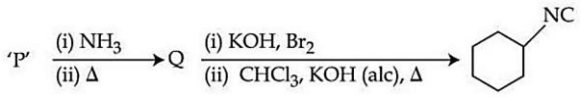
(1) $q = +ve, w = -ve, \Delta U = -ve$

(2) $q = +ve, w = -ve, \Delta U = +ve$

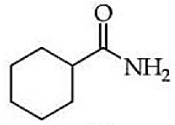
(3) $q = -ve, w = -ve, \Delta U = -ve$

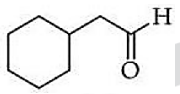
(4) $q = +ve, w = 0, \Delta U = -ve$

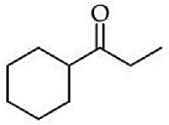
34. Compound 'P' undergoes the following sequence of reactions:

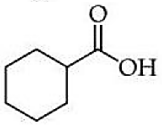


'P' is:

(1) 

(2) 

(3) 

(4) 

35. Given below are two statements:

Statement I: Sublimation is used for the separation and purification of compounds with low melting point.

Statement II: The boiling point of a liquid increases as the external pressure is reduced.

In the light of the above statements, choose the correct answer from the options given below:

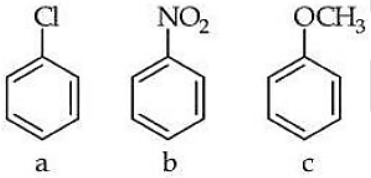
(1) Both Statement I and Statement II are false

(2) Both Statement I and Statement II are true

(3) Statement I is false but Statement II is true

(4) Statement I is true but Statement II is false

36. Consider the following compounds



Arrange these compounds in the increasing order of reactivity with nitrating mixture.

(1) c < b< a (2) b < c < a

(3) c < a < b (4) b < a < c

37. The statements that are incorrect about the nickel(II) complex of dimethylglyoxime are:

A. It is red in colour.

B. It has a high solubility in water at $pH = 9$.

C. The Ni ion has two unpaired d-electrons.

D. The $N - Ni - N$ bond angle is almost close to 90°.

E. The complex contains four five-membered metallacycles (metal containing rings).

Choose the correct answer from the options given below:

(1) B, C and E Only (2) A, D and B Only

(3) C and D Only (4) C and E Only

38. Given,

(A) $n = 5, m_l = -1$

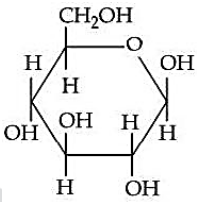
(B) $n = 3, 1 = 2, m_l = -1, m_s = +\frac{1}{2}$

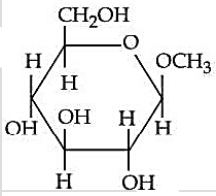
The maximum number of electron(s) in an atom that can have the quantum numbers as given in (A) and (B) respectively are:

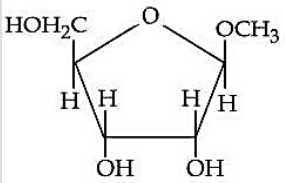
(1) 4 and 1 (2) 26 and 1

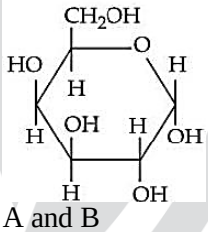
(3) 2 and 4 (4) 8 and 1

39. From the given following (A to D) cyclic structures, those which will not react with Tollen's reagent are:

(A) 

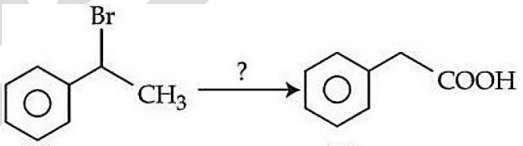
(B) 

(C) 

(D) 

(1) A and B (2) B and D

(3) A and D (4) B and C

40. 

The correct sequence of reagents for the above conversion of X to Y is:

(1) (i) $NaOH(aq)$
(ii) Jones reagent
(iii) H_3O^+

(2) (i) NaOEt
(ii) B_2H_6 / H_2O_2
(iii) Jones reagent

(3) (i) Jones reagent
(ii) NaOEt
(iii) Hot $KMnO_4$ / KOH

(4) (i) B_2H_6 / H_2O_2
(ii) NaOEt
(iii) Jones reagent

41. In the given electrochemical cell, $Ag(s)|AgCl(s)|FeCl_2(aq), FeCl_3(aq)|Pt(s)$ at 298 K, the cell potential (E_{cell}) will increase when:

(A) Concentration of Fe^{2+} is increased.

(B) Concentration of Fe^{3+} is decreased.

(C) Concentration of Fe^{2+} is decreased.

(D) Concentration of Fe^{3+} is increased.

(E) Concentration of Cl^- is increased.

Choose the correct answer from the options given below:

(1) A and E Only (2) A and B Only

(3) B Only (4) C, D and E Only

42. Given below are two statements:

Statement I: $[CoBr_4]^{2-}$ ion will absorb light of lower energy than $[CoCl_4]^{2-}$ ion.

Statement II: In $[CoI_4]^{2-}$ ion, the energy separation between the two set of d-orbitals is more than $[CoCl_4]^{2-}$ ion.

In the light of the above statements, choose the correct answer from the options given below:

(1) Both Statement I and Statement II are false

(2) Statement I is false but Statement II is true

(3) Both Statement I and Statement II are true

(4) Statement I is true but Statement II is false

43. Which of the following statements regarding the energy of the stationary state is true in the following one-electron systems?

(1) -1.09×10^{-18} J for second orbit of H atom.

(2) $+2.18\times10^{-18}$ J for second orbit of He^+ ion

(3) $+8.72\times10^{-18}$ J for first orbit of He^+ ion

(4) -2.18×10^{-18} J for third orbit of Li^{2+} ion

44. The correct statements from the following are:

A. Ionic radii of trivalent cations of group 13 elements decreases down the group.

B. Electronegativity of group 13 elements decreases down the group.

C. Among the group 13 elements, Boron has highest first ionisation enthalpy.

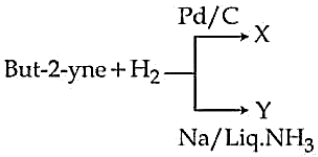
D. The trichloride and triiodide of group 13 elements are covalent in nature.

Choose the correct answer from the options given below:

(1) A and C Only (2) C and D Only

(3) B and D Only (4) A and D Only

45. But-2-yne and hydrogen (one mole each) are separately treated with (i) Pd/C and (ii) $Na/liq.\ NH_3$ to give the products X and Y respectively.



Identify the incorrect statements.

A. *X* and *Y* are stereoisomers.

B. Dipole moment of X is zero.

C. Boiling point of X is higher than Y.

D. X and Y react with $O_3/Zn + H_2O$ to give different products.

Choose the correct answer from the options given below:

(1) B and C Only (2) B and D Only

(3) A and C Only (4) A and B Only

Integer Type Questions

46. Consider all the structural isomers with molecular formula $C_5H_{11}Br$ are separately treated with $KOH(aq)$ to give respective substitution products, without any rearrangement. The number of products which can exhibit optical isomerism from these is_____.

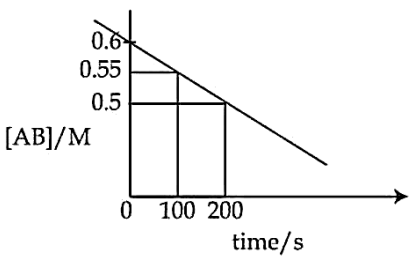
47. x mg of pure HCl was used to make an aqueous solution. 25.0 mL of $0.1M Ba(OH)_2$ solution is used when the HCl solution was titrated against it. The numerical value of *x* is ____ $\times10^{-1}$. (Nearest integer)

Given: Molar mass of HCl and $Ba(OH)_2$ are 36.5 and 171.0 g mol^{-1} respectively.

48. The crystal field splitting energy of $[Co(\text{ oxalate})_3]^{3-}$ complex is 'n' times that of the $[Cr(\text{ oxalate})_3]^{3-}$ complex. Here 'n' is____.

(Assume $\Delta_0 \gg P$)

49. For the thermal decomposition of reactant AB(g), the following plot is constructed.



The half-life of the reaction is 'x' min. x = _____ min. (Nearest integer)

50. For the following gas phase equilibrium reaction at constant temperature,

$NH_3(g) \rightleftharpoons 1/2\ N_2(g) + 3/2 H_2(g)$

if the total pressure is $\sqrt{3}$ atm and the pressure equilibrium constant (K_p) is 9 atm , then the degree of dissociation is given as $\left(x \times 10^{-2}\right)^{-1/2}$.

The value of x is_____ . (nearest integer)

SECTION-III (MATHEMATICS)

Single Correct Type Questions

51. A building construction work can be completed by two masons *A* and *B* together in 22.5 days. Mason *A* alone can complete the construction work in 24 days less than mason *B* alone. Then mason *A* alone will complete the construction work in:

(1) 42 days (2) 36 days
(3) 24 days (4) 30 days

52. Among the statements:

I: If $\begin{vmatrix} 1 & \cos\alpha & \cos\beta \\ \cos\alpha & 1 & \cos\gamma \\ \cos\beta & \cos\gamma & 1 \end{vmatrix} = \begin{vmatrix} 0 & \cos\alpha & \cos\beta \\ \cos\alpha & 0 & \cos\gamma \\ \cos\beta & \cos\gamma & 0 \end{vmatrix}$,

then $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = \frac{3}{2}$, and

II: If $\begin{vmatrix} x^2+x & x+1 & x-2 \\ 2x^2+3x-1 & 3x & 3x-3 \\ x^2+2x+3 & 2x-1 & 2x-1 \end{vmatrix} = px + q$, then

$p^2 = 196q^2$,

(1) only I is true (2) only II is true
(3) both are true (4) both are false

53. If α and $\beta(\alpha < \beta)$ are the roots of the equation

$\left(-2+\sqrt{3}\right)\left(\left|\sqrt{x}-3\right|\right) + \left(x - 6\sqrt{x}\right) + \left(9 - 2\sqrt{3}\right) = 0, x \geqslant 0$,

then $\sqrt{\frac{\beta}{\alpha}} + \sqrt{\alpha\beta}$ is equal to:

(1) 9 (2) 8
(3) 10 (4) 11

54. The value of the integral $\int_{\frac{\pi}{24}}^{\frac{5\pi}{24}} \frac{dx}{1+\sqrt[3]{\tan 2x}}$ is:

(1) $\frac{\pi}{18}$ (2) $\frac{\pi}{3}$
(3) $\frac{\pi}{6}$ (4) $\frac{\pi}{12}$

55. Number of solutions of

$\sqrt{3}\cos 2\theta + 8\cos\theta + 3\sqrt{3} = 0, \theta \in [-3\pi, 2\pi]$ is:

(1) 3 (2) 0
(3) 5 (4) 4

56. Let $f(x) = \begin{cases} \frac{ax^2+2ax+3}{4x^2+4x-3} & , x \neq -\frac{3}{2}, \frac{1}{2} \\ b & , x = -\frac{3}{2}, \frac{1}{2} \end{cases}$

be continuous at $x = -\frac{3}{2}$. If $f \circ f(x) = \frac{7}{5}$, then x is equal to:

(1) 1.4 (2) 0
(3) 2 (4) 1

57. Let $\vec{a} = -\hat{i} + \hat{j} + 2\hat{k}, \vec{b} = \hat{i} - \hat{j} - 3\hat{k}, \vec{c} = \vec{a} \times \vec{b}$ and $\vec{d} = \vec{c} \times \vec{a}$. Then $\left(\vec{a} - \vec{b}\right) \cdot \vec{d}$ is equal to:

(1) –4 (2) 2
(3) 4 (4) –2

58. Let the direction cosines of two lines satisfy the equations: $4l + m - n = 0$ and $2mn + 10nl + 3lm = 0$. Then the cosine of the acute angle between these lines is:

(1) $\frac{20}{3\sqrt{38}}$ (2) $\frac{10}{3\sqrt{38}}$
(3) $\frac{10}{\sqrt{38}}$ (4) $\frac{10}{7\sqrt{38}}$

59. Let $S = \left\{z : 3 \leqslant \left|2z - 3(1+i)\right| \leqslant 7\right\}$ be a set of complex numbers. Then $\min_{z \in S}\left|\left(z + \frac{1}{2}(5+3i)\right)\right|$ is equal to:

(1) $\frac{1}{2}$ (2) 2
(3) $\frac{3}{2}$ (4) $\frac{5}{2}$

60. The value of $\frac{{}^{100}C_{50}}{51}+\frac{{}^{100}C_{51}}{52}+\ldots+\frac{{}^{100}C_{100}}{101}$ is:

(1) $\frac{2^{100}}{100}$ (2) $\frac{2^{101}}{101}$

(3) $\frac{2^{101}}{100}$ (4) $\frac{2^{100}}{101}$

61. Let $y=y(x)$ be the solution of the differential equation $x^4\,dy+\left(4x^3y+2\sin x\right)dx=0$, $x>0, y\left(\frac{\pi}{2}\right)=0$. Then $\pi^4 y\left(\frac{\pi}{3}\right)$ is equal to:

(1) 64 (2) 92

(3) 81 (4) 72

62. A rectangle is formed by the lines $x=0, y=0, x=3$ and $y=4$. Let the line L be perpendicular to $3x+y+6=0$ and divide the area of the rectangle into two equal parts. Then the distance of the point $\left(\frac{1}{2},-5\right)$ from the line L is equal to:

(1) $2\sqrt{5}$ (2) $3\sqrt{10}$

(3) $2\sqrt{10}$ (4) $\sqrt{10}$

63. Let α and β respectively be the maximum and the minimum values of the function

$f(\theta)=4\left(\sin^4\left(\frac{7\pi}{2}-\theta\right)+\sin^4(11\pi+\theta)\right)$

$-2\left(\sin^6\left(\frac{3\pi}{2}-\theta\right)+\sin^6(9\pi-\theta)\right), \theta\in R$.

Then $\alpha+2\beta$ is equal to:

(1) 6 (2) 3

(3) 4 (4) 5

64. The vertices B and C of a triangle ABC lie on the line $\frac{x}{1}=\frac{1-y}{-2}=\frac{z-2}{3}$. The coordinates of A and B are $(1,6,3)$ and $(4,9,\alpha)$ respectively and C is at a distance of 10 units from B. The area (in sq. units) of ΔABC is:

(1) $5\sqrt{13}$ (2) $20\sqrt{13}$

(3) $15\sqrt{13}$ (4) $10\sqrt{13}$

65. Let $f(x)=\int\frac{\left(2-x^2\right)\cdot e^x}{\left(\sqrt{1+x}\right)(1-x)^{3/2}}\,dx$. If $f(0)=0$, then $f\left(\frac{1}{2}\right)$ is equal to:

(1) $\sqrt{3e}-1$ (2) $\sqrt{2e}+1$

(3) $\sqrt{3e}+1$ (4) $\sqrt{2e}-1$

66. Let $A=\{-2,-1,0,1,2,3,4\}$. Let R be a relation on A defined by xRy if and only if $2x+y\le 2$. Let l be the number of elements in R. Let m and n be the minimum number of elements required to be added in R to make it reflexive and symmetric relations respectively. Then $l + m + n$ is equal to:

(1) 35 (2) 34

(3) 33 (4) 32

67. Let the mean and variance of 8 numbers $-10,-7,-1,x,y,9,2,16$ be $\frac{7}{2}$ and $\frac{293}{4}$, respectively. Then the mean of 4 numbers $x, y, x+y+1, |x-y|$ is:

(1) 10 (2) 9

(3) 11 (4) 12

68. Let the domain of the function $f(x)=\log_3\log_5\log_7\left(9x-x^2-13\right)$ be the interval (m, n). Let the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ have eccentricity $\frac{n}{3}$ and the length of the latus rectum $\frac{8m}{3}$. Then $b^2 - a^2$ is equal to:

(1) 7 (2) 5

(3) 11 (4) 9

69. Let the line $y-x=1$ intersect the ellipse $\frac{x^2}{2}+\frac{y^2}{1}=1$ at the points A and B. Then the angle made by the line segment AB at the center of the ellipse is:

(1) $\frac{\pi}{2}+2\tan^{-1}\left(\frac{1}{4}\right)$

(2) $\frac{\pi}{2}-\tan^{-1}\left(\frac{1}{4}\right)$

(3) $\frac{\pi}{2}+\tan^{-1}\left(\frac{1}{4}\right)$

(4) $\pi-\tan^{-1}\left(\frac{1}{4}\right)$

70. The sum of all possible values of $n\in N$, so that the coefficients of x, x^2 and x^3 in the expansion of $(1 + x^2)^2(1 + x)^n$, are in arithmetic progression is:

(1) 3 (2) 12

(3) 9 (4) 7

Integer Type Questions

71. Let $|A| = 6$, where A is a 3×3 matrix. If $\left|adj\left(3adj\left(A^2 \cdot adj\left(2A\right)\right)\right)\right| = 2^m \cdot 3^n, m, n \in N$, then $m+n$ is equal to ____ .

72. Let f be a twice differentiable non-negative function such that $(f(x))^2 = 25 + \int_0^x \left((f(t))^2 + \left(f'(t)\right)^2\right)dt$. Then the mean of $f\left(\log_e(1)\right), f\left(\log_e(2)\right), \ldots..., f\left(\log_e(625)\right)$ is equal to_____.

73. From the first 100 natural numbers, two numbers first a and then b are selected randomly without replacement. If the probability that $a - b \geq 10$ is $\frac{m}{n}, \gcd(m,n) = 1$, then m + n is equal to_____.

74. The number of 4-letter words, with or without meaning, which can be formed using the letters PQRPQRSTUVP, is_____.

75. Let the area of the region bounded by the curve $y = \max\{\sin x, \cos x\}$, lines $x = 0, x = \frac{3\pi}{2}$, and the x-axis be A. Then, $A + A^2$ is equal to_____.

PHYSICS WALLAH

JEE MAIN 2026

SESSION-01

Date: 23-01-2026

Shift-02

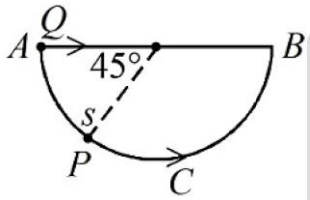
SECTION-I (PHYSICS)

Single Correct Type Questions

1. Two charges $7\mu C$ and $-2\mu C$ are placed at $(-9,0,0)$ cm and $(9,0,0)$ cm respectively in an external field $E=\frac{A}{r^2}\hat{r}$, where $A=9\times10^5$ N/C.m^2. Considering the potential at infinity is 0, the electrostatic energy of the configuration is _____ J.

(1) –90.7 (2) 24.3
(3) 49.3 (4) 1.4

2. A bead P sliding on a frictionless semi-circular string (ACB) and it is at point S at $t=0$ and at this instant the horizontal component of its velocity is v. Another bead Q of the same mass as P is ejected from point A at $t=0$ along the horizontal string AB, with the speed v, friction between the beads and the respective strings may be neglected in both cases. Let t_P and t_Q be the respective times taken by beads P and Q to reach the point B, then the relation between t_P and t_Q is



(1) $t_P>1.25t_Q$ (2) $t_P<t_Q$
(3) $t_P>t_Q$ (4) $t_P=t_Q$

3. A paratrooper jumps from an aeroplane and opens a parachute after 2 s of free fall and starts deaccelerating with 3 m/s^2. At 10 m height from ground, while descending with the help of parachute, the speed of paratrooper is 5 m/s. The initial height of the airplane is _____ m. ($g=10$ m/s^2)

(1) 20 (2) 82.5
(3) 62.5 (4) 92.5

4. Suppose a long solenoid of 100 cm length, radius 2 cm having 500 turns per unit length, carries a current $I=10\sin(\omega t)$ A, where $\omega=1000$ rad./s. A circular conducting loop (B) of radius 1 cm coaxially slided through the solenoid at a speed $v=1$ cm/s. The r.m.s. current through the loop when the coil B is inserted 10 cm inside the solenoid is $\alpha/\sqrt{2}\mu$A. The value of α is _____.
[Resistance of the loop = 10Ω]

(1) 280 (2) 100
(3) 197 (4) 80

5. The internal energy of a monoatomic gas is 3nRT. One mole of helium is kept in a cylinder having internal cross section area of 17 cm^2 and fitted with a light movable frictionless piston. The gas is heated slowly by suppling 126 J heat. If the temperature rises by 4°C, then the piston will move _____ cm. (atmospheric pressure = 10^5 Pa)

(1) 14.5 (2) 15.5
(3) 1.55 (4) 1.45

6. A body of mass 14 kg initially at rest explodes and breaks into three fragments of masses in the ratio 2:2:3. The two pieces of equal masses fly off perpendicular to each other with a speed of 18 m/s each. The velocity of the heavier fragment is _____ m/s.

(1) $10\sqrt{2}$ (2) $12\sqrt{2}$
(3) $24\sqrt{2}$ (4) 12

7. Which of the following pair of nuclei are isobars of the element?

(1) $^2_1$H and $^3_1$H
(2) $^{198}_{80}$Hg and $^{197}_{79}$Au
(3) $^{236}_{92}$U and $^{238}_{92}$U
(4) $^3_1$H and $^3_2$He

8. The current passing through a conducting loop in the form of equilateral triangle of side $4\sqrt{3}$ cm is 2 A. The magnetic field at its centroid is $\alpha\times10^{-5}$ T. The value of α is _____.
(Given : $\mu_0=4\pi\times10^{-7}$ SI units)

(1) $3\sqrt{3}$ (2) $\frac{\sqrt{3}}{2}$
(3) $2\sqrt{3}$ (4) $\sqrt{3}$

9. When an unpolarized light falls at a particular angle on a glass plate (placed in air), it is observed that the reflected beam is linearly polarized. The angle of refracted beam with respect to the normal is _____. ($\tan^{-1}(1.52)=57.7^\circ$, refractive indices of air and glass are 1.00 and 1.52, respectively.)

(1) 42.6° (2) 32.3°
(3) 36.3° (4) 39.6°

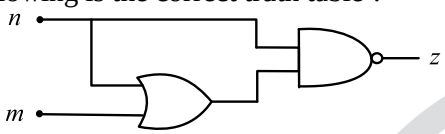
10. A parallel plate capacitor with plate separation 5 mm is charged by a battery. On introducing a mica sheet of 2 mm and maintaining the connections of the plates with the terminals of the battery, it is found that it draws 25% more charge from the battery. The dielectric constant of mica is _____.

(1) 1.0 (2) 1.5
(3) 2.5 (4) 2.0

11. To compare EMF of two cells using potentiometer the balancing lengths obtained are 200 cm and 150 cm. The least count of scale is 1 cm. The percentage error in the ratio of EMFs is _____

(1) 1.75 (2) 1.17
(3) 1.45 (4) 1.55

12. For the given logic gate circuit, which of the following is the correct truth table ?



(1)

n	m	z
0	0	1
0	1	1
1	1	0
1	0	0

(2)

n	m	z
0	0	0
0	1	1
1	1	0
1	0	1

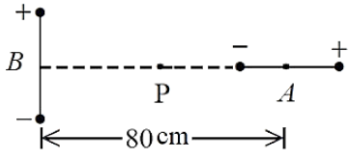
(3)

n	m	z
0	0	1
0	1	0
1	1	0
1	0	0

(4)

n	m	z
0	0	1
0	1	0
1	1	1
1	0	0

13. Two shorts dipoles (A, B). A having charges $\pm 2\mu C$ and length 1 cm and B having charges $\pm 4\mu C$ and length 1 cm are placed with their centres 80 cm apart as shown in the figure. The electric field at a point P, equi-distant from the centres of both dipoles is _____ N/C.



(1) $9\sqrt{2}\times10^4$ (2) $\frac{9}{16}\sqrt{2}\times10^5$
(3) $\frac{9}{16}\sqrt{2}\times10^4$ (4) $4.5\sqrt{2}\times10^4$

14. A prism of angle 75° and refractive index $\sqrt{3}$ is coated with thin film of refractive index 1.5 only at the back exit surface. To have total internal reflection at the back exit surface the incident angle must not be _____. ($\sin 15^\circ = 0.25$ and $\sin 25^\circ = 0.43$)

(1) $> 25^\circ$ (2) 15°
(3) $< 15^\circ$ (4) between 15° and 20°

15. One mole of an ideal diatomic gas expands from volume V to $2V$ isothermally at a temperature $27^\circ C$ and does W joule of work. If the gas undergoes same magnitude of expansion adiabatically from $27^\circ C$ doing the same amount of work W, then its final temperature will be (close to) _____ $^\circ C$. $(\log_e 2 = 0.693)$

(1) −189 (2) −117
(3) −56 (4) −30

16. A circular loop of radius 7 cm is placed in uniform magnetic field of 0.2 T directed perpendicular to plane of loop. The loop is converted into a square loop in 0.5 s. The EMF induced in the loop is _____ mV.

(1) 13.2 (2) 1.32
(3) 6.6 (4) 8.25

17. A block is sliding down on an inclined plane of slope θ and at an instant t = 0 this block is given an upward momentum so that it starts moving up on the inclined surface with velocity u. The distance (S) travelled by the block before its velocity become zero, is _____.
(g = gravitational acceleration)

(1) $\frac{u^2}{4g\sin\theta}$ (2) $\frac{u^2}{\sqrt{2}g\cos\theta}$
(3) $\frac{2u^2}{g\cos\theta}$ (4) $\frac{u^2}{2g\sin\theta}$

18. The ratio of speeds of electromagnetic waves in vacuum and a medium, having dielectric constant $k = 3$ and permeability of $\mu = 2\mu_0$, is (μ_0 = permeability of vacuum)

(1) 3 : 2 (2) 36 : 1

(3) $\sqrt{6}$: 1 (4) 6 : 1

19. An air bubble of volume 2.9 cm^3 rises from the bottom of a swimming pool of 5 m deep. At the bottom of the pool water temperature is $17^\circ C$. The volume of the bubble when it reaches the surface, where the water temperature is $27^\circ C$, is _____ cm^3. ($g = 10\ m/s^2$, density of water $= 10^3\ kg/m^3$, and 1 atm pressure is 10^5 Pa)

(1) 3.0 (2) 2.0

(3) 4.2 (4) 4.5

20. A small metallic sphere of diameter 2 mm and density 10.5 g/cm^3 is dropped in glycerine having viscosity 10 Poise and density 1.5 g/cm^3 respectively. The terminal velocity attained by the sphere is _____ cm/s. ($\pi = \frac{22}{7}$ and $g = 10\ m/s^2$)

(1) 1.5 (2) 3.0

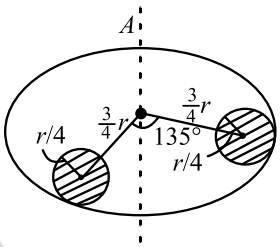
(3) 1.0 (4) 2.0

Integer Type Questions

21. The average energy released per fission for the nucleus of $^{235}_{92}U$ is 190 MeV. When all the atoms of 47 g pure $^{235}_{92}U$ undergo fission process, the energy released is $\alpha \times 10^{23}$ MeV. The value of α is ____. (Avogadro Number $= 6 \times 10^{23}$ per mole)

22. A ball of radius r and density ρ dropped through a viscous liquid of density σ and viscosity η attains its terminal velocity at time t, given by $t = A\rho^a r^b \eta^c \sigma^d$, where A is a constant and a, b, c and d are integers. The value of $\frac{b+c}{a+d}$ is _____.

23. Suppose there is a uniform circular disc of mass M kg and radius r m shown in figure. The shaded regions are cut out from the disc. The moment of inertia of the remainder about the axis A of the disc is given by $\frac{x}{256}Mr^2$. The value of x is _____.



24. The velocity of sound in air is doubled when the temperature is raised from 0°C to α°C. The value of α is _____.

25. The size of the images of an object, formed by a thin lens are equal when the object is placed at two different positions 8 cm and 24 cm from the lens. The focal length of the lens is _____ cm.

SECTION-II (CHEMISTRY)

Single Correct Type Questions

26. Identify the **CORRECT** set of details from the following:

A. $[Co(NH_3)_6]^{3+}$: Inner orbital complex; d^2sp^3 hybridized

B. $[MnCl_6]^{3-}$: Outer orbital complex; sp^3d^2 hybridized

C. $[CoF_6]^{3-}$: Outer orbital complex; d^2sp^3 hybridized

D. $[FeF_6]^{3-}$: Outer orbital complex; sp^3d^2 hybridized

E. $[Ni(CN)_4]^{2-}$: Inner orbital complex; sp^3 hybridized

Choose the correct answer from the given below:

(1) A, B, C, D & E

(2) A, C & E Only

(3) C & D Only

(4) A, B & D Only

27. The oxidation state of chromium in the final product formed in the reaction between KI and acidified $K_2Cr_2O_7$ solution is:

(1) +4 (2) +3

(3) +6 (4) +2

28. Observe the following reactions at T(K).

I. $A \rightarrow$ products .

II. $5Br^-(aq) + BrO_3^-(aq) + 6H^+(aq) \rightarrow 3Br_2(aq) + 3H_2O(l)$

Both the reactions are started at 10.00 am. The rates of these reactions at 10.10 am are same. The value of $-\frac{\Delta[Br^-]}{\Delta t}$ at 10.10 am is 2×10^{-4} mol L^{-1} min^{-1}. The concentration of A at 10.10 am is 10^{-2} mol L^{-1}. What is the first order rate constant (in min^{-1}) of reaction I?

(1) 10^{-2} (2) 2×10^{-3}

(3) 10^{-3} (4) 4×10^{-3}

29. It is noticed that Pb^{2+} is more stable than Pb^{4+} but Sn^{2+} is less stable than Sn^{4+}. Observe the following reactions.

$PbO_2 + Pb \rightarrow 2PbO; \Delta_rG^\circ(1)$

$SnO_2 + Sn \rightarrow 2SnO; \Delta_rG^\circ(2)$

Identify the correct set from the following

(1) $\Delta_rG^\circ(1) > 0; \Delta_rG^\circ(2) < 0$

(2) $\Delta_rG^\circ(1) > 0; \Delta_rG^\circ(2) > 0$

(3) $\Delta_rG^\circ(1) < 0; \Delta_rG^\circ(2) > 0$

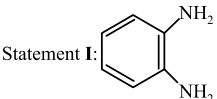
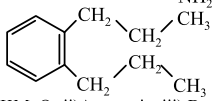
(4) $\Delta_rG^\circ(1) < 0; \Delta_rG^\circ(2) < 0$

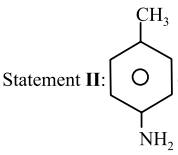
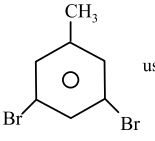
30. Elements X and Y belong to Group 15. The difference between the electronegativity values of 'X' and phosphorus is higher than that of the difference between phosphorus and 'Y'. 'X' & 'Y' are respectively

(1) As & Bi (2) N & As

(3) As & Sb (4) Bi & N

31. Given below are two statements:

Statement **I**:  can be synthesized from  using simpler reagents in the order i) Acidic $KMnO_4$,ii)Ammonia, iii) Bromine and alkali

Statement **II**:  can be converted into  using reagents

in the order

(i) Bromine-H_2O

(ii) $NaNO_2$/HCl (0 –5 °C)

(iii) Aq. H_3PO_2.

n the light of the above statements, choose the *correct* answer from the given below

(1) Both Statement I and Statement II are false

(2) Statement I is false but Statement II is true

(3) Statement I is true but Statement II is false

(4) Both Statement I and Statement II are true

32. Iodoform test can differentiate between

A. Methanol and Ethanol

B. CH_3COOH and CH_3CH_2COOH

C. Cyclohexene and cyclohexanone

D. Diethyl ether and Pentan-3-one

E. Anisole and acetone

Choose the *correct* answer from the given below:

(1) A & D Only (2) A, B & E Only

(3) A & E Only (4) B, C & E Only

33. A student has been given a compound "x" of molecular formula- C_6H_7N . 'x' is sparingly soluble in water. However, on addition of dilute mineral acid, 'x' becomes soluble in water. 'x' when treated with $CHCl_3$ and KOH (alc), 'y' is produced. 'y' has a specific unpleasant smell. On treatment with benzenesulphonyl chloride, 'x' gives a compound 'z' which is soluble in alkali. The number of different "H" atoms present in 'z' is:

(1) 7 (2) 5

(3) 8 (4) 4

34. Which of the following statements are **TRUE** about Haloform reaction?

A. Sodium hypochlorite reacts with KI to give KOI.

B. KOI is a reducing agent.

C. α,β-unsaturated methylketone ($CH_3-CH=CH-\overset{\overset{O}{\|}}{C}-CH_3$) will give iodoform reaction.

D. Isopropyl alcohol will not give iodoform test.

E. Methanoic acid will give positive iodoform test.

Choose the *correct* answer from the given below:

(1) A, C & E Only (2) A & C Only

(3) A, B & C Only (4) B, D & E Only

35. Which statements are **NOT TRUE** about XeO_2F_2 ?

A. It has a see-saw shape.

B. Xe has 5 electron pairs in its valence shell in XeO_2F_2 .

C. The O–Xe–O bond angle is close to 180° .

D. The F–Xe–F bond angle is close to 180° .

E. Xe has 16 valence electrons in XeO_2F_2 .

Choose the *correct* answer from the given below:

(1) A and D Only (2) B, C and E Only

(3) B and D Only (4) B, D and E Only

36. In Carius method 0.2425 g of an organic compound gave 0.5253 g silver chloride. The percentage of chlorine in the organic compound is

(1) 34.79% (2) 37.57%
(3) 53.58% (4) 87.65%

37. Both human DNA and RNA are chiral molecules. The chirality in DNA and RNA arises due to the presence of

(1) Base unit
(2) L–sugar component
(3) Chiral phosphate unit
(4) D–sugar component

38. Given below are two statements:

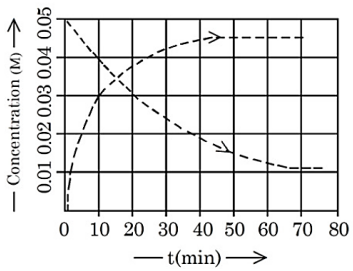
Statement I: $(CH_3)_3\overset{\oplus}{C}$ is more stable than $CH_3\overset{\oplus}{C}$ as nine hyperconjugation interactions are possible in $(CH_3)_3\overset{\oplus}{C}$.

Statement II: $\overset{\oplus}{C}H_3$ is less stable than $(CH_3)_3\overset{\oplus}{C}$ as only three hyperconjugation interactions are possible in $\overset{\oplus}{C}H_3$.

In the light of the above statements, choose the *correct* answer from the given below

(1) Statement I is false but Statement II is true
(2) Both Statement I and Statement II are false
(3) Statement I is true but Statement II is false
(4) Both Statement I and Statement II are true

39.



Given above is the concentration vs time plot for a dissociation reaction: $A \rightarrow nB$. Based on the data of the initial phase of the reaction (initial 10 min), the value of n is _____.

(1) 4 (2) 5
(3) 3 (4) 2

40. The work functions of two metals (M_A and M_B) are in the 1 : 2 ratio. When these metals are exposed to photons of energy 6 eV, the kinetic energy of liberated electrons of $M_A : M_B$ is in the ratio of 2.642 : 1. The work functions (in eV) of M_A and M_B are respectively.

(1) 1.4, 2.8 (2) 1.5, 3.0
(3) 2.3, 4.6 (4) 3.1, 6.2

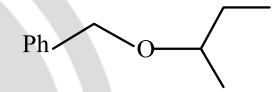
41. Given below are two statements:

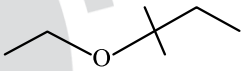
Statement I: The second ionisation enthalpy of Na is larger than the corresponding ionisation enthalpy of Mg.

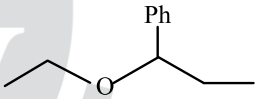
Statement II: The ionic radius of O^{2-} is larger than that of F^-. In the light of the above statements, choose the *correct* answer from the given below

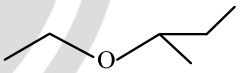
(1) Both Statement I and Statement II are true
(2) Statement I is true but Statement II is false
(3) Both Statement I and Statement II are false
(4) Statement I is false but Statement II is true

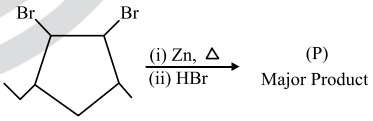
42. A mixed ether (P), when heated with excess of hot concentrated hydrogen iodide produces two different alkyl iodides which when treated with aq. NaOH give compounds (Q) and (R). Both (Q) and (R) give yellow precipitate with NaOI. Identify the mixed ether (P):

(1) 

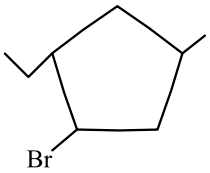
(2) 

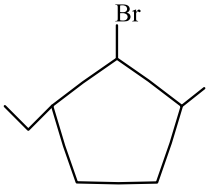
(3) 

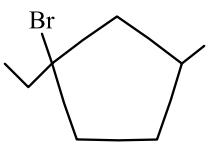
(4) 

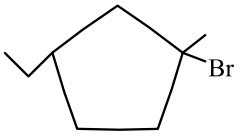
43. 

Identify (P)

(1) 

(2) 

(3) 

(4) 

44. Identify the **INCORRECT** statements from the following:

A. Notation $^{24}_{12}Mg$ represents 24 protons and 12 neutrons.

B. Wavelength of a radiation of frequency $4.5\times10^{15}\ s^{-1}$ is $6.7\times10^{-8}\ m$.

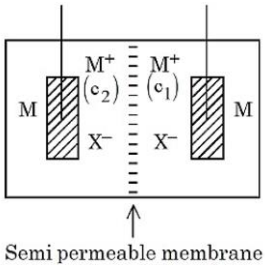
C. One radiation has wavelength $=\lambda_1$ (900 nm) and energy $=E_1$. Other radiation has wavelength $=\lambda_2$ (300 nm) and energy $=E_2$. $E_1:E_2=3:1$.

D. Number of photons of light of wavelength 2000 pm that provides 1 J of energy is 1.006×10^{16}. Choose the *correct* answer from the given below:

(1) A and C Only (2) A and B Only

(3) A and D Only (4) B and C Only

45.



Consider the above electrochemical cell where a metal electrode (M) is undergoing redox reaction by forming M^+ ($M\rightarrow M^+ + e^-$). The cation M^+ is present in two different concentrations c_1 and c_2 as shown above. Which of the following statement is correct for generating a positive cell potential?

(1) If c_1 is present at anode, then $c_1 > c_2$.

(2) If c_1 is present at cathode, then $c_1 > c_2$.

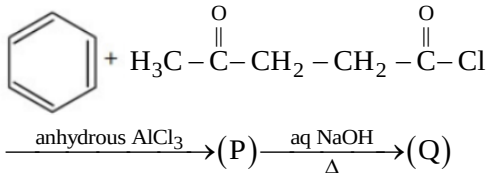
(3) If c_1 is present at anode, then $c_1 = c_2$.

(4) If c_1 is present at cathode, then $c_1 < c_2$.

Integer Type Questions

46. 200 cc of $x\times10^{-3}$ M potassium dichromate is required to oxidise 750 cc of 0.6 M Mohr's salt solution in acidic medium. Here x = _____.

47. Consider the following reaction of benzene.



In compound (Q), the percentage of oxygen is _____ %. (Nearest integer)

48. $X_2(g)+Y_2(g)\rightleftharpoons 2Z(g)$ $X_2(g)$ and $Y_2(g)$ are added to a 1 L flask and it is found that the system attains the above equilibrium at T(K) with the number of moles of $X_2(g)$, $Y_2(g)$ and $Z(g)$ being 3, 3 and 9 mol respectively (equilibrium moles). Under this condition of equilibrium, 10 mol of $Z(g)$ is added to the flask and the temperature is maintained at T(K). Then the number of moles of $Z(g)$ in the flask when the new equilibrium is established is _____. (Nearest integer)

49. Total number of unpaired electrons present in the central metal atoms/ions of $[Ni(CO)_4]$, $[NiCl_4]^{2-}$, $[PtCl_2(NH_3)_2]$, $[Ni(CN)_4]^{2-}$ and $[Pt(CN)_4]^{2-}$ is _____.

50. Two liquids A and B form an ideal solution. At 320 K, the vapour pressure of the solution, containing 3 mol of A and 1 mol of B is 500 mm Hg. At the same temperature, if 1 mol of A is further added to this solution, vapour pressure of the solution increases by 20 mm Hg. Vapour pressure (in mm Hg) of B in pure state is _____. (Nearest integer)

SECTION-III (MATHEMATICS)

Single Correct Type Questions

51. If the points of intersection of the ellipses $x^2+2y^2-6x-12y+23=0$ and $4x^2+2y^2-20x-12y+35=0$ lie on a circle of radius r and centre (a,b), then the value of $ab+18r^2$ is

(1) 52 (2) 53

(3) 55 (4) 51

52. If $f(x)=\begin{cases}\dfrac{a|x|+x^2-2(\sin|x|)(\cos|x|)}{x} & ,x\neq0\\ b & ,x=0\end{cases}$

is continuous at $x=0$, then $a+b$ is equal to

(1) 0

(2) 1

(3) 4

(4) 2

53. Let $A=\{0,1,2,...,9\}$. Let R be a relation on A defined by $(x,y)\in R$ if and only if $|x-y|$ is a multiple of 3. Given below are two statements:

Statement I: $n(R)=36$.

Statement II: R is an equivalence relation.

In the light of the above statements, choose the correct answer from the given below

(1) Both Statement I and Statement II are correct

(2) Statement I is incorrect but Statement II is correct

(3) Statement I is correct but Statement II is incorrect

(4) Both Statement I and Statement II are incorrect

54. Let $\vec{a},\vec{b},\vec{c}$ be three vectors such that $\vec{a}\times\vec{b}=2(\vec{a}\times\vec{c})$. If $|\vec{a}|=1,|\vec{b}|=4,|\vec{c}|=2$, and the angle between $\vec{b}$ and $\vec{c}$ is 60°, then $|\vec{a}\cdot\vec{c}|$ is equal to

(1) 0 (2) 1

(3) 4 (4) 2

55. If the mean and the variance of the data

Class	4–8	8–12	12–16	116–20
Frequency	3	λ	4	7

are μ and 19 respectively, then the value of $\lambda+\mu$ is

(1) 21 (2) 19

(3) 20 (4) 18

56. The system of linear equations $x+y+z=6$ $2x+5y+az=36$ $x+2y+3z=b$ has

(1) infinitely many solutions for $a=8$ and $b=16$

(2) unique solution for $a=8$ and $b=16$

(3) infinitely many solutions for $a=8$ and $b=14$

(4) unique solution for $a=8$ and $b=14$

57. The sum of all the real solutions of the equation $\log_{(x+3)}\left(6x^2+28x+30\right)=5-2\log_{(6x+10)}$ $\left(x^2+6x+9\right)$ is equal to

(1) 1 (2) 2

(3) 0 (4) 4

58. Let $A(1,2)$ and $C(-3,-6)$ be two diagonally opposite vertices of a rhombus, whose sides AD and BC are parallel to the line $7x-y=14$. If B (α,β) and D (γ,δ) are the other two vertices, then $|\alpha+\beta+\gamma+\delta|$ is equal to

(1) 6 (2) 9

(3) 1 (4) 3

59. Let $\vec{a}=\hat{i}-2\hat{j}+3\hat{k}$, $\vec{b}=2\hat{i}+\hat{j}-\hat{k}$, $\vec{c}=\lambda\hat{i}+\hat{j}+\hat{k}$ and $\vec{v}=\vec{a}\times\vec{b}$. If $\vec{v}\cdot\vec{c}=11$ and the length of the projection of $\vec{b}$ on $\vec{c}$ is p, then $9p^2$ is equal to

(1) 12 (2) 6

(3) 9 (4) 4

60 Let $I(x)=\int\frac{3dx}{(4x+6)\left(\sqrt{4x^2+8x+3}\right)}$ and $I(0)=\frac{\sqrt{3}}{4}+20$. If $I\left(\frac{1}{2}\right)=\frac{a\sqrt{2}}{b}+c$, where $a,b,c\in\mathbb{N},\gcd(a,b)=1$, then $a+b+c$ is equal to

(1) 30 (2) 28

(3) 29 (4) 31

61. Consider two sets $A=\left\{x\in\mathbb{Z}:\left|\left(|x-3|-3\right)\right|\le 1\right\}$ and $B=\left\{x\in\mathbb{R}-\{1,2\}:\frac{(x-2)(x-4)}{x-1}\log_e\left(|x-2|\right)=0\right\}$.

Then the number of onto functions $f:A\to B$ is equal to

(1) 62 (2) 32

(3) 81 (4) 79

62. Let PQ be a chord of the hyperbola $\frac{x^2}{4}-\frac{y^2}{b^2}=1$, perpendicular to the x-axis such that OPQ is an equilateral triangle, O being the centre of the hyperbola. If the eccentricity of the hyperbola is $\sqrt{3}$, then the area of the triangle OPQ is

(1) $\frac{11}{5}$ (2) $2\sqrt{3}$

(3) $\frac{9}{5}$ (4) $\frac{8\sqrt{3}}{5}$

63. The least value of $\left(\cos^2\theta-6\sin\theta\cos\theta+3\sin^2\theta+2\right)$ is

(1) $4-\sqrt{10}$ (2) $4+\sqrt{10}$

(3) 1 (4) –1

64. Let $\sum_{k=1}^{n} a_k = \alpha n^2 + \beta n$. If $a_{10} = 59$ and $a_6 = 7a_1$, then $\alpha + \beta$ is equal to

(1) 5 (2) 3
(3) 12 (4) 7

65. An equilateral triangle *OAB* is inscribed in the parabola $y^2 = 4x$ with the vertex *O* at the vertex of the parabola. Then the minimum distance of the circle having AB as a diameter from the origin is

(1) $2\left(3+\sqrt{3}\right)$ (2) $4\left(3-\sqrt{3}\right)$
(3) $4\left(6+\sqrt{3}\right)$ (4) $2\left(8-3\sqrt{3}\right)$

66. Bag *A* contains 9 white and 8 black balls, while bag *B* contains 6 white and 4 black balls. One ball is randomly picked up from the bag B and mixed up with the balls in the bag A. Then a ball is randomly drawn from the bag A. If the probability, that the ball drawn is white, is $\frac{p}{q}$, $\gcd(p,q)=1$, then $p + q$ is equal to

(1) 21 (2) 22
(3) 23 (4) 24

67. Let $\frac{\pi}{2} < \theta < \pi$ and $\cot\theta = -\frac{1}{2\sqrt{2}}$. Then the value of $\sin\left(\frac{15\theta}{2}\right)(\cos 8\theta + \sin 8\theta) + \cos\left(\frac{15\theta}{2}\right)(\cos 8\theta - \sin 8\theta)$ is equal to

(1) $\frac{\sqrt{2}-1}{\sqrt{3}}$ (2) $\frac{1-\sqrt{2}}{\sqrt{3}}$
(3) $-\frac{\sqrt{2}}{\sqrt{3}}$ (4) $\frac{\sqrt{2}}{\sqrt{3}}$

68. The area of the region enclosed between the circles $x^2 + y^2 = 4$ and $x^2 + (y-2)^2 = 4$ is:

(1) $\frac{2}{3}\left(4\pi - 3\sqrt{3}\right)$ (2) $\frac{4}{3}\left(2\pi - \sqrt{3}\right)$
(3) $\frac{2}{3}\left(2\pi - 3\sqrt{3}\right)$ (4) $\frac{4}{3}\left(2\pi - 3\sqrt{3}\right)$

69. If $z = \frac{\sqrt{3}}{2} + \frac{i}{2}, i = \sqrt{-1}$, then $(z^{201} - i)^8$ is equal to

(1) 1 (2) –1
(3) 0 (4) 256

70. The number of ways, in which 16 oranges can be distributed to four children such that each child gets at least one orange, is

(1) 403 (2) 384
(3) 455 (4) 429

Integer Type Questions

71. If the image of the point $P(a,2,a)$ in the line $\frac{x}{2} = \frac{y+a}{1} = \frac{z}{1}$ is *Q* and the image of *Q* in the line $\frac{x-2b}{2} = \frac{y-a}{1} = \frac{z+2b}{-5}$ is *P*, then $a + b$ is equal to _____.

72. Let $A = \begin{bmatrix} 0 & 2 & -3 \\ -2 & 0 & 1 \\ 3 & -1 & 0 \end{bmatrix}$ and *B* be a matrix such that $B(I - A) = I + A$. Then the sum of the diagonal elements of $B^T B$ is equal to _____.

73. Let S denote the set of 4-digit numbers *abcd* such that $a > b > c > d$ and *P* denote the set of 5-digit numbers having product of its digits equal to 20. Then $n(S) + n(P)$ is equal to _____.

74 The number of elements in the set $S = \left\{x : x \in [0,100] \text{ and } \int_0^x t^2 \sin(x-t)\,dt = x^2\right\}$ is _____.

75 If the solution curve $y = f(x)$ of the differential equation $(x^2 - 4)y' - 2xy + 2x(4 - x^2)^2 = 0, x > 2,$ passes through the point (3,15), then the local maximum value of *f* is _____.

PHYSICS WALLAH

JEE MAIN 2026

SESSION-01

Date: 23-01-2026

Shift-02

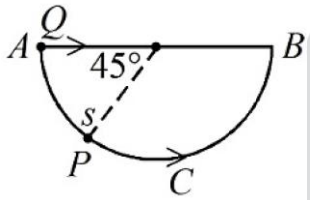
SECTION-I (PHYSICS)

Single Correct Type Questions

1. Two charges $7\mu C$ and $-2\mu C$ are placed at $(-9,0,0)$ cm and $(9,0,0)$ cm respectively in an external field $E=\frac{A}{r^2}\hat{r}$, where $A=9\times10^5$ N/C.m^2. Considering the potential at infinity is 0, the electrostatic energy of the configuration is _____ J.

(1) –90.7 (2) 24.3
(3) 49.3 (4) 1.4

2. A bead P sliding on a frictionless semi-circular string (ACB) and it is at point S at $t=0$ and at this instant the horizontal component of its velocity is v. Another bead Q of the same mass as P is ejected from point A at $t=0$ along the horizontal string AB, with the speed v, friction between the beads and the respective strings may be neglected in both cases. Let t_P and t_Q be the respective times taken by beads P and Q to reach the point B, then the relation between t_P and t_Q is



(1) $t_P>1.25t_Q$ (2) $t_P<t_Q$
(3) $t_P>t_Q$ (4) $t_P=t_Q$

3. A paratrooper jumps from an aeroplane and opens a parachute after 2 s of free fall and starts deaccelerating with 3 m/s^2. At 10 m height from ground, while descending with the help of parachute, the speed of paratrooper is 5 m/s. The initial height of the airplane is _____ m. ($g=10$ m/s^2)

(1) 20 (2) 82.5
(3) 62.5 (4) 92.5

4. Suppose a long solenoid of 100 cm length, radius 2 cm having 500 turns per unit length, carries a current $I=10\sin(\omega t)$ A, where $\omega=1000$ rad./s. A circular conducting loop (B) of radius 1 cm coaxially slided through the solenoid at a speed $v=1$ cm/s. The r.m.s. current through the loop when the coil B is inserted 10 cm inside the solenoid is $\alpha/\sqrt{2}\mu$A. The value of α is _____.
[Resistance of the loop = 10Ω]

(1) 280 (2) 100
(3) 197 (4) 80

5. The internal energy of a monoatomic gas is 3nRT. One mole of helium is kept in a cylinder having internal cross section area of 17 cm^2 and fitted with a light movable frictionless piston. The gas is heated slowly by suppling 126 J heat. If the temperature rises by 4°C, then the piston will move _____ cm. (atmospheric pressure = 10^5 Pa)

(1) 14.5 (2) 15.5
(3) 1.55 (4) 1.45

6. A body of mass 14 kg initially at rest explodes and breaks into three fragments of masses in the ratio 2:2:3. The two pieces of equal masses fly off perpendicular to each other with a speed of 18 m/s each. The velocity of the heavier fragment is _____ m/s.

(1) $10\sqrt{2}$ (2) $12\sqrt{2}$
(3) $24\sqrt{2}$ (4) 12

7. Which of the following pair of nuclei are isobars of the element?

(1) $^2_1$H and $^3_1$H
(2) $^{198}_{80}$Hg and $^{197}_{79}$Au
(3) $^{236}_{92}$U and $^{238}_{92}$U
(4) $^3_1$H and $^3_2$He

8. The current passing through a conducting loop in the form of equilateral triangle of side $4\sqrt{3}$ cm is 2 A. The magnetic field at its centroid is $\alpha\times10^{-5}$ T. The value of α is _____.
(Given : $\mu_0=4\pi\times10^{-7}$ SI units)

(1) $3\sqrt{3}$ (2) $\frac{\sqrt{3}}{2}$
(3) $2\sqrt{3}$ (4) $\sqrt{3}$

9. When an unpolarized light falls at a particular angle on a glass plate (placed in air), it is observed that the reflected beam is linearly polarized. The angle of refracted beam with respect to the normal is _____. ($\tan^{-1}(1.52)=57.7^\circ$, refractive indices of air and glass are 1.00 and 1.52, respectively.)

(1) 42.6° (2) 32.3°
(3) 36.3° (4) 39.6°

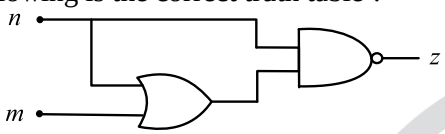
10. A parallel plate capacitor with plate separation 5 mm is charged by a battery. On introducing a mica sheet of 2 mm and maintaining the connections of the plates with the terminals of the battery, it is found that it draws 25% more charge from the battery. The dielectric constant of mica is _____.

(1) 1.0 (2) 1.5
(3) 2.5 (4) 2.0

11. To compare EMF of two cells using potentiometer the balancing lengths obtained are 200 cm and 150 cm. The least count of scale is 1 cm. The percentage error in the ratio of EMFs is _____

(1) 1.75 (2) 1.17
(3) 1.45 (4) 1.55

12. For the given logic gate circuit, which of the following is the correct truth table ?



(1)

n	m	z
0	0	1
0	1	1
1	1	0
1	0	0

(2)

n	m	z
0	0	0
0	1	1
1	1	0
1	0	1

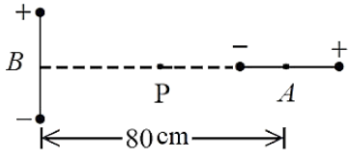
(3)

n	m	z
0	0	1
0	1	0
1	1	0
1	0	0

(4)

n	m	z
0	0	1
0	1	0
1	1	1
1	0	0

13. Two shorts dipoles (A, B). A having charges $\pm 2\mu C$ and length 1 cm and B having charges $\pm 4\mu C$ and length 1 cm are placed with their centres 80 cm apart as shown in the figure. The electric field at a point P, equi-distant from the centres of both dipoles is _____ N/C.



(1) $9\sqrt{2}\times10^4$ (2) $\frac{9}{16}\sqrt{2}\times10^5$
(3) $\frac{9}{16}\sqrt{2}\times10^4$ (4) $4.5\sqrt{2}\times10^4$

14. A prism of angle 75° and refractive index $\sqrt{3}$ is coated with thin film of refractive index 1.5 only at the back exit surface. To have total internal reflection at the back exit surface the incident angle must not be _____. ($\sin 15^\circ = 0.25$ and $\sin 25^\circ = 0.43$)

(1) $> 25^\circ$ (2) 15°
(3) $< 15^\circ$ (4) between 15° and 20°

15. One mole of an ideal diatomic gas expands from volume V to $2V$ isothermally at a temperature $27^\circ C$ and does W joule of work. If the gas undergoes same magnitude of expansion adiabatically from $27^\circ C$ doing the same amount of work W, then its final temperature will be (close to) _____ $^\circ C$. $(\log_e 2 = 0.693)$

(1) −189 (2) −117
(3) −56 (4) −30

16. A circular loop of radius 7 cm is placed in uniform magnetic field of 0.2 T directed perpendicular to plane of loop. The loop is converted into a square loop in 0.5 s. The EMF induced in the loop is _____ mV.

(1) 13.2 (2) 1.32
(3) 6.6 (4) 8.25

17. A block is sliding down on an inclined plane of slope θ and at an instant t = 0 this block is given an upward momentum so that it starts moving up on the inclined surface with velocity u. The distance (S) travelled by the block before its velocity become zero, is _____.
(g = gravitational acceleration)

(1) $\frac{u^2}{4g\sin\theta}$ (2) $\frac{u^2}{\sqrt{2}g\cos\theta}$
(3) $\frac{2u^2}{g\cos\theta}$ (4) $\frac{u^2}{2g\sin\theta}$

18. The ratio of speeds of electromagnetic waves in vacuum and a medium, having dielectric constant $k = 3$ and permeability of $\mu = 2\mu_0$, is (μ_0 = permeability of vacuum)

(1) 3 : 2 (2) 36 : 1

(3) $\sqrt{6}$: 1 (4) 6 : 1

19. An air bubble of volume 2.9 cm^3 rises from the bottom of a swimming pool of 5 m deep. At the bottom of the pool water temperature is $17^\circ C$. The volume of the bubble when it reaches the surface, where the water temperature is $27^\circ C$, is _____ cm^3. ($g = 10\ m/s^2$, density of water $= 10^3\ kg/m^3$, and 1 atm pressure is 10^5 Pa)

(1) 3.0 (2) 2.0

(3) 4.2 (4) 4.5

20. A small metallic sphere of diameter 2 mm and density 10.5 g/cm^3 is dropped in glycerine having viscosity 10 Poise and density 1.5 g/cm^3 respectively. The terminal velocity attained by the sphere is _____ cm/s. ($\pi = \frac{22}{7}$ and $g = 10\ m/s^2$)

(1) 1.5 (2) 3.0

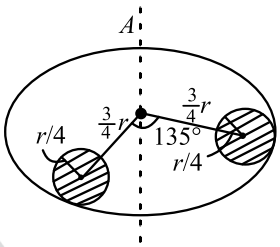
(3) 1.0 (4) 2.0

Integer Type Questions

21. The average energy released per fission for the nucleus of $^{235}_{92}U$ is 190 MeV. When all the atoms of 47 g pure $^{235}_{92}U$ undergo fission process, the energy released is $\alpha \times 10^{23}$ MeV. The value of α is ____. (Avogadro Number $= 6 \times 10^{23}$ per mole)

22. A ball of radius r and density ρ dropped through a viscous liquid of density σ and viscosity η attains its terminal velocity at time t, given by $t = A\rho^a r^b \eta^c \sigma^d$, where A is a constant and a, b, c and d are integers. The value of $\frac{b+c}{a+d}$ is _____.

23. Suppose there is a uniform circular disc of mass M kg and radius r m shown in figure. The shaded regions are cut out from the disc. The moment of inertia of the remainder about the axis A of the disc is given by $\frac{x}{256}Mr^2$. The value of x is _____.



24. The velocity of sound in air is doubled when the temperature is raised from 0°C to α°C. The value of α is _____.

25. The size of the images of an object, formed by a thin lens are equal when the object is placed at two different positions 8 cm and 24 cm from the lens. The focal length of the lens is _____ cm.

SECTION-II (CHEMISTRY)

Single Correct Type Questions

26. Identify the **CORRECT** set of details from the following:

A. $[Co(NH_3)_6]^{3+}$: Inner orbital complex; d^2sp^3 hybridized

B. $[MnCl_6]^{3-}$: Outer orbital complex; sp^3d^2 hybridized

C. $[CoF_6]^{3-}$: Outer orbital complex; d^2sp^3 hybridized

D. $[FeF_6]^{3-}$: Outer orbital complex; sp^3d^2 hybridized

E. $[Ni(CN)_4]^{2-}$: Inner orbital complex; sp^3 hybridized

Choose the correct answer from the given below:

(1) A, B, C, D & E

(2) A, C & E Only

(3) C & D Only

(4) A, B & D Only

27. The oxidation state of chromium in the final product formed in the reaction between KI and acidified $K_2Cr_2O_7$ solution is:

(1) +4 (2) +3

(3) +6 (4) +2

28. Observe the following reactions at T(K).

I. $A \rightarrow$ products .

II. $5Br^-(aq) + BrO_3^-(aq) + 6H^+(aq) \rightarrow 3Br_2(aq) + 3H_2O(l)$

Both the reactions are started at 10.00 am. The rates of these reactions at 10.10 am are same. The value of $-\frac{\Delta[Br^-]}{\Delta t}$ at 10.10 am is 2×10^{-4} mol L^{-1} min^{-1}. The concentration of A at 10.10 am is 10^{-2} mol L^{-1}. What is the first order rate constant (in min^{-1}) of reaction I?

(1) 10^{-2} (2) 2×10^{-3}

(3) 10^{-3} (4) 4×10^{-3}

29. It is noticed that Pb^{2+} is more stable than Pb^{4+} but Sn^{2+} is less stable than Sn^{4+}. Observe the following reactions.

$PbO_2 + Pb \rightarrow 2PbO; \Delta_rG^\circ(1)$

$SnO_2 + Sn \rightarrow 2SnO; \Delta_rG^\circ(2)$

Identify the correct set from the following

(1) $\Delta_rG^\circ(1) > 0; \Delta_rG^\circ(2) < 0$

(2) $\Delta_rG^\circ(1) > 0; \Delta_rG^\circ(2) > 0$

(3) $\Delta_rG^\circ(1) < 0; \Delta_rG^\circ(2) > 0$

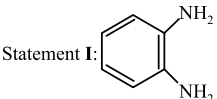
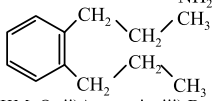
(4) $\Delta_rG^\circ(1) < 0; \Delta_rG^\circ(2) < 0$

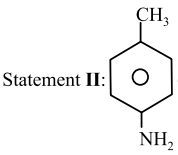
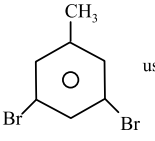
30. Elements X and Y belong to Group 15. The difference between the electronegativity values of 'X' and phosphorus is higher than that of the difference between phosphorus and 'Y'. 'X' & 'Y' are respectively

(1) As & Bi (2) N & As

(3) As & Sb (4) Bi & N

31. Given below are two statements:

Statement **I**:  can be synthesized from  using simpler reagents in the order i) Acidic $KMnO_4$,ii)Ammonia, iii) Bromine and alkali

Statement **II**:  can be converted into  using reagents

in the order

(i) Bromine-H_2O

(ii) $NaNO_2$/HCl (0 –5 °C)

(iii) Aq. H_3PO_2.

n the light of the above statements, choose the *correct* answer from the given below

(1) Both Statement I and Statement II are false

(2) Statement I is false but Statement II is true

(3) Statement I is true but Statement II is false

(4) Both Statement I and Statement II are true

32. Iodoform test can differentiate between

A. Methanol and Ethanol

B. CH_3COOH and CH_3CH_2COOH

C. Cyclohexene and cyclohexanone

D. Diethyl ether and Pentan-3-one

E. Anisole and acetone

Choose the *correct* answer from the given below:

(1) A & D Only (2) A, B & E Only

(3) A & E Only (4) B, C & E Only

33. A student has been given a compound "x" of molecular formula- C_6H_7N . 'x' is sparingly soluble in water. However, on addition of dilute mineral acid, 'x' becomes soluble in water. 'x' when treated with $CHCl_3$ and KOH (alc), 'y' is produced. 'y' has a specific unpleasant smell. On treatment with benzenesulphonyl chloride, 'x' gives a compound 'z' which is soluble in alkali. The number of different "H" atoms present in 'z' is:

(1) 7 (2) 5

(3) 8 (4) 4

34. Which of the following statements are **TRUE** about Haloform reaction?

A. Sodium hypochlorite reacts with KI to give KOI.

B. KOI is a reducing agent.

C. α,β-unsaturated methylketone ($CH_3-CH=CH-\overset{\overset{O}{\|}}{C}-CH_3$) will give iodoform reaction.

D. Isopropyl alcohol will not give iodoform test.

E. Methanoic acid will give positive iodoform test.

Choose the *correct* answer from the given below:

(1) A, C & E Only (2) A & C Only

(3) A, B & C Only (4) B, D & E Only

35. Which statements are **NOT TRUE** about XeO_2F_2 ?

A. It has a see-saw shape.

B. Xe has 5 electron pairs in its valence shell in XeO_2F_2 .

C. The O–Xe–O bond angle is close to 180° .

D. The F–Xe–F bond angle is close to 180° .

E. Xe has 16 valence electrons in XeO_2F_2 .

Choose the *correct* answer from the given below:

(1) A and D Only (2) B, C and E Only

(3) B and D Only (4) B, D and E Only

36. In Carius method 0.2425 g of an organic compound gave 0.5253 g silver chloride. The percentage of chlorine in the organic compound is

(1) 34.79% (2) 37.57%
(3) 53.58% (4) 87.65%

37. Both human DNA and RNA are chiral molecules. The chirality in DNA and RNA arises due to the presence of

(1) Base unit
(2) L–sugar component
(3) Chiral phosphate unit
(4) D–sugar component

38. Given below are two statements:

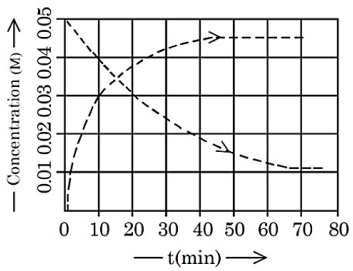
Statement I: $(CH_3)_3\overset{\oplus}{C}$ is more stable than $CH_3\overset{\oplus}{C}$ as nine hyperconjugation interactions are possible in $(CH_3)_3\overset{\oplus}{C}$.

Statement II: $\overset{\oplus}{C}H_3$ is less stable than $(CH_3)_3\overset{\oplus}{C}$ as only three hyperconjugation interactions are possible in $\overset{\oplus}{C}H_3$.

In the light of the above statements, choose the *correct* answer from the given below

(1) Statement I is false but Statement II is true
(2) Both Statement I and Statement II are false
(3) Statement I is true but Statement II is false
(4) Both Statement I and Statement II are true

39.



Given above is the concentration vs time plot for a dissociation reaction: $A \rightarrow nB$. Based on the data of the initial phase of the reaction (initial 10 min), the value of n is _____.

(1) 4 (2) 5
(3) 3 (4) 2

40. The work functions of two metals (M_A and M_B) are in the 1 : 2 ratio. When these metals are exposed to photons of energy 6 eV, the kinetic energy of liberated electrons of $M_A : M_B$ is in the ratio of 2.642 : 1. The work functions (in eV) of M_A and M_B are respectively.

(1) 1.4, 2.8 (2) 1.5, 3.0
(3) 2.3, 4.6 (4) 3.1, 6.2

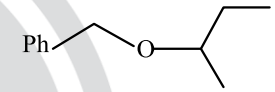
41. Given below are two statements:

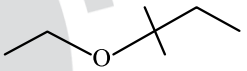
Statement I: The second ionisation enthalpy of Na is larger than the corresponding ionisation enthalpy of Mg.

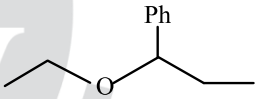
Statement II: The ionic radius of O^{2-} is larger than that of F^-. In the light of the above statements, choose the *correct* answer from the given below

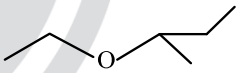
(1) Both Statement I and Statement II are true
(2) Statement I is true but Statement II is false
(3) Both Statement I and Statement II are false
(4) Statement I is false but Statement II is true

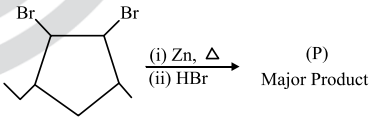
42. A mixed ether (P), when heated with excess of hot concentrated hydrogen iodide produces two different alkyl iodides which when treated with aq. NaOH give compounds (Q) and (R). Both (Q) and (R) give yellow precipitate with NaOI. Identify the mixed ether (P):

(1) 

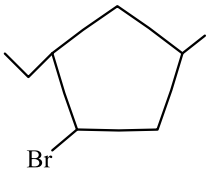
(2) 

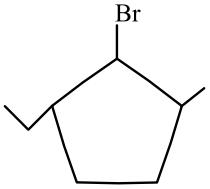
(3) 

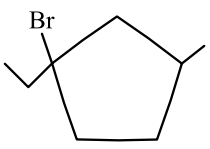
(4) 

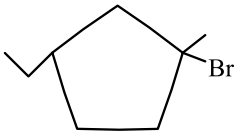
43. 

Identify (P)

(1) 

(2) 

(3) 

(4) 

44. Identify the **INCORRECT** statements from the following:

A. Notation $^{24}_{12}Mg$ represents 24 protons and 12 neutrons.

B. Wavelength of a radiation of frequency $4.5\times10^{15}\ s^{-1}$ is $6.7\times10^{-8}\ m$.

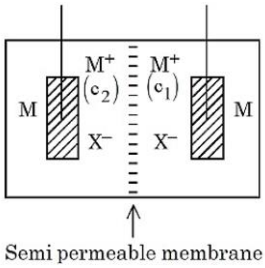
C. One radiation has wavelength $=\lambda_1$ (900 nm) and energy $=E_1$. Other radiation has wavelength $=\lambda_2$ (300 nm) and energy $=E_2$. $E_1:E_2=3:1$.

D. Number of photons of light of wavelength 2000 pm that provides 1 J of energy is 1.006×10^{16}. Choose the *correct* answer from the given below:

(1) A and C Only (2) A and B Only

(3) A and D Only (4) B and C Only

45.



Consider the above electrochemical cell where a metal electrode (M) is undergoing redox reaction by forming M^+ ($M\rightarrow M^+ + e^-$). The cation M^+ is present in two different concentrations c_1 and c_2 as shown above. Which of the following statement is correct for generating a positive cell potential?

(1) If c_1 is present at anode, then $c_1 > c_2$.

(2) If c_1 is present at cathode, then $c_1 > c_2$.

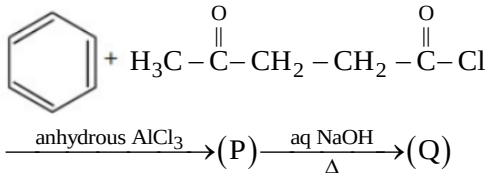
(3) If c_1 is present at anode, then $c_1 = c_2$.

(4) If c_1 is present at cathode, then $c_1 < c_2$.

Integer Type Questions

46. 200 cc of $x\times10^{-3}$ M potassium dichromate is required to oxidise 750 cc of 0.6 M Mohr's salt solution in acidic medium. Here x = _____.

47. Consider the following reaction of benzene.



In compound (Q), the percentage of oxygen is _____ %. (Nearest integer)

48. $X_2(g)+Y_2(g)\rightleftharpoons 2Z(g)$ $X_2(g)$ and $Y_2(g)$ are added to a 1 L flask and it is found that the system attains the above equilibrium at T(K) with the number of moles of $X_2(g)$, $Y_2(g)$ and $Z(g)$ being 3, 3 and 9 mol respectively (equilibrium moles). Under this condition of equilibrium, 10 mol of $Z(g)$ is added to the flask and the temperature is maintained at T(K). Then the number of moles of $Z(g)$ in the flask when the new equilibrium is established is _____. (Nearest integer)

49. Total number of unpaired electrons present in the central metal atoms/ions of $[Ni(CO)_4]$, $[NiCl_4]^{2-}$, $[PtCl_2(NH_3)_2]$, $[Ni(CN)_4]^{2-}$ and $[Pt(CN)_4]^{2-}$ is _____.

50. Two liquids A and B form an ideal solution. At 320 K, the vapour pressure of the solution, containing 3 mol of A and 1 mol of B is 500 mm Hg. At the same temperature, if 1 mol of A is further added to this solution, vapour pressure of the solution increases by 20 mm Hg. Vapour pressure (in mm Hg) of B in pure state is _____. (Nearest integer)

SECTION-III (MATHEMATICS)

Single Correct Type Questions

51. If the points of intersection of the ellipses $x^2+2y^2-6x-12y+23=0$ and $4x^2+2y^2-20x-12y+35=0$ lie on a circle of radius r and centre (a,b), then the value of $ab+18r^2$ is

(1) 52 (2) 53

(3) 55 (4) 51

52. If $f(x)=\begin{cases}\dfrac{a|x|+x^2-2(\sin|x|)(\cos|x|)}{x} & ,x\neq0\\ b & ,x=0\end{cases}$

is continuous at $x=0$, then $a+b$ is equal to

(1) 0

(2) 1

(3) 4

(4) 2

53. Let $A=\{0,1,2,...,9\}$. Let R be a relation on A defined by $(x,y)\in R$ if and only if $|x-y|$ is a multiple of 3. Given below are two statements:

Statement I: $n(R)=36$.

Statement II: R is an equivalence relation.

In the light of the above statements, choose the correct answer from the given below

(1) Both Statement I and Statement II are correct

(2) Statement I is incorrect but Statement II is correct

(3) Statement I is correct but Statement II is incorrect

(4) Both Statement I and Statement II are incorrect

54. Let $\vec{a},\vec{b},\vec{c}$ be three vectors such that $\vec{a}\times\vec{b}=2(\vec{a}\times\vec{c})$. If $|\vec{a}|=1,|\vec{b}|=4,|\vec{c}|=2$, and the angle between $\vec{b}$ and $\vec{c}$ is 60°, then $|\vec{a}\cdot\vec{c}|$ is equal to

(1) 0 (2) 1

(3) 4 (4) 2

55. If the mean and the variance of the data

Class	4–8	8–12	12–16	116–20
Frequency	3	λ	4	7

are μ and 19 respectively, then the value of $\lambda+\mu$ is

(1) 21 (2) 19

(3) 20 (4) 18

56. The system of linear equations $x+y+z=6$ $2x+5y+az=36$ $x+2y+3z=b$ has

(1) infinitely many solutions for $a=8$ and $b=16$

(2) unique solution for $a=8$ and $b=16$

(3) infinitely many solutions for $a=8$ and $b=14$

(4) unique solution for $a=8$ and $b=14$

57. The sum of all the real solutions of the equation $\log_{(x+3)}\left(6x^2+28x+30\right)=5-2\log_{(6x+10)}$ $\left(x^2+6x+9\right)$ is equal to

(1) 1 (2) 2

(3) 0 (4) 4

58. Let $A(1,2)$ and $C(-3,-6)$ be two diagonally opposite vertices of a rhombus, whose sides AD and BC are parallel to the line $7x-y=14$. If B (α,β) and D (γ,δ) are the other two vertices, then $|\alpha+\beta+\gamma+\delta|$ is equal to

(1) 6 (2) 9

(3) 1 (4) 3

59. Let $\vec{a}=\hat{i}-2\hat{j}+3\hat{k}$, $\vec{b}=2\hat{i}+\hat{j}-\hat{k}$, $\vec{c}=\lambda\hat{i}+\hat{j}+\hat{k}$ and $\vec{v}=\vec{a}\times\vec{b}$. If $\vec{v}\cdot\vec{c}=11$ and the length of the projection of $\vec{b}$ on $\vec{c}$ is p, then $9p^2$ is equal to

(1) 12 (2) 6

(3) 9 (4) 4

60 Let $I(x)=\int\frac{3dx}{(4x+6)\left(\sqrt{4x^2+8x+3}\right)}$ and $I(0)=\frac{\sqrt{3}}{4}+20$. If $I\left(\frac{1}{2}\right)=\frac{a\sqrt{2}}{b}+c$, where $a,b,c\in\mathbb{N},\gcd(a,b)=1$, then $a+b+c$ is equal to

(1) 30 (2) 28

(3) 29 (4) 31

61. Consider two sets $A=\left\{x\in\mathbb{Z}:\left|\left(|x-3|-3\right)\right|\le 1\right\}$ and $B=\left\{x\in\mathbb{R}-\{1,2\}:\frac{(x-2)(x-4)}{x-1}\log_e\left(|x-2|\right)=0\right\}$.

Then the number of onto functions $f:A\to B$ is equal to

(1) 62 (2) 32

(3) 81 (4) 79

62. Let PQ be a chord of the hyperbola $\frac{x^2}{4}-\frac{y^2}{b^2}=1$, perpendicular to the x-axis such that OPQ is an equilateral triangle, O being the centre of the hyperbola. If the eccentricity of the hyperbola is $\sqrt{3}$, then the area of the triangle OPQ is

(1) $\frac{11}{5}$ (2) $2\sqrt{3}$

(3) $\frac{9}{5}$ (4) $\frac{8\sqrt{3}}{5}$

63. The least value of $\left(\cos^2\theta-6\sin\theta\cos\theta+3\sin^2\theta+2\right)$ is

(1) $4-\sqrt{10}$ (2) $4+\sqrt{10}$

(3) 1 (4) –1

64. Let $\sum_{k=1}^{n} a_k = \alpha n^2 + \beta n$. If $a_{10} = 59$ and $a_6 = 7a_1$, then $\alpha + \beta$ is equal to

(1) 5 (2) 3
(3) 12 (4) 7

65. An equilateral triangle *OAB* is inscribed in the parabola $y^2 = 4x$ with the vertex *O* at the vertex of the parabola. Then the minimum distance of the circle having AB as a diameter from the origin is

(1) $2\left(3+\sqrt{3}\right)$ (2) $4\left(3-\sqrt{3}\right)$
(3) $4\left(6+\sqrt{3}\right)$ (4) $2\left(8-3\sqrt{3}\right)$

66. Bag *A* contains 9 white and 8 black balls, while bag *B* contains 6 white and 4 black balls. One ball is randomly picked up from the bag B and mixed up with the balls in the bag A. Then a ball is randomly drawn from the bag A. If the probability, that the ball drawn is white, is $\frac{p}{q}$, $\gcd(p,q)=1$, then $p + q$ is equal to

(1) 21 (2) 22
(3) 23 (4) 24

67. Let $\frac{\pi}{2} < \theta < \pi$ and $\cot\theta = -\frac{1}{2\sqrt{2}}$. Then the value of $\sin\left(\frac{15\theta}{2}\right)(\cos 8\theta + \sin 8\theta) + \cos\left(\frac{15\theta}{2}\right)(\cos 8\theta - \sin 8\theta)$ is equal to

(1) $\frac{\sqrt{2}-1}{\sqrt{3}}$ (2) $\frac{1-\sqrt{2}}{\sqrt{3}}$
(3) $-\frac{\sqrt{2}}{\sqrt{3}}$ (4) $\frac{\sqrt{2}}{\sqrt{3}}$

68. The area of the region enclosed between the circles $x^2 + y^2 = 4$ and $x^2 + (y-2)^2 = 4$ is:

(1) $\frac{2}{3}\left(4\pi - 3\sqrt{3}\right)$ (2) $\frac{4}{3}\left(2\pi - \sqrt{3}\right)$
(3) $\frac{2}{3}\left(2\pi - 3\sqrt{3}\right)$ (4) $\frac{4}{3}\left(2\pi - 3\sqrt{3}\right)$

69. If $z = \frac{\sqrt{3}}{2} + \frac{i}{2}, i = \sqrt{-1}$, then $(z^{201} - i)^8$ is equal to

(1) 1 (2) –1
(3) 0 (4) 256

70. The number of ways, in which 16 oranges can be distributed to four children such that each child gets at least one orange, is

(1) 403 (2) 384
(3) 455 (4) 429

Integer Type Questions

71. If the image of the point $P(a,2,a)$ in the line $\frac{x}{2} = \frac{y+a}{1} = \frac{z}{1}$ is *Q* and the image of *Q* in the line $\frac{x-2b}{2} = \frac{y-a}{1} = \frac{z+2b}{-5}$ is *P*, then $a + b$ is equal to _____.

72. Let $A = \begin{bmatrix} 0 & 2 & -3 \\ -2 & 0 & 1 \\ 3 & -1 & 0 \end{bmatrix}$ and *B* be a matrix such that $B(I - A) = I + A$. Then the sum of the diagonal elements of $B^T B$ is equal to _____.

73. Let S denote the set of 4-digit numbers *abcd* such that $a > b > c > d$ and *P* denote the set of 5-digit numbers having product of its digits equal to 20. Then $n(S) + n(P)$ is equal to _____.

74 The number of elements in the set $S = \left\{x : x \in [0,100] \text{ and } \int_0^x t^2 \sin(x-t)\,dt = x^2\right\}$ is _____.

75 If the solution curve $y = f(x)$ of the differential equation $(x^2 - 4)y' - 2xy + 2x(4 - x^2)^2 = 0, x > 2,$ passes through the point (3,15), then the local maximum value of *f* is _____.

PHYSICS WALLAH

JEE MAIN 2026

SESSION-01

Date: 24-01-2026

Shift-01

SECTION-I (PHYSICS)

Single Correct Type Questions

1. A cylindrical block of mass M and area of cross section A is floating in a liquid of density ρ and with its axis vertical. When depressed a little and released the block starts oscillating. The period of oscillation is

(1) $2\pi\sqrt{\frac{\rho A}{Mg}}$ (2) $\pi\sqrt{\frac{2M}{\rho Ag}}$

(3) $\pi\sqrt{\frac{\rho A}{Mg}}$ (4) $2\pi\sqrt{\frac{M}{\rho Ag}}$

2. Match the Column-I with Column-II

Column-I		Column-II	
A	Radio-wave	I	is produced by Magnetron valve
B	Micro-wave	II	due to change in the vibrational modes of atoms
C	Infrared-wave	III	due to inner shell electrons moving from higher energy level to lower energy level
D	X-ray	IV	due to rapid acceleration of electrons

Choose the correct answer from the options given below:

(1) A-IV, B-I, C-II, D-III
(2) A-IV, B-II, C-I, D-III
(3) A-IV, B-III, C-I, D-II
(4) A-II, B-IV, C-III, D-I

3. The electrostatic potential in a charged spherical region of radius r varies as $V = ar^3 + b$, where a and b are constants. The total charge in the sphere of unit radius is $\alpha \times \pi a \in_0$. The value of α is (permittivity of vacuum is $\in_0$)

(1) – 8 (2) –9
(3) –12 (4) –6

4. An unpolarised light is incident at an interface of two dielectric media having refractive indices of 2 (incident medium) and $2\sqrt{3}$ (medium) respectively. To satisfy the condition that reflected and refracted rays are perpendicular to each other, the angle of incidence is

(1) 60° (2) 30°
(3) 10° (4) 45°

5. A boy throws a ball into air at 45° from the horizontal to land it on a roof of a building of height H. If the ball attains maximum height in 2 s and lands on the building in 3 s after launch, then value of H is _____ m. (g = 10 m/s²)

(1) 10 (2) 20
(3) 15 (4) 25

6. Three charges + $2q$, +$3q$ and –$4q$ are situated at (0, –$3a$), ($2a$, 0) and (–$2a$, 0) respectively in the x y plane. The resultant dipole moment about origin is

(1) $2qa\left(3\hat{j}-\hat{i}\right)$ (2) $2qa\left(7\hat{i}-3\hat{j}\right)$

(3) $2qa\left(3\hat{i}-7\hat{j}\right)$ (4) $2qa\left(3\hat{j}-7\hat{i}\right)$

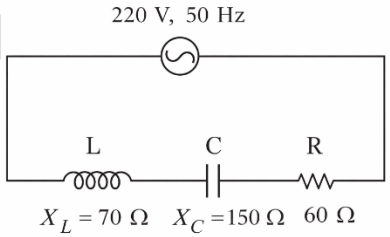
7. Two electrons are moving in orbits of two hydrogen like atoms with speeds 3×10^5 m/s and 2.5×10^5 m/s respectively. If the radii of these orbits are nearly same then the possible order of energy states are _____ respectively.

(1) 9 and 8 (2) 8 and 10
(3) 6 and 5 (4) 10 and 12

8. Two resistors of 100 Ω each are connected in series with a 9 V battery. A voltmeter of 400 Ω resistance is connected to measure the voltage drop across one of the resistors. The voltmeter reading is _____ V.

(1) 2 (2) 4
(3) 4.5 (4) 3

9. For the series LCR circuit connected with 220 V, 50 Hz a.c source as shown in the figure, the power factor is $\frac{\alpha}{10}$. The value of α is



(1) 6 (2) 4
(3) 8 (4) 10

10. A spring of force constant 15 N/m is cut into two pieces. If the ratio of their length is 1:3, then the force constant of smaller piece is _____ N/m.

(1) 45
(2) 60
(3) 20
(4) 15

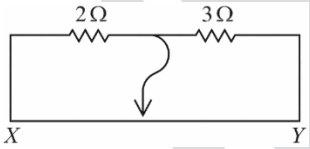
11. Density of water at 4 °C and 20 °C are 1000 kg/m³ and 998 kg/m³ respectively. The increase in internal energy of 4 kg of water when it is heated from 4 °C to 20 °C is _____ J. (specific heat capacity of water = 4.2 J/kg. and 1 atmospheric pressure = 10^5 Pa)

(1) 315826.2 (2) 268799.2
(3) 234699.2 (4) 258700.8

12. Given below are two statements:
Statement I: For all elements, greater the mass of the nucleus, greater is the binding energy per nucleon.
Statement II: For all elements, nuclei with less binding energy per nucleon transforms to nuclei with greater binding energy per nucleon. In the light of the above statements, choose the correct answer from the options given below

(1) Statement I is false but Statement II is true
(2) Both Statement I and Statement II are true
(3) Both Statement I and Statement II are false
(4) Statement I is true but Statement II is false

13. Two resistors 2 Ω and 3Ω are connected in the gaps of bridge as shown in figure. The null point is obtained with the contact of jockey at some point on wire *XY*. When an unknown resistor is connected in parallel with 3Ω resistor, the null point is shifted by 22.5 cm toward Y. The resistance of unknown resistor is _____ Ω.



(1) 2 (2) 1
(3) 3 (4) 4

14. Two masses 400 g and 350 g are suspended from the ends of a light string passing over a heavy pulley of radius 2 cm. When released from rest the heavier mass is observed to fall 81 cm in 9 s. The rotational inertia of the pulley is _____ kg.m². (g = 9.8 m/s²)

(1) 1.86×10^{-2} (2) 9.5×10^{-3}
(3) 8.3×10^{-3} (4) 4.75×10^{-3}

15. In a microscope of tube length 10 cm two convex lenses are arranged with focal length of 2 cm and 5 cm. Total magnification obtained with this system for normal adjustment is $(5)^k$. The value of k is

(1) 4 (2) 3.5
(3) 2 (4) 5

16. There are three co-centric conducting spherical shells *A*, *B* and *C* of radii *a*, *b* and *c* respectively ($c > b > a$) and they are charged with charge , q_1, q_2 and q_3 respectively. The potentials of the spheres *A*, *B* and *C* respectively, are:

(1) $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{a}\right)$, $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2}{b}+\frac{q_3}{c}\right)$, $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1}{a}+\frac{q_2}{b}+\frac{q_3}{c}\right)$

(2) $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1}{a}+\frac{q_2}{b}+\frac{q_3}{c}\right)$, $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2}{b}+\frac{q_3}{c}\right)$, $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{c}\right)$

(3) $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{a}\right)$, $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{b}\right)$, $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{c}\right)$

(4) $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1}{a}+\frac{q_2}{b}+\frac{q_3}{c}\right)$, $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{b}\right)$, $\frac{1}{4\pi\epsilon_0}\left(\frac{q_1+q_2+q_3}{c}\right)$

17. The exit surface of a prism with refractive index *n* is coated with a material having refractive index $\frac{n}{2}$. When this prism is set for minimum angle of deviation, it exactly meets the condition of critical angle. The prism angle is

(1) 45° (2) 30°
(3) 15° (4) 60°

18. Match the Column-I with Column-II

Column-I		**Column-II**	
A	Magnetic induction	I	$M\,L\,T^{-2}A^{-2}$
B	Magnetic flux	II	$M\,L^2\,T^{-2}A^{-2}$
C	Magnetic permeability	III	$M\,L^0\,T^{-2}A^{-1}$
D	Self inductance	IV	$M\,L^2\,T^{-2}A^{-1}$

Choose the correct answer from the options given below:

(1) A-III, B-IV, C-II, D-I
(2) A-IV, B-III, C-I, D-II
(3) A-III, B-IV, C-I, D-II
(4) A-I, B-III, C-IV, D-II

19. Three masses 200 kg, 300 kg and 400 kg are placed at the vertices of an equilateral triangle with sides 20 m. They are rearranged on the vertices of a bigger triangle of side 25 m and with the same centre. The work done in this process _____ J.
(Gravitational constant $G = 6.7\times10^{-11}\ \mathrm{N\,m^2/kg^2}$)

(1) 4.77×10^{-7} (2) 2.85×10^{-7}
(3) 9.86×10^{-6} (4) 1.74×10^{-7}

20. A brass wire of length 2 m and radius 1 mm at 27°C is held taut between two rigid supports. Initially it was cooled to a temperature of –43 °C creating a tension T in the wire. The temperature to which the wire has to be cooled in order to increase the tension in it to 1.4T, is _____ °C.

(1) –71 (2) –80

(3) –65 (4) –86

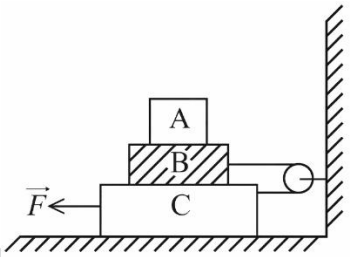
Integer Type Questions

21. A short bar magnet placed with its axis at 30° with an external field of 800 Gauss, experiences a torque of 0.016 N.m. The work done in moving it from most stable to most unstable position is $\alpha \times 10^{-3}$ J. The value of α is

22. A gas of certain mass filled in a closed cylinder at a pressure of 3.23 kPa has temperature 50 °C. The gas is now heated to double its temperature. The modified pressure is _____ Pa.

23. Sixty four rain drops of radius 1 mm each falling down with a terminal velocity of 10 cm/s coalesce to form a bigger drop. The terminal velocity of bigger drop is _____ cm/s.

24. In the given figure the blocks A, B and C weigh 4 kg, 6 kg and 8 kg respectively. The co-efficient of sliding friction between any two surfaces is 0.5. The force F required to slide the block C with constant speed is _____ N. (Use g = 10 m/s²)



25. A voltage regulating circuit consisting of Zener diode, having break-down voltage of 10 V and maximum power dissipation of 0.4 W, is operated at 15 V. The approximate value of protective resistance in this circuit is _____ Ω.

SECTION-II (CHEMISTRY)

Single Correct Type Questions

26. Given below are two statements:

Statement I: K > Mg > Al > B is the correct order in terms of metallic character.

Statement II: Atomic radius is always greater than the ionic radius for any element.

In the light of the above statements, choose the correct answer from the options given below

(1) Both Statement I and Statement II are true

(2) Statement I is true but Statement II is false

(3) Statement I is false but Statement II is true

(4) Both Statement I and Statement II are false

27. Given below are two statements:

Statement I: The number of paramagnetic species among $[CoF_6]^{3-}$, $[TiF_6]^{3-}$, V_2O_5 and $[Fe(CN)_6]^{3-}$ is 3.

Statement II: $K_4[Fe(CN)_6] < K_3[Fe(CN)_6] < [Fe(H_2O)_6]\ SO_4.H_2O < [Fe(H_2O)_6]Cl_3$ is the correct order in terms of number of unpaired electron(s) present in the complexes.

In the light of the above statements, choose the correct answer from the options given below

(1) Both Statement I and Statement II are false

(2) Both Statement I and Statement II are true

(3) Statement I is true but Statement II is false

(4) Statement I is false but Statement II is true

28. Consider three metal chlorides x, y and z, where x is water soluble at room temperature, y is sparingly soluble in water at room temperature and z is soluble in hot water. x, y and z are respectively

(1) AgCl, Hg_2Cl_2 and $PbCl_2$

(2) $AlCl_3$, $PbCl_2$ and $BaCl_2$

(3) $MgCl_2$, AgCl and $AlCl_3$

(4) $CuCl_2$, AgCl and $PbCl_2$

29. Consider a mixture 'X' which is made by dissolving 0.4 mol of $[Co(NH_3)_5SO_4]Br$ and 0.4 mol of $[Co(NH_3)_5Br]\ SO_4$ in water to make 4 L of solution. When 2 L of mixture 'X' is allowed to react with excess of $AgNO_3$, it forms precipitate 'Y'. The rest 2 L of mixture 'X' reacts with excess $BaCl_2$ to form precipitate 'Z'. Which of the following statements is CORRECT?

(1) 0.2 mol of 'Z' is formed.

(2) 0.4 mol of 'Z' is formed.

(3) 'Y' is $BaSO_4$ and 'Z' is AgBr.

(4) 0.1 mol of 'Y' is formed.

30. 'W' g of a non-volatile electrolyte solid solute of molar mass 'M' g mol^{-1} when dissolved in 100 mL water, decreases vapour pressure of water from 640 mm Hg to 600 mmHg. If aqueous solution of the electrolyte boils at 375 K and K_b for water is 0.52 K kg mol^{-1}, then the mole fraction of the electrolyte solute (x_2) in the solution can be expressed as. (Given: density of water = 1 g/mL and boiling point of water = 373 K)

(1) $\frac{2.6}{16}\times\frac{M}{W}$ (2) $\frac{1.3}{8}\times\frac{W}{M}$

(3) $\frac{16}{2.6}\times\frac{W}{M}$ (4) $\frac{1.3}{8}\times\frac{M}{W}$

31. Arrange the following carbanions in the decreasing order of stability.

I. $p-Br-C_6H_4-\overset{\ominus}{\underset{\cdot\cdot}{C}}H_2$

II. $C_6H_5-\overset{\ominus}{\underset{\cdot\cdot}{C}}H_2$

III. $p-CH_3O-C_6H_4-\overset{\ominus}{\underset{\cdot\cdot}{C}}H_2$

IV. $p-CHO-C_6H_4-\overset{\ominus}{\underset{\cdot\cdot}{C}}H_2$

V. $p-CH_3-C_6H_4-\overset{\ominus}{\underset{\cdot\cdot}{C}}H_2$

Choose the correct answer from the options given below:

(1) IV >I>II>V> III

(2) I>IV> II > V > III

(3) I > II > IV > V > III

(4) IV > II>I>III>V

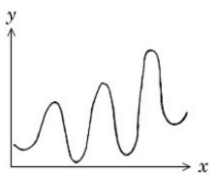
32. A $\rightarrow$ D is an endothermic reaction occurring in three steps (elementary).

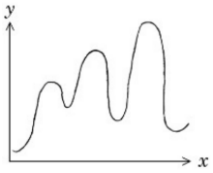
(i) A $\rightarrow$ B ΔH_i = +ve

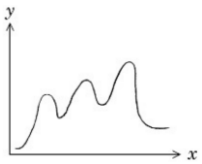
(ii) B $\rightarrow$C ΔH_{ii} = -ve

(iii) C $\rightarrow$D ΔH_{iii} = -ve

Which of the following graphs between potential energy (y-axis) vs reaction coordinate (x-axis) correctly represents the reaction profile of A $\rightarrow$D?

(1) 

(2) 

(3) 

(4) 

33. Among the following, the CORRECT combinations are

A. $IF_3 \rightarrow$T-shaped (sp^3d)

B. $IF_5 \rightarrow$Square pyramidal (sp^3d^2)

C. $IF_7 \rightarrow$ Pentagonal bipyramidal (sp^3d^3)

D. $ClO_4^- \rightarrow$ Square planar (sp^2d)

Choose the correct answer from the options given below:

(1) B, C and D Only

(2) A, B and C Only

(3) A and B Only

(4) A, B, C and D

34. At 27 °C in presence of a catalyst, activation energy of a reaction is lowered by 10 kJ mol^{-1}. The logarithm of ratio of $\frac{k_{(catalysed)}}{k_{(uncatalysed)}}$ is....

(Consider that the frequency factor for both the reactions is same)

(1) 1.741 (2) 17.41

(3) 0.1741 (4) 3.482

35. Match the Column-I with Column-II

Column-I Isothermal process for ideal gas system		**Column-II Work done** $(V_f > V_i)$	
A	Reversible expansion	I	$w = 0$
B	Free expansion	II	$w = -nRT\ln\frac{V_f}{V_i}$
C	Irreversible expansion	III	$w = -p_{ex}(V_f - V_i)$
D	Irreversible compression	IV	$w = -p_{ex}(V_i - V_f)$

Choose the correct answer from the options given below:

(1) A-II, B-I, C-III, D-IV

(2) A-I, B-III, C-II, D-IV

(3) A-IV, B-II, C-III, D-I

(4) A-IV, B-I, C-III, D-II

36. Given below are statements about some molecules/ions. Identify the CORRECT statements.

A. The dipole moment value of NF_3 is higher than that of NH_3.

B. The dipole moment value of BeH_2 is zero.

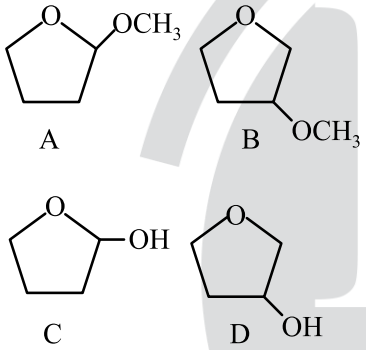
C. The bond order of O_2^{2-} and F_2 is same.

D. The formal charge on the central oxygen atom of ozone is -1.

E. In NO_2, all the three atoms satisfy the octet rule, hence it is very stable. Choose the correct answer from the options given below:

(1) B & C Only (2) A, C & D Only
(3) A, B, C, D & E (4) B, C & D Only

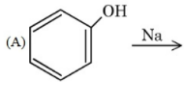
37. A student is given one compound among the following compounds that gives positive test with Tollen's reagent.



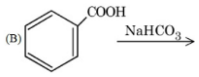
The compound is :

(1) C (2) A
(3) B (4) D

38. Consider the following two reactions A and B.



Main Product + gas (x)



Main Product + gas (y)

Numerical value of [molar mass of x + molar mass of y] is

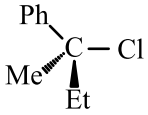
(1) 88 (2) 46
(3) 160 (4) 4

39. A solution is prepared by dissolving 0.3 g of a non-volatile non-electrolyte solute 'A' of molar mass 60 g mol^{-1} and 0.9 g of a non-volatile non-electrolyte solute 'B' of molar mass 180 g mol^{-1} in 100 mL H_2O at 27°C. Osmotic pressure of the solution will be _____. [Given: R = 0.082 L atm K^{-1} mol^{-1}]

(1) 1.47 atm (2) 1.23 atm
(3) 0.82 atm (4) 2.46 atm

40. Given below are two statements:

Statement I: 'C – Cl' bond is stronger in $CH_2 = CH - Cl$ than $CH_3 - CH_2 - Cl$

Statement II: The given optically active molecule,  on hydrolysis gives a solution that can rotate the plane polarized light.

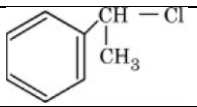
In the light of the above statements, choose the correct answer from the options given below

(1) Both Statement I and Statement II are true
(2) Statement I is false but Statement II is true
(3) Both Statement I and Statement II are false
(4) Statement I is true but Statement II is false

41. A hydroxy compound (X) with molar mass 122 g mol^{-1} is acetylated with acetic anhydride, using a large excess of the reagent ensuring complete acetylation of all hydroxyl groups. The product obtained has a molar mass of 290 g mol^{-1}. The number of hydroxyl groups present in compound (X) is:

(1) 2 (2) 5
(3) 3 (4) 4

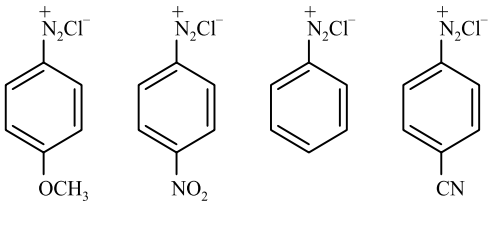
42. Match the Column-I with Column-II

Column-I Chloro derivative		Column-II Example	
A	Vinyl Chloride	I	$CH_2 = CH - CH_2Cl$
B	Benzyl Chloride	II	$CH_3 - CH(Cl)CH_3$
C	Alkyl Chloride	III	$CH_2 = CHCl$
D	Allyl Chloride	IV	

Choose the correct answer from the options given below:

(1) A-III, B-IV, C-II, D-I
(2) A-IV, B-I, C-III, D-II
(3) A-III, B-IV, C-I, D-II
(4) A-I, B-II, C-IV, D-III

43. The correct stability order of the following diazonium salts is

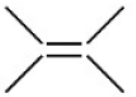
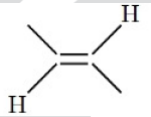


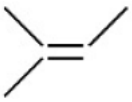
(A) (B) (C) (D)

(1) C>D>B>A (2) C>A>D>B
(3) A>B>C>D (4) A>C>D>B

44. Given below are two statements:
Statement I: Hybridisation, shape and spin only magnetic moment of $K_3[Co(CO_3)_3]$ is sp^3d^2, octahedral and 4.9 BM respectively.
Statement II: Geometry, hybridisation and spin only magnetic moment values (BM) of the ions $[Ni(CN)_4]^{2-}$, $[MnBr_4]^{2-}$ and $[CoF_6]^{3-}$ respectively are square planar, tetrahedral, octahedral; dsp^2, sp^3, sp^3d^2 and 0, 5.9, 4.9.
In the light of the above statements, choose the correct answer from the options given below
(1) Both Statement I and Statement II are true
(2) Statement I is false but Statement II is true
(3) Both Statement I and Statement II are false
(4) Statement I is true but Statement II is false

45. Arrange the following alkenes in decreasing order of stability.

(I)  (II) 

(III)  (IV) 

Choose the correct answer from the options given below:
(1) I > III > IV > II (2) I > III > II > IV
(3) III > II > I > IV (4) III > I > II > IV

Integer Type Questions

46. X and Y are the number of electrons involved, respectively during the oxidation of I^- to I_2 and S^{2-} to S by acidified $K_2Cr_2O_7$. The value of X + Y is

47. The hydrogen spectrum consists of several spectral lines in Lyman series (L_1, L_2, L_3...; L_1 has lowest energy among Lyman series). Similarly it consists of several spectral lines in Balmer series (B_1, B_2, B_3 ...; B_1 has lowest energy among Balmer lines). The energy of L_1 is x times the energy of B_1. The value of x is _____ $\times 10^{-1}$ (Nearest integer)

48. In Dumas method for estimation of nitrogen, 0.50 g of an organic compound gave 70 mL of nitrogen collected at 300 K and 715 mm pressure. The percentage of nitrogen in the organic compound is _____ %. (Aqueous tension at 300 K is 15 mm).

49. Consider two Group IV metal ions X^{2+} and Y^{2+}. A solution containing 0.01 M X^{2+} and 0.01 M Y^{2+} is saturated with H_2S. The pH at which the metal sulphide YS will form as a precipitate is _____ (Nearest integer) (Given: K_{sp} (XS) = 1×10^{-22} at 25°C, K_{sp} (YS) = 4×10^{-16} at 25°C, [H_2S] = 0.1M in solution, $K_{a1} \times K_{a2}$ (H_2S) = 1.0×10^{-21}, log 2 = 0.30, log 3 = 0.48, log 5 = 0.70)

50. Electricity is passed through an acidic solution of Cu^{2+} till all the Cu^{2+} was exhausted, leading to the deposition of 300 mg of Cu metal. However, a current of 600 mA was continued to pass through the same solution for another 28 minutes by keeping the total volume of the solution fixed at 200 mL. The total volume of oxygen evolved at STP during the entire process is _____ mL. (Nearest integer) [Given: Cu^{2+} (aq) + $2e^- \rightarrow$ Cu(s) E°_{red} = +0.34V, $O_2(g) + 4H^+ + 4e^- \rightarrow 2H_2O$ E°_{red} = +1.23 V, Molar mass of Cu = 63.54 g mol^{-1}, Molar mass of O_2 = 32 g mol^{-1}, Faraday Constant = 96500 C mol^{-1}, Molar volume at STP = 22.4 L]

SECTION-III (MATHEMATICS)

Single Correct Type Questions

51. From a lot containing 10 defective and 90 non-defective bulbs, 8 bulbs are selected one by one with replacement. Then the probability of getting at least 7 defective bulbs is

(1) $\frac{67}{10^8}$ (2) $\frac{81}{10^8}$

(3) $\frac{7}{10^7}$ (4) $\frac{73}{10^8}$

52. The number of the real solutions of the equation: $x|x+3|+|x-1|-2=0$ is

(1) 5 (2) 2
(3) 4 (4) 3

53. let 729, 81, 9, 1, …. be a sequence and P_n denote the product of the first *n* terms of this sequence.

If $2\sum_{n=1}^{40}(P_n)^{\frac{1}{n}} = \frac{3^\alpha - 1}{3^\beta}$ and *gcd* (α, β) =1, then α + β is equal to

(1) 76 (2) 74
(3) 73 (4) 75

54. The mean and variance of a data of 10 observations are 10 and 2, respectively. If an observations α in this data is replaced by β, then the means and variance becomes 10.1 and 1.99, respectively. Then α + β equals

(1) 10 (2) 15
(3) 20 (4) 5

55. Let α, β ∈ *R* be such that function $f(x)=\begin{cases}2\alpha\left(x^2-2\right)+2\beta x & ,x<1\\ (\alpha+3)x+(\alpha-\beta) & ,x\geq 1\end{cases}$ be differentiable at all $x \in R$. Then 34 (α+ β) is equal to

(1) 84 (2) 48
(3) 36 (4) 24

56. Let $\vec{a}=2\hat{i}+\hat{j}-2\hat{k}, \vec{b}=\hat{i}+\hat{j}$ and $\vec{c}=\vec{a}\times\vec{b}$. Let $\vec{d}$ be a vector such that $\left|\vec{d}-\vec{a}\right|=\sqrt{11}, \left|\vec{c}\times\vec{d}\right|=3$ and the angle between $\vec{c}$ and $\vec{d}$ is $\frac{\pi}{4}$. Then $\vec{a}\cdot\vec{d}$ is equal to

(1) 0 (2) 11
(3) 1 (4) 3

57. Let $f(t)=\int\left(\frac{1-\sin\left(\log_e t\right)}{1-\cos\left(\log_e t\right)}\right)dt, t>1.$ If $f\left(e^{\pi/2}\right)=-e^{\pi/2}$ and $f\left(e^{\pi/4}\right)=\alpha e^{\pi/4}$, then α equals

(1) $-1-2\sqrt{2}$ (2) $1+\sqrt{2}$
(3) $-1+\sqrt{2}$ (4) $-1-\sqrt{2}$

58. If $\cot x=\frac{5}{12}$ for some $x\in\left(\pi,\frac{3\pi}{2}\right)$, then

$\sin 7x\left(\cos\frac{13x}{2}+\sin\frac{13x}{2}\right)+$

$\cos 7x\left(\cos\frac{13x}{2}-\sin\frac{13x}{2}\right)$ is equal to

(1) $\frac{5}{\sqrt{13}}$ (2) $\frac{4}{\sqrt{26}}$
(3) $\frac{1}{\sqrt{13}}$ (4) $\frac{6}{\sqrt{26}}$

59. Let $S=\frac{1}{25!}+\frac{1}{3!23!}+\frac{1}{5!21!}+\ldots$ up to 13 terms. If $13S=\frac{2^k}{n!}, k\in\mathbb{N}$, then *n* + *k* is equal to

(1) 52 (2) 49
(3) 51 (4) 50

60. Let $A(1,0), B(2,-1)$ and $C\left(\frac{7}{3},\frac{4}{3}\right)$ be three points. If the equation of the bisector of the angle *ABC* is $\alpha x + \beta y = 5$, then the value of $\alpha^2+\beta^2$ is

(1) 8 (2) 5
(3) 10 (4) 13

61. Let the lines

$L_1: \vec{r}=\hat{i}+2\hat{j}+3\hat{k}+\lambda\left(2\hat{i}+3\hat{j}+4\hat{k}\right), \lambda\in\mathbb{R}$ and

$L_2: \vec{r}=\left(4\hat{i}+\hat{j}\right)+\mu\left(5\hat{i}+2\hat{j}+\hat{k}\right), \mu\in\mathbb{R}$,

intersect at the point *R*. Let *P* and *Q* be the points lying on lines L_1 and L_2, respectively, such that $\left|\overrightarrow{PR}\right|=\sqrt{29}$ and $\left|\overrightarrow{PQ}\right|=\sqrt{\frac{47}{3}}$. If the point *P* lies in the first octant, then $27(QR)^2$ is equal to

(1) 360 (2) 348
(3) 340 (4) 320

62. Let *R* be a relation defined on the set $\{1,2,3,4\}\times\{1,2,3,4\}$ by $R=\left\{\left((a,b),(c,d)\right): 2a+3b=3c+4d\right\}$. Then the number of elements in *R* is

(1) 18 (2) 15
(3) 6 (4) 12

63. Let a circle of radius 4 pass through the origin *O*, the points $A\left(-\sqrt{3}a,0\right)$ and $B\left(0,-\sqrt{2}b\right)$, where *a* and *b* are real parameters and $ab\neq 0$. Then the locus of the centroid of Δ*OAB* is a circle of radius

(1) $\frac{8}{3}$ (2) $\frac{5}{3}$
(3) $\frac{11}{3}$ (4) $\frac{7}{3}$

64. Let each of the two ellipses

$E_1: \frac{x^2}{a^2}+\frac{y^2}{b^2}=1, (a>b)$ and

$E_2: \frac{x^2}{A^2}+\frac{y^2}{B^2}=1, (A<B)$ have eccentricity $\frac{4}{5}$. Let the lengths of the latus recta of E_1 and E_2 be l_1 and l_2, respectively, such that $2l_1^2=9l_2$. If the distance between the foci of E_1 is 8, then the distance between the foci of E_2 is

(1) $\frac{8}{5}$ (2) $\frac{96}{5}$
(3) $\frac{32}{5}$ (4) $\frac{16}{5}$

65. Consider an A.P.: $a_1, a_2, \ldots, a_n; a_1 > 0$. If $a_2 - a_1 = \frac{-3}{4}, a_n = \frac{1}{4}a_1$, and $\sum_{i=1}^{n} a_i = \frac{525}{2}$, then $\sum_{i=1}^{17} a_i$ is equal to

(1) 952 (2) 476
(3) 238 (4) 136

66. If the function
$f(x) = \frac{e^x\left(e^{\tan x - x} - 1\right) + \log_e(\sec x + \tan x) - x}{\tan x - x}$ is continuous at $x = 0$, then the value of $f(0)$ is equal to

(1) 2 (2) $\frac{3}{2}$
(3) $\frac{1}{2}$ (4) $\frac{2}{3}$

67. Let $S = \{z \in \mathbb{C} : \left|\frac{z-6i}{z-2i}\right| = 1$ and $\left|\frac{z-8+2i}{z+2i}\right| = \frac{3}{5}\}$.
Then $\sum_{z \in S} |z|^2$ is equal to

(1) 398 (2) 413
(3) 385 (4) 423

68. The value of $\frac{\sqrt{3}\,\text{cosec}\,20^\circ - \sec 20^\circ}{\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ}$ is equal to

(1) 64 (2) 32
(3) 16 (4) 12

69. If the domain of the function
$f(x) = \log_{\left(10x^2 - 17x + 7\right)}\left(18x^2 - 11x + 1\right)$ is
$(-\infty, a) \cup (b, c) \cup (d, \infty) - \{e\}$, then
$90(a + b + c + d + e)$ equals:

(1) 316 (2) 307
(3) 177 (4) 170

70. Let A_1 be the bounded area enclosed by the curves $y = x^2 + 2, x + y = 8$ and y-axis that lies in the first quadrant. Let A_2 be the bounded area enclosed by the curves $y = x^2 + 2, y^2 = x, x = 2$, and y-axis that lies in the first quadrant. Then $A_1 - A_2$ is equal to

(1) $\frac{2}{3}\left(3\sqrt{2} + 1\right)$ (2) $\frac{2}{3}\left(\sqrt{2} + 1\right)$
(3) $\frac{2}{3}\left(2\sqrt{2} + 1\right)$ (4) $\frac{2}{3}\left(4\sqrt{2} + 1\right)$

Integer Type Questions

71. The number of 3×2 matrices A, which can be formed using the elements of the set $\{-2, -1, 0, 1, 2\}$ such that the sum of all the diagonal elements of A^TA is 5, is ____

72. Let $(2\alpha, \alpha)$ be the largest interval in which the function $f(t) = \frac{|t+1|}{t^2}, t < 0$, is strictly decreasing. Then the local maximum value of the function
$g(x) = 2\log_e(x-2) + \alpha x^2 + 4x - \alpha, x > 2$, is ____

73. Let a differentiable function f satisfy the equation $\int_0^{36} f\left(\frac{tx}{36}\right) dt = 4\alpha f(x)$. If $y = f(x)$ is a standard parabola passing through the points $(2,1)$ and $(-4, \beta)$, then β^α is equal to ____ .

74. The number of numbers greater than 5000, less than 9000 and divisible by 3 , that can be formed using the digits $0, 1, 2, 5, 9$, if the repetition of the digits is allowed, is ____

75. Let a line L passing through the point P (1,1,1) be perpendicular to the lines $\frac{x-4}{4} = \frac{y-1}{1} = \frac{z-1}{1}$ and $\frac{x-17}{1} = \frac{y-71}{1} = \frac{z}{0}$. Let the line L intersect the $yz-$ plane at the point Q. Another line parallel to L and passing through the point $S(1,0,-1)$ intersects the yz-plane at the point R. Then the square of the area of the parallelogram $PQRS$ is equal to ____.

PHYSICS WALLAH

JEE MAIN 2026

SESSION-01

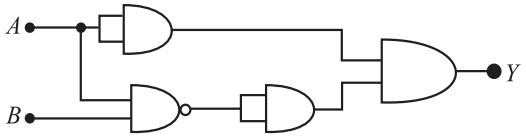
Date: 24-01-2026

Shift-02

SECTION-I (PHYSICS)

Single Correct Type Questions

1. Identify the correct truth table of the given logic circuit.



(1)

A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

(2)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

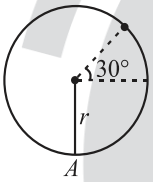
(3)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(4)

A	B	Y
0	0	0
0	1	0
1	0	1
1	1	0

2. In case of vertical circular motion of a particle by a thread of length r if the tension in the thread is zero at an angle 30° shown in figure, the velocity at the bottom point (*A*) of the circular path is (*g* = gravitational acceleration)



(1) $\sqrt{5gr}$ (2) $\sqrt{4gr}$

(3) $\sqrt{\frac{5}{2}gr}$ (4) $\sqrt{\frac{7}{2}gr}$

3. A flexible chain of mass m hangs between two fixed points at the same level. The inclination of the chain with the horizontal at the two points of support is 30°. Considering the equilibrium of each half of the chain, the tension of the chain at the lowest point is

(1) mg (2) $\frac{1}{2}mg$

(3) $\sqrt{3}mg$ (4) $\frac{\sqrt{3}}{2}mg$

4. In the Young's double slit experiment the intensity produced by each one of the individual slits is I_0. The distance between two slits is 2 mm. The distance of screen from slits is 10 m. The wavelength of light is 6000 Å. The intensity of light on the screen in front of one of the slits is

(1) $\frac{I_0}{2}$ (2) $2I_0$

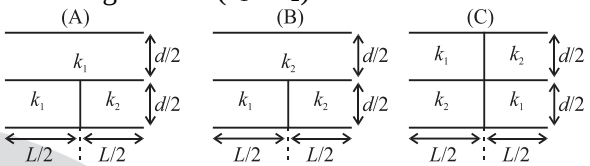
(3) I_0 (4) $4I_0$

5. A moving coil galvanometer of resistance 100Ω shows a full-scale deflection for a current of 1 mA. The value of resistance required to convert this galvanometer into an ammeter, showing full scale deflection for a current of 5 mA, is ____Ω

(1) 0.5 (2) 2.5

(3) 25 (4) 10

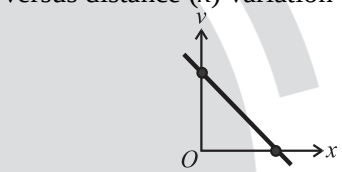
6. Three parallel plate capacitors each with area *A* and separation *d* are filled with two dielectric (k_1 and k_2) in the following fashion. Which of the following is true? ($k_1 > k_2$)



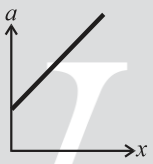
(1) $C_B > C_C > C_A$ (2) $C_A > C_C > C_B$

(3) $C_C > C_B > C_A$ (4) $C_C > C_A > C_B$

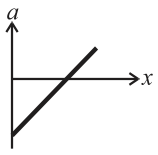
7. The velocity (v) - Distance (x) graph is shown in figure. Which graph represents acceleration(a) versus distance (x) variation of this system?



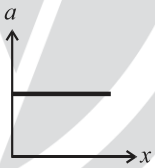
(1)



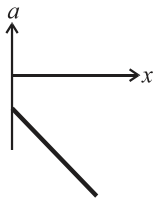
(2)



(3)



(4)



8. A point source is kept at the center of a spherically enclosed detector. If the volume of the detector increased by 8 times, the intensity will

(1) decrease by 4 times

(2) increase by 64 times

(3) increase by 8 times

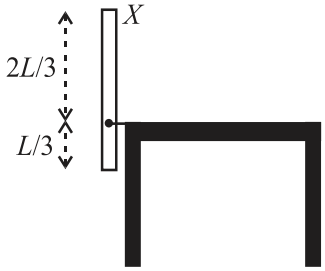
(4) decrease by 8 times

9. A regular hexagon is formed by six wires each of resistance r Ω and the corners are joined to the centre by wires of same resistance. If the current enters at one corner and leaves at the opposite corner, the equivalent resistance of the hexagon between the two opposite corners will be

(1) $\frac{3}{5}r$ (2) $\frac{5}{8}r$

(3) $\frac{4}{5}r$ (4) $\frac{3}{4}r$

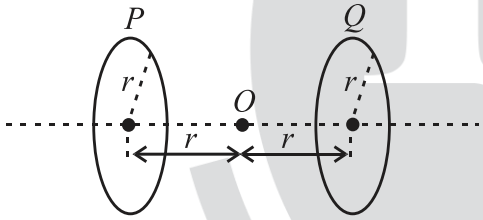
10. A thin uniform rod (X) of mass M and length L is pivoted at a height $\left(\frac{L}{3}\right)$ as shown in the figure. The rod is allowed to fall from a vertical position and lie horizontally on the table. The angular velocity of this rod when it hits the table top, is (g = gravitational acceleration)



(1) $\frac{1}{\sqrt{2}}\sqrt{\frac{g}{L}}$ (2) $\sqrt{\frac{3g}{L}}$

(3) $\frac{3}{\sqrt{2}}\sqrt{\frac{g}{L}}$ (4) $\sqrt{\frac{3}{2}\frac{g}{L}}$

11. Two identical circular loops P and Q each of radius r are lying in parallel planes such that they have common axis. The current through P and Q are I and $4I$ respectively in clockwise direction as seen from O. The net magnetic field at O is:



(1) $\frac{\mu_0 I}{4\sqrt{2}r}$ towards Q

(2) $\frac{3\mu_0 I}{4\sqrt{2}r}$ towards P

(3) $\frac{\mu_0 I}{4\sqrt{2}r}$ towards P

(4) $\frac{3\mu_0 I}{4\sqrt{2}r}$ towards Q

12. Five persons P_1, P_2, P_3, P_4 and P_5 recorded object distance (u) and image distance (v) using same convex lens having power +5D as (25, 96), (30, 62), (35, 37), (45, 35) and (50, 32) respectively. Identify correct statement

(1) Readings recorded by all persons are correct

(2) Readings recorded by P_4 and P_5 persons are incorrect

(3) Readings recorded by P_3 person are incorrect

(4) Readings recorded by P_3 and P_2 persons are incorrect

13. In a vernier callipers, 50 vernier scale divisions are equal to 48 main scale divisions. If one main scale division = 0.05 mm, then the least count of the vernier callipers is ____ mm.

(1) 0.05 (2) 0.002

(3) 0.02 (4) 0.005

14. Distance between an object and three times magnified real image is 40 cm. The focal length of the mirror used is ____cm.

(1) –15/2 (2) –20

(3) –10 (4) –15

15. When a light of a given wavelength falls on a metallic surface the stopping potential for photoelectrons is 3.2 V. If a second light having wavelength twice of first light is used, the stopping potential drops to 0.7 V. The wavelength of first light is _____m. ($h = 6.63 \times 10^{-34}$J.s, $e = 1.6 \times 10^{-19}$ C, $c = 3 \times 10^8$m/s)

(1) 3.1×10^{-7} (2) 2.5×10^{-7}

(3) 2.2×10^{-8} (4) 2.9×10^{-8}

16. The binding energy for the following nuclear reactions are expressed in MeV.

$${}_2He^3 + {}_0n^1 \rightarrow {}_2He^4 + 20 \text{ MeV}$$

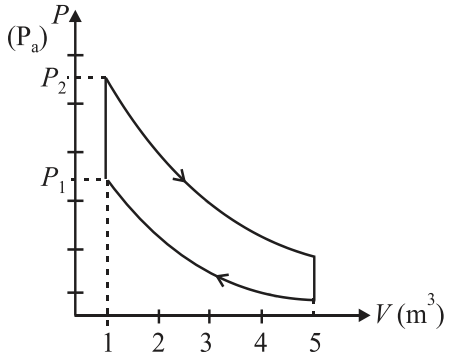
$${}_2He^4 + {}_0n^1 \rightarrow {}_2He^5 - 0.9 \text{ MeV}$$

If X_3, X_4, X_5 denote the stability of ${}_2He^3$, ${}_2He^4$ and ${}_2He^5$, respectively, then the correct order is :

(1) $X_4 < X_5 < X_3$ (2) $X_4 > X_5 > X_3$

(3) $X_4 > X_5 < X_3$ (4) $X_4 = X_5 = X_3$

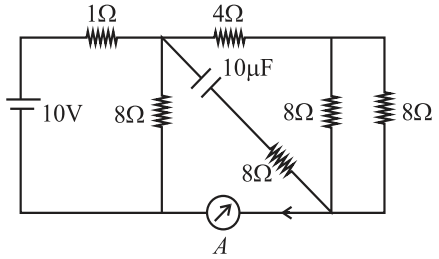
17. 10 mole of an ideal gas is undergoing the process shown in the figure. The heat involved in the process from P_1 to P_2 is α Joule ($P_1 = 21.7$ Pa and $P_2 = 30$ Pa , $C_V = 21$ J/K.mol , $R = 8.3$ J/mol.K). The value of α is



(1) 21 (2) 24

(3) 15 (4) 28

18. The reading of the ammeter (A) in steady state in the following circuit (assuming negligible internal resistance of the ammeter) is ____A.



(1) 2 (2) 1
(3) 0 (4) ½

19. A cubical block of density $\rho_b = 600\ \text{kg/m}^3$ floats in a liquid of density $\rho_e = 900\ \text{kg/m}^3$. If the height of block is H = 8.0 cm then height of the submerged part is ____ cm.
(1) 4.3 (2) 7.3
(3) 5.3 (4) 6.3

20. The fifth harmonic of a closed organ pipe is found to be in unison with the first harmonic of an open pipe. The ratio of lengths of closed pipe to that of the open pipe is $5/x$. The value of x is
(1) 4 (2) 1
(3) 3 (4) 2

Integer Type Questions

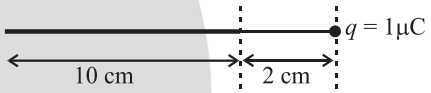
21. A soap bubble of surface tension 0.04 N/m is blown to a diameter of 7 cm. If $(15000 - x)$ μJ of work is done in blowing it further to make its diameter 14 cm, then the value of x is $(\pi = \frac{22}{7})$

22. A uniform solid cylinder of length L and radius R has moment of inertia about its axis equal to I_1. A small co-centric cylinder of length $\frac{L}{2}$ and radius $\frac{R}{3}$ carved from this cylinder has moment of inertia about its axis equals to I_2. The ratio I_1/I_2 is

23. In a meter bridge experiment to determine the value of unknown resistance, first the resistances 2Ω and 3Ω are connected in the left and right gaps of the bridge and the null point is obtained at a distance l cm from the left. Now when an unknown resistance xΩ is connected in parallel to 3Ω resistance, the null point is shifted by 10 cm to the right of wire. The value of unknown resistance x is Ω.

24. A point charge q = 1 μC is located at a distance 2 cm from one end of a thin insulating wire of length 10 cm having a charge Q = 24 μC, distributed uniformly along its length, as shown in figure. Force between q and wire is ____N.

(Use : $\frac{1}{4\pi\epsilon_0} = 9\times10^9\ \text{N.m}^2/\text{C}^2$)



25. When 300 J of heat given to an ideal gas with $C_P = \frac{7}{2}R$ its temperature raises from 20°C to 50 °C keeping its volume constant. The value of 100 times the ratio of mass of gas to the molecular mass of gas is (R = 8.314 J/mol.K)

SECTION-II (CHEMISTRY)

Single Correct Type Questions

26. At 298 K, the mole percentage of $N_2(g)$ in air is 80%. Water is in equilibrium with air at a pressure of 10 atm. What is the mole fraction of $N_2(g)$ in water at 298 K? (K_H for N_2 is 6.5×10^7 mm Hg)
(1) 1.17×10^{-4} (2) 9.35×10^{-5}
(3) 1.23×10^{-7} (4) 9.35×10^{5}

27. The wavelength of spectral line obtained in the spectrum of Li^{2+} ion, when the transition takes place between two levels whose sum is 4 and difference is 2, is
(1) 2.28×10^{-7} cm
(2) 1.14×10^{-7} cm
(3) 2.28×10^{-6} cm
(4) 1.14×10^{-6} cm

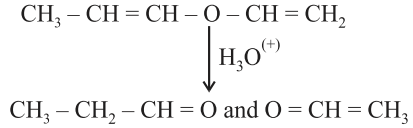
28. The number of possible tripeptides formed involving alanine (ala), glycine (gly) and valine (val), where no amino acid has been used more than once is:
(1) 8 (2) 6
(3) 4 (4) 3

29. The heat of atomisation of methane and ethane are 'x' kJ mol^{-1} and 'y' kJ mol^{-1} respectively. The longest wavelength (λ) of light capable of breaking the C-C bond can be expressed in SI unit as:

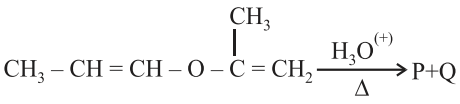
(1) $\frac{N_A hc}{250(y-6x)}$ (2) $\frac{N_A hc}{250(4y-6x)}$

(3) $\frac{hc}{1000}\left(\frac{y-6x}{4}\right)^{-1}$ (4) $N_A hc\left(y-\frac{6x}{4}\right)^{-1}$

30. The unsaturated ether on acidic hydrolysis produces carbonyl compounds as shown below:



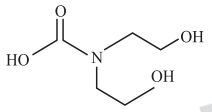
Based on this, predict the solution/reagent that will help to distinguish "P" and "Q" obtained in the following reaction:

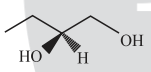


(1) Fehling solution
(2) Lucas reagent
(3) 2, 4 - DNP reagent
(4) Saturated $NaHSO_3$ solution

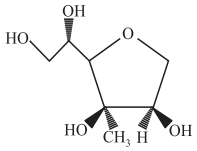
31. One mole of $Cl_2(g)$ was passed into 2L of cold 2M KOH solution. After the reaction, the concentrations of Cl^-, ClO^- and OH^- are respectively (assume volume remains constant)
(1) 0.5M, 0.5M, 0.5M
(2) 1M, 1M, 1M
(3) 0.5M, 0.5M, 1M
(4) 0.75M, 0.75M, 1M

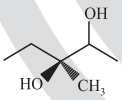
32. From the following, how many compounds contain at least one secondary alcohol?

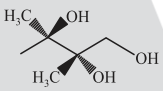

(I)


(II)


(III)


(IV)


(V)


(VI)

(1) Two (2) Three
(3) Five (4) Four

33. Consider the following gaseous equilibrium in a closed container of volume 'V' at T(K).

$P^2(g) + Q_2(g) \rightleftharpoons 2PQ(g)$

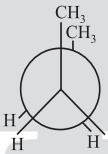
2 moles each of $P_2(g)$, $Q_2(g)$ and PQ(g) are present at equilibrium. Now one mole each of 'P_2' and 'Q_2' are added to the equilibrium keeping the temperature at T(K). The number of moles of P_2, Q_2 and PQ at the new equilibrium, respectively, are
(1) 1.66, 1.66, 1.66
(2) 2.67, 2.67, 2.67
(3) 1.21, 2.24, 1.56
(4) 2.56, 1.62, 2.24

34. "X" is an oxoanion of the lightest element of group 7 (in the periodic table). The metal is in +6 oxidation state in "X". The color of the potassium salt of X is
(1) green (2) yellow
(3) orange (4) purple

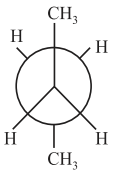
35. Two liquids A and B form an ideal solution at temperature T K. At T K, the vapour pressures of pure A and B are 55 and 15 kN m^{-2} respectively. What is the mole fraction of A in solution of A and B in equilibrium with a vapour in which the mole fraction of A is 0.8?
(1) 0.480 (2) 0.340
(3) 0.5217 (4) 0.663

36. The correct order of C, N, O and F in terms of second ionisation potential is
(1) C<N<F<O (2) C<O<N<F
(3) F<N<C<O (4) C<F<N<O

37. Given below are two statements:
Statement I: There are several conformers for n-butane. Out of those conformers,


(X)

is the least stable and most stable conformer is


(Y)

Statement II: As the dihedral angle increases, torsional strain decreases from (X) to (Y). In the light of the above statements, choose the correct answer from the options given below
(1) Both Statement I and Statement II are true
(2) Both Statement I and Statement II are false
(3) Statement I is false but Statement II is true
(4) Statement I is true but Statement II is false

38. Given below are two statements:
Statement I: Cross aldol condensation between two different aldehydes will always produce four different products.
Statement II: When semicarbazide reacts with a mixture of benzaldehyde and acetophenone under optimum pH, it forms a condensation product with acetophenone only.
In the light of the above statements, choose the correct answer from the options given below
(1) Statement I is true but Statement II is false
(2) Both Statement I and Statement II are false
(3) Statement I is false but Statement II is true
(4) Both Statement I and Statement II are true

39. The wavelength of light absorbed for the following complexes are in the order

$[Co(NH_3)_6]^{3+}$; $[Co(H_2O)_6]^{3+}$; $[Co(CN)_6]^{3-}$; $[Co(NH_3)_5(H_2O)]^{3+}$; $[CoF_6]^{3-}$

(I) (II) (III) (IV) (V)

(1) III < I < IV < II < V
(2) III < IV < I < II < V
(3) III < I < IV < V < II
(4) III < I < II < IV < V

40. Pair of species among the following having same bond order as well as paramagnetic character will be-

(1) O_2^-, N_2^+ (2) O_2^-, N_2^-
(3) O_2^+, N_2^- (4) O_2^+, N_2^{2-}

41. Find out the statements which are not true.

A. Resonating structures with more number of covalent bonds and lesser charge separation are more stable.
B. In electromeric effect, an unsaturated system shows +E effect with nucleophile and -E effect with electrophile.
C. Inductive effect is responsible for high melting point, boiling point and dipole moment of polar compounds.
D. The greater the number of alkyl groups attached to the doubly bonded carbon atoms, higher is the heat of hydrogenation.
E. Stability of carbanion increases with the increase in s character of the carbon carrying the negative charge. Choose the correct answer from the options given below:

(1) A, C & D only (2) A, D & E only
(3) B & D only (4) B, D & E only

42. A student has planned to prepare acetanilide from aniline using acetic anhydride. The student has started from 9.3 g of aniline. However, the student has managed to obtain 11 g of dry acetanilide. The % yield of this reaction is:

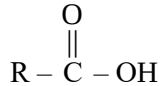
(1) 97.5% (2) 81.5%
(3) 59.5% (4) 72.5%

43. In the Group analysis of cations, Ba^{2+} & Ca^{2+} are precipitated respectively as

(1) sulphide & sulphide
(2) carbonate & carbonate
(3) chromate & sulphide
(4) hydroxide & carbonate

44. Given below are two statements:

Statement I: The dipole moment of R-CN is greater than R-NC and R-NC can undergo hydrolysis under acidic medium to produce



Statement II: R-CN hydrolyses under acidic medium to produce a compound which on treatment with $SOCl_2$, followed by the addition of NH_3 gives another compound(x). This compound (x) on treatment with NaOCl/NaOH gives a product, that on treatment with $CHCl_3$/KOH/Δ produces R-NC

In the light of the above statements, choose the correct answer from the options given below

(1) Both Statement I and Statement II are true
(2) Both Statement I and Statement II are false
(3) Statement I is false but Statement II is true
(4) Statement I is true but Statement II is false

45. Choose the INCORRECT statement

(1) CO_2 is the most acidic oxide among the dioxides of group of 14 elements.
(2) Among the isotopes of carbon, ^{13}C is a radioactive isotope.
(3) Carbon cannot exceed its covalency more than four.
(4) Carbon exhibits negative oxidation states along with +4 and +2.

Integer Type Questions

46. 0.25 g of an organic compound "A" containing carbon, hydrogen and oxygen was analysed using the combustion method. There was an increase in mass of $CaCl_2$ tube and potash tube at the end of the experiment. The amount was found to be 0.15 g and 0.1837 g, respectively. The percentage of oxygen in compound A is % (Nearest integer).
(Given: molar mass in g mol^{-1} H: 1, C: 12, O: 16)

47. Grignard reagent RMgBr (P) reacts with water and forms a gas (Q). One gram of Q occupies 1.4 dm^3 at STP. (P) on reaction with dry ice in dry ether followed by H_3O^+ forms a compound (Z). 0.1 mole of (Z) will weigh g. (Nearest integer)

48. The half-life of ^{65}Zn is 245 days. After x days, 75% of original activity remained. The value of x in days is (Nearest integer) (Given: log 3 = 0.4771 and log 2 = 0.3010)

49. Molar conductivity of a weak acid HQ of concentration 0.18 M was found to be $\frac{1}{30}$ of the molar conductivity of another weak acid HZ with concentration of 0.02 M. If $\lambda^\circ_{Q^-}$ happened to be equal with $\lambda^\circ_{Z^-}$, then the difference of the pK_a values of the two weak acids (pK_a (HQ) – pK_a(HZ)) is (Nearest integer). [Given: degree of dissociation (α) << 1 for both weak acids, λ°: limiting molar conductivity of ions]

50. A chromium complex with a formula $CrCl_3.6H_2O$ has a spin only magnetic moment value of 3.87 BM and its solution conductivity corresponds to 1: 2 electrolyte. 2.75 g of the complex solution was initially passed through a cation exchanger. The solution obtained after the process was reacted with excess of $AgNO_3$. The amount of AgCl formed in the above process is g. (Nearest integer)
[Given: Molar mass in g mol^{-1} Cr: 52; Cl: 35.5, Ag:108, O:16, H:1]

SECTION-III (MATHEMATICS)

Single Correct Type Questions

51. Let $y = y(x)$ be a differentiable function in the interval $(0, \infty)$ such that $y(1) = 2$, and $\lim\limits_{t\to x}\frac{t^2y(x)-x^2y(t)}{x-t}=3$ for each $x > 0$. Then $2y(2)$ is equal to
(1) 27 (2) 18
(3) 23 (4) 12

52. Let the length of the latus rectum of an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, $(a > b)$, be 30. If its eccentricity is the maximum value of the function $f(t)=-\frac{3}{4}+2t-t^2$, then $(a^2 + b^2)$ is equal to
(1) 516 (2) 496
(3) 256 (4) 276

53. Let a_1, a_2, a_3, a_4 be an A.P. of four terms such that each term of the A.P. and its common difference l are integers. If $a_1 + a_2 + a_3 + a_4 = 48$ and $a_1 a_2 a_3 a_4 + l^4 = 361$, then the largest term of the A.P. is equal to
(1) 24 (2) 27
(3) 23 (4) 21

54. Let $X = \{x \in N: 1 \le x \le 19\}$ and for some $a, b \in R$, $Y = \{ax + b : x \in X\}$. If the mean and variance of the elements of Y are 30 and 750, respectively, then the sum of all possible values of b is
(1) 100 (2) 20
(3) 80 (4) 60

55. Let $\vec{a}=2\hat{i}-5\hat{j}+5\hat{k}$ and $\vec{b}=\hat{i}-\hat{j}+3\hat{k}$. If $\vec{c}$ is a vector such that $2(\vec{a}\times\vec{c})+3(\vec{b}\times\vec{c})=\vec{0}$ and $(\vec{a}-\vec{b})\cdot\vec{c}=-97$, then $|\vec{c}\times\vec{k}|^2$ is equal to
(1) 193
(2) 233
(3) 205
(4) 218

56. Let the angles made with the positive x-axis by two straight lines drawn from the point $P(2, 3)$ and meeting the line $x + y = 6$ at a distance $\sqrt{\frac{2}{3}}$ from the point P be θ_1 and θ_2. Then the value of $(\theta_1 + \theta_2)$ is:
(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{3}$
(3) $\frac{\pi}{12}$ (4) $\frac{\pi}{6}$

57. Let the image of parabola $x^2 = 4y$, in the line $x - y = 1$ be $(y+a)^2=b(x-c)$, $a, b, c \in N$. Then $a + b + c$ is equal to
(1) 6 (2) 8
(3) 4 (4) 12

58. The largest value of n, for which 40^n divides 60!, is
(1) 13 (2) 12
(3) 11 (4) 14

59. If the domain of the function $f(x)=\sin^{-1}\left(\frac{1}{x^2-2x-2}\right)$ is $(-\infty,\alpha]\cup[\beta,\gamma]\cup[\delta,\infty)$, then $\alpha+\beta+\gamma+\delta$ is equal to
(1) 3 (2) 5
(3) 4 (4) 2

60. Let $[t]$ denote the greatest integer less than or equal to t. If the function

$$f(x)=\begin{cases} b^2\sin\left(\frac{\pi}{2}\left[\frac{\pi}{2}(\cos x+\sin x)\cos x\right]\right), & x<0 \\ \frac{\sin x-\frac{1}{2}\sin 2x}{x^3}, & x>0 \\ a, & x=0 \end{cases}$$

is continuous at $x = 0$, then a^2+b^2 is equal to
(1) $\frac{9}{16}$ (2) $\frac{1}{2}$
(3) $\frac{5}{8}$ (4) $\frac{3}{4}$

61. Let $\vec{a}=2\hat{i}-\hat{j}-\hat{k}$, $\vec{b}=\hat{i}+3\hat{j}-\hat{k}$ and $\vec{c}=2\hat{i}+\hat{j}+3\hat{k}$. Let $\vec{v}$ be the vector in the plane of the vectors $\vec{a}$ and $\vec{b}$, such that the length of its projection on the vector $\vec{c}$ is $\frac{1}{\sqrt{14}}$. Then $|\vec{v}|^2$ is equal to

(1) 13

(2) $\frac{\sqrt{35}}{2}$

(3) $\frac{\sqrt{21}}{2}$

(4) 7

62. The sum of all values of α, for which the shortest distance between the lines $\frac{x+1}{\alpha}=\frac{y-2}{-1}=\frac{z-4}{-\alpha}$ and $\frac{x}{\alpha}=\frac{y-1}{2}=\frac{z-1}{2\alpha}$ is $\sqrt{2}$, is

(1) 8 (2) 6

(3) –8 (4) –6

63. Let f be a function such that $3f(x)+2f\left(\frac{m}{19x}\right)=5x$, $x \neq 0$, where $m=\sum_{i=1}^{9}(i)^2$. Then $f(5)-f(2)$ is equal to

(1) 18

(2) 36

(3) 9

(4) –9

64. The letters of the word "UDAYPUR" are written in all possible ways with or without meaning and these words are arranged as in a dictionary. The rank of the word "UDAYPUR" is

(1) 1581

(2) 1578

(3) 1579

(4) 1580

65. Consider the following three statements for the function $f:(0,\infty)\to\mathbb{R}$ defined by $f(x)=|\log_e x|-|x-1|$:

(I) f is differentiable at all $x > 0$.

(II) f is increasing in (0, 1).

(III) f is decreasing in (1, ∞). Then.

(1) All (I), (II) and (III) are TRUE.

(2) Only (I) and (III) are TRUE.

(3) Only (II) and (III) are TRUE.

(4) Only (I) is TRUE.

66. Let $f(x)=\int\frac{7x^{10}+9x^8}{(1+x^2+2x^9)^2}dx, x>0$,

$\lim_{x\to 0} f(x)=0$ and $f(1)=\frac{1}{4}$.

If $A=\begin{bmatrix}0 & 0 & 1\\ \frac{1}{4} & f'(1) & 1\\ \alpha^2 & 4 & 1\end{bmatrix}$ and $B = adj(adjA)$ be such that $|B| = 81$, then α^2 is equal to

(1) 3 (2) 4

(3) 2 (4) 1

67. Let $f(\alpha)$ denote the area of the region in the first quadrant bounded by $x=0, x=1, y^2=x$ and $y=|\alpha x-5|-|1-\alpha x|+\alpha x^2$.

Then $\left(f(0)+f(1)\right)$ is equal to

(1) 7 (2) 12

(3) 14 (4) 9

68. $\left(\frac{1}{3}+\frac{4}{7}\right)+\left(\frac{1}{3^2}+\frac{1}{3}\times\frac{4}{7}+\frac{4^2}{7^2}\right)+\left(\frac{1}{3^3}+\frac{1}{3^2}\times\frac{4}{7}+\frac{1}{3}\times\frac{4^2}{7^2}+\frac{4^3}{7^3}\right)+\ldots$ upto infinite terms, is equal to

(1) $\frac{4}{3}$ (2) $\frac{6}{5}$

(3) $\frac{7}{4}$ (4) $\frac{5}{2}$

69. Let $P = [p_{ij}]$ and $Q = [q_{ij}]$ be two square matrices of order 3 such that $q_{ij}=2^{(i+j-1)}p_{ij}$ and $\det(Q)=2^{10}$. Then the value of det (adj (adj P)) is:

(1) 81 (2) 32

(3) 124 (4) 16

70. The smallest positive integral value of a, for which all the roots of $x^4-ax^2+9=0$ are real and distinct, is equal to

(1) 3 (2) 4

(3) 9 (4) 7

Integer Type Questions

71. Let $z = (1 + i)(1+2i)(1+3i)\ldots(1 + ni)$, where $i=\sqrt{-1}$. If $|z|^2 = 44200$, then n is equal to___

72. Let S be a set of 5 elements and $P(S)$ denote the power set of S. Let E be an event of choosing an ordered pair (A, B) from the set $P(S) \times P(S)$ such that $A \cap B = \varnothing$. If the probability of the event E is $\frac{3^p}{2^q}$, where $p, q \in N$, then $p + q$ is equal to

73. The number of elements in the set $\{x \in [0, 180°]: \tan(x + 100°) = \tan(x + 50°) \tan x \tan(x - 50°)\}$ is

74. If $f(x)$ satisfies the relation $f(x) = e^x + \int_0^1 (y + xe^x) f(y)\,dy$, then $e + f(0)$ is equal to

75. Let (h, k) lie on the circle C: $x^2 + y^2 = 4$ and the point $(2h + 1, 3k + 2)$ lie on an ellipse with eccentricity e. Then the value of $\frac{5}{e^2}$ is equal to

PHYSICS WALLAH

JEE MAIN 2026

SESSION-01

Date: 28-01-2026

Shift-02

SECTION-I (PHYSICS)

Single Correct Type Questions

1. A nuclues has mass number α and radius R_α. Another nucleus has mass number β and radius R_β. If $\beta = 8\alpha$ then R_α / R_β is:

(1) 1 (2) 0.5
(3) 2 (4) 8

2. When the position vector $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ changes sign as $-\vec{r}$, which one of the following vector will not flip under sign change?

(1) Acceleration
(2) Velocity
(3) Angular momentum
(4) Linear momentum

3. Number of photons of equal energy emitted per second by a 6 mW laser source operating at 663 nm is ____. (Given: $h = 6.63 \times 10^{-34}$ Js and $c = 3 \times 10^8$ m/s)

(1) 2×10^{16} (2) 5×10^{16}
(3) 5×10^{15} (4) 10×10^{15}

4. A particle starts moving from time $t = 0$ and its coordinate is given as $x(t) = 4t^3 – 3t$

A. The particle returns to its original position (origin) 0.866 units later
B. The particle is 1 unit away from origin at its turning point
C. Acceleration of the particle is non-negative
D. The particle is 0.5 units away from origin at its turning point
E. Particle never turns back as acceleration is non-negative

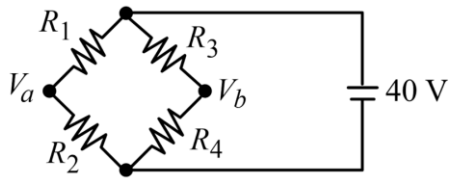
Choose the correct answer from the options given below:

(1) A, C only
(2) A, C, D only
(3) A, B, C only
(4) C, E only

5. The time period of a simple harmonic oscillator is $T = 2\pi\sqrt{\frac{k}{m}}$. Measured value of mass (m) of the object is 10 g with an accuracy of 10 mg and time for 50 oscillations of the spring is found to be 60 s using a watch of 2s resolution. Percentage error in determination of spring constant (k) is _____ %.

(1) 3.35 (2) 3.43
(3) 7.60 (4) 6.76

6. A Wheatstone bridge is initially at room temperature and all arms of the bridge have same value of resistances $(R_1 = R_2 = R_3 = R_4)$. When R_3 resistance is heated to some temperature, its resistance value has gone up by 10%. The potential difference $(V_a - V_b)$ (after R_3 is heated) is _____ V.



(1) 1.05 (2) 0.95
(3) 2 (4) 0

7. A plane electromagnetic wave is moving in free space with velocity $c = 3 \times 10^8$ m/s and its electric field is given as $\vec{E} = 54\sin(kz - \omega t)\,\hat{j}$ V/m, where $\hat{j}$ is the unit vector along y-axis. The magnetic field vector $\vec{B}$ of the wave is:

(1) $1.4\times10^{-7}\sin(kz-\omega t)\hat{i}\,T$
(2) $+1.8\times10^{-7}\sin(kz-\omega t)\hat{i}\,T$
(3) $1.4\times10^{-7}\sin(kz-\omega t)\hat{k}\,T$
(4) $-1.8\times10^{-7}\sin(kz-\omega t)\hat{i}\,T$

8. Which one of the following is not a measurable quantity?

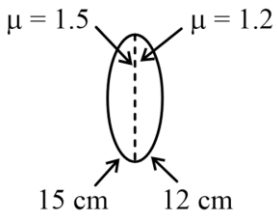
(1) Voltage
(2) Displacement current
(3) Resistance
(4) Voltage difference

9. The mean free path of a molecule of diameter 5×10^{-10} m at the temperature 41°C and pressure 1.38×10^5 Pa, is given as _____ m.

(Given $k_B = 1.38\times10^{-23}$ J/K).

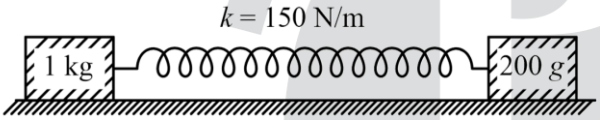
(1) 2×10^{-8}
(2) $2\sqrt{2}\times10^{-10}$
(3) $2\sqrt{2}\times10^{-8}$
(4) $10\sqrt{2}\times10^{-8}$

10. A biconvex lens is formed by using two thin planoconvex lenses, as shown in the figure. The refractive index and radius of curved surfaces are also mentioned in figure. When an object is placed on the left side of lens at a distance of 30 cm from the biconvex lens, the magnification of the image will be:



(1) – 2 (2) – 2.5
(3) + 2 (4) + 2.5

11. As shown in the figure, a spring is kept in a stretched position with some extension by holding the masses 1 kg and 0.2 kg with a separation more than spring natural length and are released. Assuming the horizontal surface to be frictionless, the angular frequency (in SI unit) of the system is:



(1) 30 (2) 27
(3) 5 (4) 20

12. In an experiment, a set of reading are obtained as follows - 1.24 mm, 1.25 mm, 1.23 mm, 1.21 mm. The expected least count of the instrument used in recording these readings is _____ mm.

(1) 0.1 (2) 0.01
(3) 0.001 (4) 0.05

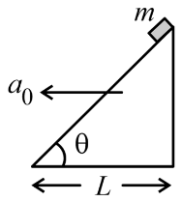
13. Match List-I with List-II.

List-I		List-II	
A.	Coefficient of viscosity	**I.**	$\left[ML^{-1}T^{-2}\right]$
B.	Surface tension	**II.**	$\left[ML^{2}T^{-2}\right]$
C.	Pressure	**III.**	$\left[ML^{0}T^{-2}\right]$
D.	Surface energy	**IV.**	$\left[ML^{-1}T^{-1}\right]$

Choose the correct answer from the options given below:

(1) A-I, B-II, C-IV, D-III
(2) A-IV, B-I, C-II, D-III
(3) A-IV, B-III, C-I, D-II
(4) A-I, B-III, C-II, D-IV

14. A small block of mass m slides down from the top of a frictionless inclined surface, while the inclined plane is moving towards left with constant acceleration a_0. The angle between the inclined plane and ground is θ and its base length is L. Assuming that initially the small block is at the top of the inclined plane, the time it takes to reach the lowest point of the inclined plane is ___.



(1) $\sqrt{\dfrac{2L}{g\sin\theta - a_0\cos\theta}}$

(2) $\sqrt{\dfrac{4L}{g\sin 2\theta - a_0(1+\cos 2\theta)}}$

(3) $\sqrt{\dfrac{4L}{g\cos^2\theta - a_0\sin\theta\cos\theta}}$

(4) $\sqrt{\dfrac{2L}{g\sin 2\theta - a_0(1+\cos 2\theta)}}$

15. The speed of a longitudinal wave in a metallic bar is 400 m/s. If the density and Young's modulus of the bar material are increased by 0.5% and 1%, respectively then the speed of the wave is changed approximately to _____ m/s.

(1) 398 (2) 402
(3) 399 (4) 401

16. For a transparent prism, if the angle of minimum deviation is equal to its refracting angle, the refractive index n of the prism satisfies.

(1) $n \geq 2$ (2) $\sqrt{2} < n < 2$
(3) $\sqrt{2} < n < 2\sqrt{2}$ (4) $1 < n < 2$

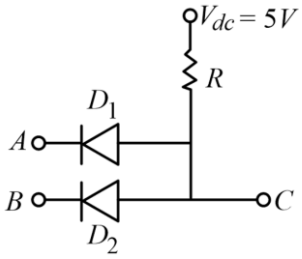
17. A long cylindrical conductor with large cross section carries an electric current distributed uniformly over its cross-section. Magnetic field due to this current is:

A. Maximum at either ends of the conductor and minimum at the midpoint
B. Maximum at the axis of the conductor
C. Minimum at the surface of the conductor
D. Minimum at the axis of the conductor
E. Same at all points in the cross-section of the conductor

Choose the correct answer from the options given below:

(1) E only (2) D only
(3) A, D only (4) B, C only

18. Two p-n junction diodes D_1 and D_2 are connected as shown in figure. A and B are input signals and C is the output. The given circuit will function as a ____.



(1) OR Gate (2) NOR Gate
(3) AND Gate (4) NAND Gate

19. Identify the correct statements:

A. Electrostatic field lines form closed loops.
B. The electric field lines point radially outward when charge is greater than zero.
C. The Gauss - Law is valid only for inverse - square force.
D. The workdone in moving a charged particle in a static electric field around a closed path is zero.
E. The motion of a particle under Coulomb's force must take place in a plane.

Choose the correct answer from the options given below:

(1) A, B, C, D only
(2) A, B, D, E only
(3) A, C, E only
(4) B, C, D, E only

20. Identify the correct statements:

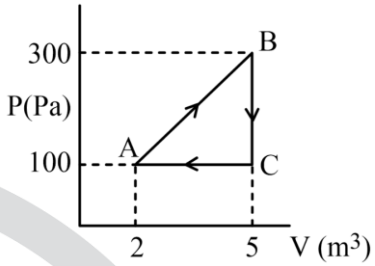
A. Effective capacitance of a series combination of capacitors is always smaller than the smallest capacitance of the capacitor in the combination.
B. When a dielectric medium is placed between the charged plates of a capacitor, displacement of charges cannot occur due to insulation property of dielectric.
C. Increasing of area of capacitor plate or decreasing of thickness of dielectric is an alternate method to increase the capacitance.
D. For a point charge, concentric spherical shells centered at the location of the charge are equipotential surfaces.

Choose the correct answer from the options given below:

(1) C and D only
(2) B and D only
(3) A, C and D only
(4) A, B and C only

Integer Type Questions

21. A thermodynamic system is taken through the cyclic process *ABC* as shown in the figure. The total work done by the system during the cycle *ABC* is _____ J.



22. Two tuning forks A and B are sounded together giving rise to 8 beats in 2s. When fork A is loaded with wax, the beat frequency is reduced to 4 beats in 2s. If the original frequency of tuning fork B is 380 Hz then original frequency of tuning fork A is ____ Hz.

23. A fly wheel having mass 3 kg and radius 5 m is free to rotate about a horizontal axis. A string having negligible mass is wound around the wheel and the loose end of the string is connected to 3 kg mass. The mass is kept at rest initially and released. Kinetic energy of the wheel when the mass descends by 3 m is _____ J. (g = 10 m/s²)

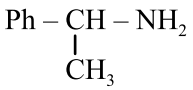
24. A beam of light consisting of wavelengths 650 nm and 550 nm illuminates the Young's double slits with separation of 2 mm such that the interference fringes are formed on a screen, placed at a distance of 1.2 m from the slits. The least distance of a point from the central maximum, where the bright fringes due to both the wavelengths coincide, is _____ $\times 10^{-5}$ m.

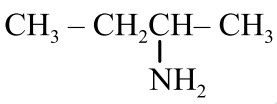
25. An inductor stores 16 J of magnetic field energy and dissipates 32 W of thermal energy due to its resistance when an a.c. current of 2 A (rms) and frequency 50 Hz flows through it. The ratio of inductive reactance to its resistance is ____.
(π = 3.14)

SECTION-II (CHEMISTRY)

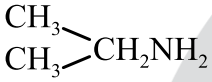
Single Correct Type Questions

26. A student performed analysis of aliphatic organic compound 'X' which on analysis gave C = 61.01%, H = 15.25%, N = 23.74%. This compound, on treatment wth HNO_2/H_2O produced another compound 'Y' which did not contain only nitrogen atom. However the compound 'Y' upon controlled oxidation produced another compound 'Z' that responded to iodoform tst. The structure of 'X' is:

(1) 

(2) 

(3) $CH_3CH_2CH_2NH_2$

(4) 

27. Given below are two statements:

Statement I : The increasing order of boiling point of hydrogen halides is HCl < HBr < HI < HF.

Statement II : The increasing order of melting point of hydrogen halides is HCl < HBr < HF < HI.

In the light of the above statements, choose the correct answer from the options given below:

(1) Both Statement I and Statement II are false

(2) Statement I is false but Statement II is true

(3) Statement I is true but Statement II is false

(4) Both Statement I and Statement II are true

28. Observe the following equilibrium in a 1 L flask.

$A(g) \rightleftharpoons B(g)$

At T(K), the equilibrium concentrations of A and B are 0.5 M and 0.375 M respectively. 0.1 moles of A is added into the flask and heated to T(K) to establish the equilibrium again. The new equilibrium concentrations (in M) of A and B respectively.

(1) 0.367, 0.275

(2) 0.557, 0.418

(3) 0.53, 0.4

(4) 0.742, 0.557

29. Consider the following statements about manganate and permanganate ions. Identify the correct statements.

A. The geometry of both manganate and permanganate ions is tetrahedral.

B. The oxidation states of Mn in manganate and permanganate are +7 and +6, respectively.

C. Oxidation of Mn(II) salt by peroxodisulphate gives manganate ion as the final product.

D. Manganate ion is paramagnetic and permanganate ions is diamagnetic.

E. Acidified permanganate ion reduces oxalate, nitrite and iodide ions.

Choose the correct answer from the options given below:

(1) A, C and D Only

(2) A, D and E Only

(3) A and D Only

(4) A, B and C Only

30. The reactions which produce alcohol as a product are:

A. $CH_4 + O_2 \xrightarrow[\Delta]{Mo_2O_3}$

B. $2CH_3CH_3 + 3O_2 \xrightarrow[\Delta]{(CH_3COO)_2Mn}$

C. $(CH_3)_3CH \xrightarrow{KMnO_4}$

D. $2CH_4 + O_2 \xrightarrow{Cu/523K/100\ atm.}$

E. $CH_3 - CH = CH - CH_3 \xrightarrow{KMnO_4/H^+}$

Choose the correct answer from the options given below:

(1) B, D and E Only

(2) A and D Only

(3) C and D Only

(4) A, C and E Only

31. Consider the following aqueous solutions.

I. 2.2 g Glucose in 125 mL of solution.

II. 1.9 g Calcium chloride in 250 mL of solution.

III. 9.0 g Urea in 500 mL of solution.

IV. 20.5 g Aluminium sulphate in 750 mL of solution.

The correct increasing order of boiling point of these solutions will be:

[Given: Molar mass in g mol^{-1} : H = 1, C = 12, N = 14, O = 16, Cl = 35.5, Ca = 40, Al = 27 and S = 32]

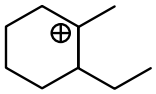
(1) I < II < III < IV

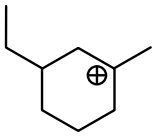
(2) III < I < II < IV

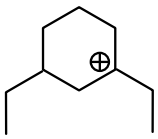
(3) II < III < IV < I

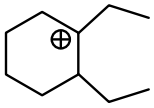
(4) II < III < I < IV

32. The cyclic cations having the same number of hyperconjugation are:

A. 

B. 

C. 

D. 

Choose the corerct answer from the options given below:

(1) A, C and D Only (2) A and B Only

(3) A and C Only (4) B and C Only

33. The plot of $\log_{10} K$ vs $\frac{1}{T}$ gives a straight line. The intercept and slope respectively are (where K is equilibrium constant).

(1) $\frac{\Delta S^\circ}{2.303R}, -\frac{\Delta H^\circ}{2.303R}$

(2) $\frac{2.303R}{\Delta H^\circ}, \frac{2.303R}{\Delta S^\circ}$

(3) $-\frac{\Delta S^\circ R}{2.303}, \frac{\Delta H^\circ R}{2.303}$

(4) $-\frac{\Delta H^\circ}{2.303R}, \frac{\Delta S^\circ}{2.303R}$

34. Identify the correct statements:

The persence of $-NO_2$ group in benzene ring

A. activates the ring towards electrophilic substitutions.

B. Deactivates the ring towards electrophilic substitutions.

C. Activates the rign towards nucleophilic substitutions.

D. Deactivates the ring towards nucleophilic substitutions.

(1) B and D Only

(2) C and A Only

(3) A and D Only

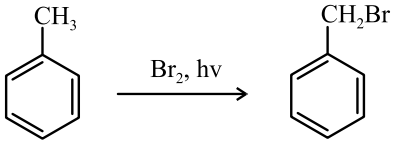
(4) B and C Only

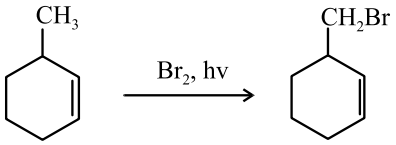
35. The wavelength of photon 'A' is 400 nm. The frequency photon 'B' is 10^{16} s^{-1}. The wave number of photon 'C' is 10^4 cm^{-1}. The correct order energy of these photons is:

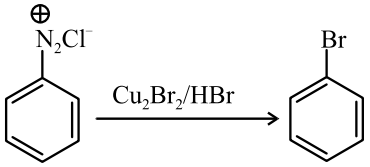
(1) C > B > A (2) A > B > C

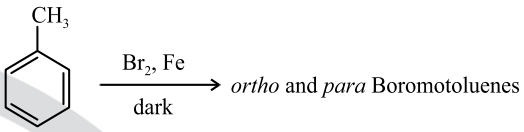
(3) A > C > B (4) B > A > C

36. Which of the following reactions is NOT correctly represented?

(1) 

(2) 

(3) 

(4) 

37. For the given reaction:

$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

If 90g $CaCO_3$ is added to 300 mL of HCl which contains 38.55% HCl by mass and has density 1.13 g mL^{-1}, then which of the following option is correct?

Given molar mass of H, Cl, Ca and O are 1, 35.5, 40 and 16 g mol^{-1} respecively.

(1) 64.97 g of HCl remains unreacted

(2) 60.32 g of HCl remain unreacted

(3) 97.30 g of HCl reacted

(4) 32.85 g of $CaCO_3$ remains unreacted

38. Consider the elemetns N, P, O, S, Cl and F. The number of valence electrons present in the elements with most and least metallic character from the above list is respectively.

(1) 5 and 6 (2) 6 and 7

(3) 5 and 7 (4) 7 and 5

39. The correct order of acidic strength of the major products formed in the given reactions is:

A. $PhNH_2 \xrightarrow[(2)CuCN \\ (3)H_3O^+/\Delta]{(1)NaNO_2+HCl(<5^\circ C)} [A]$

B. $CH_3CH_2CHO \xrightarrow[\Delta]{[Ag(NH_3)_2]^+, OH^-} [B]$

C. $CH_4 + O_2 \xrightarrow[(ii)Na_2Cr_2O_7/H^+]{(i)Mo_2O_3} [B]$

D. $PhCH_2MgBr + CO_2 \xrightarrow[H_3O^+]{\text{Dry ether}} [D]$

Choose the corect answer from the options given below:

(1) A > D > C > B

(2) C > A > D > B

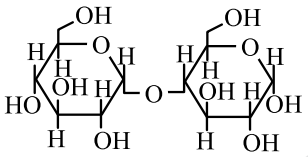
(3) C > B > A > D

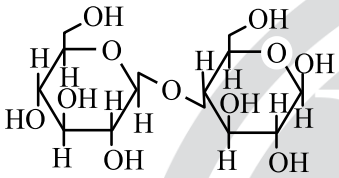
(4) A > D > B > C

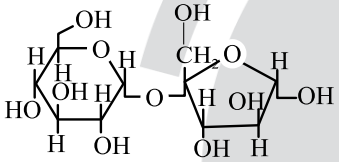
40. The correct increasing order of spin only magnetic moment values of the complex ions $[MnBr_4]^{2-}(A), [Cu(H_2O_6)]^{2+}(B), [Ni(CN)_4]^{2-}$ (C) and $[Ni(H_2O)_6]^{2+}(D)$ is:

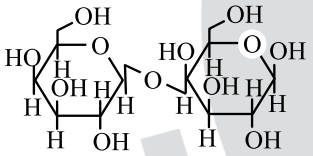
(1) C = D < B < A
(2) C < B < D < A
(3) A = B < C < D
(4) A = B < D < C

41. Structures of four disaccharides are given below. Among the given disacchardies, the non-reducing sugar is :

(1) 

(2) 

(3) 

(4) 

42. Total number of alkali insoluble solid sulphonamides obtained by reaction of given amines with Hinsberg's reagent is _____
Aniline, N-methylaniline, Methanamine, N, N-Dimethylmethanamine, N-Methyl methanamine, Phenylmethanamine, N-Propylaniline, N-phenylaniline, N, N-Dimethylniline, Allyl amine, Isopropyl amine.

(1) 2 (2) 8
(3) 5 (4) 4

43. Consider the following reactions

$$Na_2B_4O_7 \xrightarrow{\Delta} 2X + Y$$

$$CuSO_4 + Y \xrightarrow{\text{Non-Luminous flame}} Z + SO_3$$

$$2Z + 2X + \text{Carbon} \xrightarrow{\text{Luminous flame}} 2Q + Na_2B_4O_7 + CO$$

The oxidation states of Cu in Z and Q, respectively are:

(1) +1 and +1 (2) +2 and +2
(3) +1 and +2 (4) +2 and +1

44. A student has been given 0.314 g of an organic compound and asked to estimate Sulphur. During the experiment, the student has obtained 0.4813 g of barium sulphate. The percentage of sulphur present in the compound is …….. (Given Molar mass in g mol^{-1} S : 32, $BaSO_4$: 233)

(1) 63.15% (2) 21.05%
(3) 48.24% (4) 42.10%

45. Match List-I with List-II according to shape.

List-I		List-II	
A.	XeO_3	**I**	BrF_5
B.	XeF_2	**II**	NH_3
C.	XeO_2F_2	**III**	$[I_3]^-$
D.	$XeOF_4$	**IV.**	SF_4

Choose the correct answer from the options given below:

(1) A-III, B-II, C-IV, D-I
(2) A-II, B-III, C-IV, D-I
(3) A-II, B-I, C-III, D-IV
(4) A-II, B-III, C-I, D-IV

Integer Type Questions

46. A volume of x mL of 5 M $NaHCO_3$ solution was mixed with 10 mL H_2CO_3 solution to make an electrolytic buffer. If the same buffer was used in the following electrochemical cell to record a cell $Sn(s)|Sn(OH)_6^{2-}(0.5M)||HSnO_2^-(0.05M)|OH^-|Bi_2O(s)|Bi(s)$

Consider upto one of decimal for intermediate calculations

Given: $E^\circ_{HSnO_2^-|Sn(OH)_6^{2-}} = -0.9V$

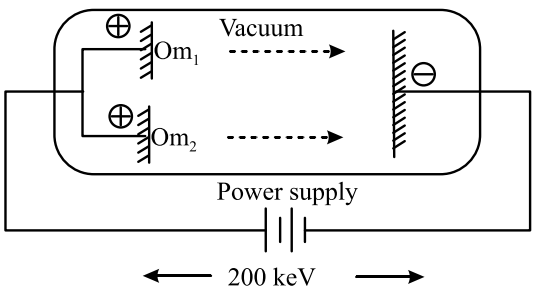
$E^\circ_{Bi_2O_3|Bi|} = -0.44V$

$pKa_{(H_2CO_3)} = 6.11$

$\frac{2.303RT}{F} = 0.059V$

$\text{Anti}\log(1.29) = 19.5$

47. Two positively charged particles m_1 and m_2 have been accelerated across the same potential difference of 200 ke V as shown below:



[Given mass of m_1 = 1 anu and m_2 = 4 amu]
The de Broglie wave length of m_1 will be x times of m_2. The value of x is _____ (nearest integer)

48. $A \longrightarrow B$ (first reaction)

$C \longrightarrow D$ (second reaction)

Consider the above two first-order reactions. The rate constant for first reaction at 500 K is double of the same at 300K. At 500 K, 50% of the reaction becomes complete in 2 hour. The activation energy of the second reaction is half of that the first reaction. If the rate constant at 500 K of the second reaction becomes double of the rate constant of first reaction at the same temperature, then rate constant for the second reaction at 300 K is _____ $\times 10^{-1}$ hour^{-1} (nearest integer)

49. The number of isoelectronic species among Sc^{3+}, Cr^{2+}, Mn^{3+}, Co^{3+} and Fe^{3+} is 'n'. If 'n' moles of AgCl is formed during the reaction of complex with formula $CoCl_3(en)_2NH_3$ with excess of $AgNO_3$ solution, then the number of electrons present in the t_{2g} orbital of the complex is:

50. For strong electrolyte Λ_m increased slowly with dilution and can be represented by the equation

$\Lambda_m = \Lambda^\circ_m - Ac^{1/2}$

Molar conductivity values of the solutions of strong electrolyte AB at 18° C are given below:

C[molL^{-1}]	0.04	0.09	0.16	0.25
$\Lambda_m\left[\text{S cm}^2\text{mol}^{-1}\right]$	96.1	95.7	95.3	94.9

The value of constnat A Based on the above data [in S cm^2 mol^{-1}/(mol/L)$^{1/2}$] unit is _____

SECTION-III (MATHEMATICS)

Single Correct Type Questions

51. Let the ellipse $E: \frac{x^2}{144} + \frac{y^2}{169} = 1$ and the hyperbola $H: \frac{x^2}{16} - \frac{y^2}{\lambda^2} = -1$ have the same foci. If e and L respectively denote the eccentricity and the length of the latus rectum of H, then the value of $24(e + L)$ is:

(1) 126 (2) 148

(3) 67 (4) 296

52. Let $f(x) = \int \frac{dx}{x^{\left(\frac{2}{3}\right)} + 2x^{\left(\frac{1}{2}\right)}}$ be such that

$f(0) = -26 + 24\log_e(2)$.

If $f(1) = a + b\log_e(3)$, where $a, b \in Z$, then $a + b$ is equal to:

(1) –11 (2) –5

(3) –18 (4) –26

53. Consider the principal values of inverse trigonometric functions, the value of the expression $\tan\left(2\sin^{-1}\left(\frac{2}{\sqrt{13}}\right) - 2\cos^{-1}\left(\frac{3}{\sqrt{10}}\right)\right)$ is equal to:

(1) $\frac{16}{63}$ (2) $\frac{33}{56}$

(3) $-\frac{16}{63}$ (4) $-\frac{33}{56}$

54. Let $f(x) = \lim\limits_{\theta \to 0}\left(\frac{\cos\pi x - x^{\left(\frac{2}{\theta}\right)}\sin(x-1)}{1 + x^{\left(\frac{2}{\theta}\right)}(x-1)}\right), x \in R.$

Consider the following two statements:

(I) $f(x)$ is discontinuous at $x = 1$.

(II) $f(x)$ is continuous at $x = -1$.

Then,

(1) Only (II) is True

(2) Only (I) is True

(3) Both (I) and (II) are True

(4) Neither (I) nor (II) is True

55. Let $y = y(x)$ be the solution of the differential equation $x\frac{dy}{dx} - y = x^2\cot x$, $x \in (0, \pi)$.

If $y\left(\frac{\pi}{2}\right) = \frac{\pi}{2}$, then $6y\left(\frac{\pi}{6}\right) - 8y\left(\frac{\pi}{4}\right)$ is equal to:

(1) 3π (2) -3π

(3) π (4) $-\pi$

56. Let P be a point in the plane of the vectors $\overrightarrow{AB} = 3\hat{i} + \hat{j} - \hat{k}$ and $\overrightarrow{AC} = \hat{i} - \hat{j} + 3\hat{k}$ such that P is equidistant from the lines AB and AC. If $\left|\overrightarrow{AP}\right| = \frac{\sqrt{5}}{2}$, then the area of the triangle ABP is:

(1) 2 (2) $\frac{\sqrt{30}}{4}$

(3) $\frac{3}{2}$ (4) $\frac{\sqrt{26}}{4}$

57. Let [·] denote the greatest integer functon. Then $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}}\left(\frac{12(13+[x])}{3+[\sin x]+[\cos x]}\right)dx$ is equal to:

(1) $11\pi+2$ (2) $15\pi+4$

(3) $12\pi+5$ (4) $13\pi+1$

58. Let the arithemetic mean of $\frac{1}{a}$ and $\frac{1}{b}$ be $\frac{5}{16}$, $a > 2$. If α is such that a, 4, α, b are in A.P., then the equation $ax^2-ax+2(\alpha-2b)=0$ has:

(1) one root in (1, 4) and another in (–2, 0)

(2) both roots in the interval (–2, 0)

(3) complex roots of magnitude less than 2

(4) one root in (0, 2) and another in (–4, – 2)

59. Let A be the focus of the parabola $y^2=8x$. Let the line $y = mx + c$ intersect the parabola at two distinct points B and C. If the centroid of the ΔABC is $\left(\frac{7}{3},\frac{4}{3}\right)$, then $(BC)^2$ is equal to:

(1) 89 (2) 80

(3) 41 (4) 32

60. An ellipse has its center at (1, – 2), one focus at (3, –2) and one vertex at (5, – 2). Then the length of its latus rectum is:

(1) 6 (2) $\frac{16}{\sqrt{3}}$

(3) $6\sqrt{3}$ (4) $4\sqrt{3}$

61. Given below are two statements:

Statement-I: $25^{13} + 20^{13} + 8^{13} + 3^{13}$ is divisible by 7.

Statement-II: The integral part of $\left(7+4\sqrt{3}\right)^{25}$ is an odd number.

In the light of the above statements, choose the correct answer from the options given below:

(1) Both Statement I and Statement II are false

(2) Both Statement I and Statement II are true

(3) Statement I is true but Statement II is false

(4) Statement I is false but Statement II is true

62. The sum of the coefficients of x^{499} and x^{500} in $(1+x)^{1000}+x(1+x)^{999}+x^2(1+x)^{998}+...+x^{1000}$ is:

(1) ${}^{1001}C_{501}$ (2) ${}^{1002}C_{501}$

(3) ${}^{1000}C_{501}$ (4) ${}^{1002}C_{500}$

63. Let the circle $x^2+y^2=4$ intersect x-axis at the points $A(a, 0)$, $a > 0$ and $B(b, 0)$. Let $P(2\cos\alpha, 2\sin\alpha)$, $0<\alpha<\frac{\pi}{2}$ and $Q(2\cos\beta, 2\sin\beta)$ be two points such that $(\alpha-\beta)=\frac{\pi}{2}$. Then the point of intersection of AQ and BP lies on:

(1) $x^2+y^2-4y-4=0$

(2) $x^2+y^2-4x-4=0$

(3) $x^2+y^2-4x-4y=0$

(4) $x^2+y^2-4x-4y-4=0$

64. Let $P_1: y=4x^2$ and $P_2: y=x^2+27$ be two parabolas. If the area of the bounded region enclosed between P_1 and P_2 is six times the area of the bounded region enclosed between the line $y = \alpha x$, $\alpha > 0$ and P_1, then α is equal to:

(1) 12 (2) 8

(3) 6 (4) 15

65. Given below are two statements:

Statement-I: The function $f: R \to R$ defined by $f(x)=\frac{x}{1+|x|}$ in one-one.

Statement-II: The function $f: R \to R$ defined by $f(x)=\frac{x^2+4x-30}{x^2-8x+18}$ is many-one.

In the light of the above statements, choose the correct answer from the options given below:

(1) Statement I is false but Statement II is true

(2) Both Statement I and Statement II are true

(3) Statement I is true but Statement II is false

(4) Both Statement I and Statement II is false

66. The sum of all the elements in the range of $f(x)=\text{Sgn}(\sin x)+\text{Sgn}(\cos x)+\text{Sgn}(\tan x)+\text{Sgn}(\cot x)$, $x\neq\frac{n\pi}{2}$, $n\in Z$, where

$\text{Sgn}(t)=\begin{cases}1, & \text{if } t>0\\ -1 & \text{if } t<0\end{cases}$, is:

(1) –2 (2) 2

(3) 4 (4) 0

67. Let $Q(a, b, c)$ be the image of the point $P(3, 2, 1)$ in the line $\frac{x-1}{1}=\frac{y}{2}=\frac{z-1}{1}$. Then the distance of Q from the line $\frac{x-9}{3}=\frac{y-9}{2}=\frac{z-5}{-2}$ is

(1) 8 (2) 7

(3) 5 (4) 6

68. Let $A=\{z\in C:|z-2|\le 4\}$ and $B=\{z\in C:|z-2|+|z+2|=5\}$.

Then the max $\{|z_1-z_2|: z_1\in A \text{ and } z_2\in B\}$ is:

(1) $\frac{17}{2}$ (2) $\frac{15}{2}$

(3) 8 (4) 9

69. $\frac{6}{3^{26}}+\frac{10\cdot 1}{3^{25}}+\frac{10\cdot 2}{3^{24}}+\frac{10\cdot 2^2}{3^{23}}+...+\frac{10\cdot 2^{24}}{3}$ is equal to:

(1) 3^{25} (2) 3^{26}

(3) 2^{25} (4) 2^{26}

70. The probability distribution of a random variable X is given below:

X	$4k$	$\frac{30}{7}k$	$\frac{32}{7}k$	$\frac{34}{7}k$	$\frac{36}{7}k$	$\frac{38}{7}k$	$\frac{40}{7}k$	$6k$
$P(X)$	$\frac{2}{15}$	$\frac{1}{15}$	$\frac{2}{15}$	$\frac{1}{5}$	$\frac{1}{15}$	$\frac{2}{15}$	$\frac{1}{5}$	$\frac{1}{15}$

If $E(X)=\frac{263}{15}$, then $P(X < 20)$ is equal to:

(1) $\frac{8}{15}$ (2) $\frac{3}{5}$

(3) $\frac{11}{15}$ (4) $\frac{14}{15}$

Integer Type Questions

71. Let $A=\begin{bmatrix}3 & -4\\ 1 & -1\end{bmatrix}$ and B be two matrices such that $A^{100} = 100B + I$. Then the sum of all the elements of B^{100} is _____

72. If the distance of the point $P(43, \alpha, \beta)$, $\beta < 0$, from the line $\vec{r}=4\hat{i}-\hat{k}+\mu\left(2\hat{i}+3\hat{k}\right)$, $\mu\in R$ along a line with direction ratios 3, –1, 0 is $13\sqrt{10}$, then $\alpha^2+\beta^2$ is equal to _____

73. Three persons enter in a lift at the ground floor. The lift will go upto 10^{th} floor. The number of ways, in which the three persons can exit the lift at three different floors, if the lift does not stop at first, second and third floors, is equal to _____

74. If $\sum_{r=1}^{25}\left(\frac{r}{r^4+r^2+1}\right)=\frac{p}{q}$, where p and q are positive integers such that $gcd(p, q) = 1$, then $p + q$ is equal to _____

75. Let f be a differentiable function satisfying $f(x)=1-2x+\int_0^x e^{(x-t)}f(t)dt, x\in R$ and let $g(x)=\int_0^x\left(f(t)+2\right)^{15}(t-4)^6(t+12)^{17}dt, x\in R$. If p and q are respectively the points of local minima and local maxima of g, then the value of $|p + q|$ is equal to _____.

PHYSICS WALLAH

JEE MAIN 2026

SESSION-01

Date: 28-01-2026

Shift-01

SECTION-I (PHYSICS)

Single Correct Type Questions

1. An atom ${}^{8}_{3}X$ is bombarded by shower of fundamental particles and in 10 s this atom absorbed 10 electrons, 10 protons and 9 neutrons. The percentage growth in the surface area of the nucleons is recorded by:

(1) 225% (2) 150%
(3) 125% (4) 900%

2. Two point charges of 1 nC and 2 nC are placed at the two corners of equilateral triangle of side 3 cm. The work done in bringing a charge of 3 nC from infinity to the third corner of the triangle is _____ μJ.

$\frac{1}{4\pi\epsilon_0} = 9\times10^9 \text{ N.m}^2/\text{C}^2$

(1) 5.4 (2) 3.3
(3) 27 (4) 2.7

3. For the two cells having same EMF *E* and internal resistance *r*, the current passing through the external resistor 6Ω is same when both the cells are connected either in parallel or in series. The value of internal resistance *r* is _____ Ω.

(1) 4 (2) 6
(3) 9 (4) 3

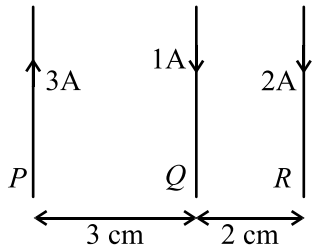
4. The electric field of an electromagnetic wave travelling through a medium is given by

$\vec{E}(x,t) = 25\sin\left(2.0\times10^{15}t - 10^7 x\right)\hat{n}$

then the refractive index of the medium is _____.
(All given measurement are in SI units)

(1) 1.2 (2) 2
(3) 1.7 (4) 1.5

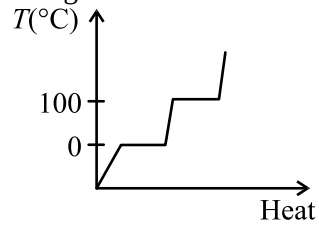
5. Three long straight wires carrying current are arranged mutually parallel as shown in the figure. The force experienced by 15 cm length of wire *Q* is _____.

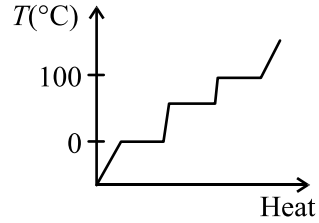


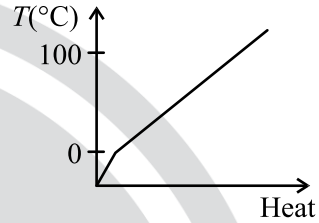
$\left(\mu_o = 4\pi\times10^{-7} \text{ T}\cdot\text{m/A}\right)$

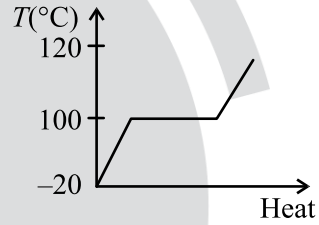
(1) 6×10^{-6} N towards *R*
(2) 6×10^{-7} N towards *P*
(3) 6×10^{-7} N towards *R*
(4) 6×10^{-6} N towards *P*

6. Which of the following best represents the temperature versus heat supplied graph for water, in the range of –20°C to 120°C ?

(1)


(2)


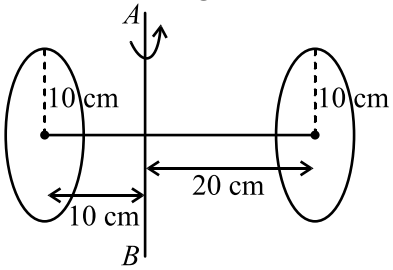
(3)


(4)


7. A block of mass 5 kg is moving on an inclined plane which makes an angle of 30° with the horizontal. Friction coefficient between the block and inclined plane surface is $\frac{\sqrt{3}}{2}$. The force to be applied on the block so that the block will move down without acceleration is _____N.
(g = 10 m/s²).

(1) 15 (2) 25
(3) 7.5 (4) 12.5

8. Two circular discs of radius each 10 cm are joined at their centres by a rod of length 30 cm and mass 600 gm as shown in figure.



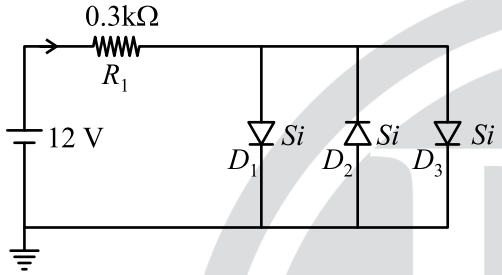
If the mass of each disc is 600 gm and applied torque between two discs is 43 × 10⁵ dyne.cm, the angular acceleration of the discs about the given axis *AB* is _____ rad/s².

(1) 22 (2) 11
(3) 27 (4) 100

9. In the potentiometer, when the cell in the secondary circuit is shunted with 4Ω resistance, the balance is obtained at the length 120 cm of wire. Now when the same cell is shunted with 12Ω resistance, the balance is shifted to a length of 180 cm. The internal resistance of cell is _____Ω

(1) 12 (2) 3
(3) 6 (4) 4

10. Assuming in forward bias condition there is a voltage drop of 0.7 V across a silicon diode, the current through diode D_1 in the circuit is _____mA.
(Assume all diodes in the given circuit are identical)



(1) 20.15 (2) 18.8
(3) 17.6 (4) 11.7

11. 10 kg of ice at –10°C is added to 100 kg of water to lower its temperature from 25°C. Consider no heat exchange to surroundings. The decrement to the temperature of water is _____°C.
(specific heat of ice = 2100 J/Kg.°C, specific heat of water = 4200 J/Kg.°C, latent heat of fusion of ice = 3.36×10^5 J/Kg)

(1) 15 (2) 11.6
(3) 6.67 (4) 10

12. The magnitudes of power of a biconvex lens (refractive index 1.5) and that of a plano-concave lens (refractive index = 1.7) are same. If the curvature of planoconcave lens exactly matches with the curvature of back surface of the biconvex lens, then ratio of radius of curvature of front and back surface of the biconvex lens is _____.

(1) 12 : 5 (2) 5 : 12
(3) 5 : 2 (4) 2 : 5

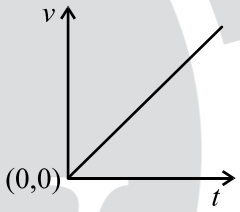
13. Two wires *A* and *B* made of different materials of lengths 6.0 cm and 5.4 cm, respectively and area of cross sections 3.0×10^{-5} m^2 and 4.5×10^{-5} m^2, respectively are stretched by the same magnitude under a given load. The ratio of the Young's modulus of *A* to that of *B* is *x* : 3. The value of *x* is _____.

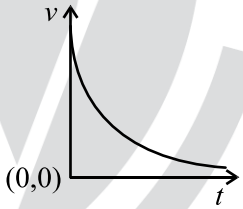
(1) 1 (2) 4
(3) 2 (4) 5

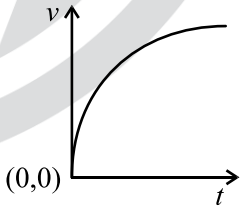
14. When both jaws of vernier callipers touch each other, zero mark of the vernier scale is right to zero mark of main scale, 4th mark on vernier scale coincides with certain mark on the main scale. While measuring the length of a cylinder, observer observes 15 divisions on main scale and 5th division of vernier scale coincides with a main scale division. Measured length of cylinder is _____mm.
(Least count of Vernier calliper = 0.1 mm)

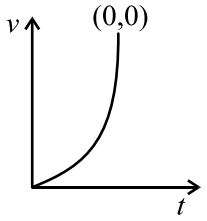
(1) 15.4
(2) 15.9
(3) 15.5
(4) 15.1

15. A particle of mass *m* falls from rest through a resistive medium having resistive force, $F = -kv$, where *v* is the velocity of the particle and *k* is a constant. Which of the following graphs represents velocity (*v*) versus time (*t*)?

(1)


(2)


(3)


(4)


16. The magnetic field at the centre of a current carrying circular loop of radius *R* is 16μT. The magnetic field at a distance $x = \sqrt{3}R$ on its axis from the centre is _____ μT.

(1) 4 (2) 8
(3) 2 (4) $2\sqrt{2}$

17. The electric current in the circuit is given as $i = i_0(t/T)$. The r.m.s current for the period $t = 0$ to $t = T$ is _____.

(1) $\frac{i_0}{\sqrt{6}}$ (2) $\frac{i_0}{\sqrt{2}}$

(3) $\frac{i_0}{\sqrt{3}}$ (4) i_0

18. Water drops fall from a tap on the floor, 5 m below, at regular intervals of time, the first drop strikes the floor when the sixth drop begins to fall. The height at which the fourth drop will be from ground, at the instant when the first drop strikes the ground is ____ m.

(g = 10 m/s^2)

(1) 3.8 (2) 4.2

(3) 2.5 (4) 4.0

19. Given below are two statements:

Statement I: A plane wave after passing through prism remains as plane wave but passing through small pin hole may become spherical wave.

Statement II: The curvature of a spherical wave emerging from a slit will increase for increasing slit width.

In the light of the above statements, choose the correct answer from the options given below

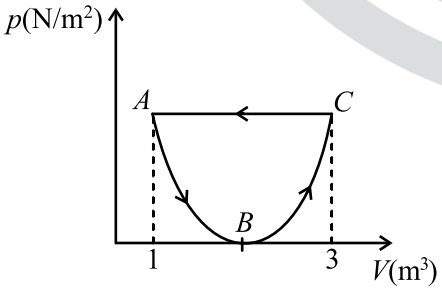
(1) Both Statement I and Statement II are false

(2) Both Statement I and Statement II are true

(3) Statement I is true but Statement II is false

(4) Statement I is false but Statement II is true

20. In the following $p - V$ diagram the equation of state along the curved path is given by $(V - 2)^2 = 4ap$ where a is a constant. The total work done in the closed path is

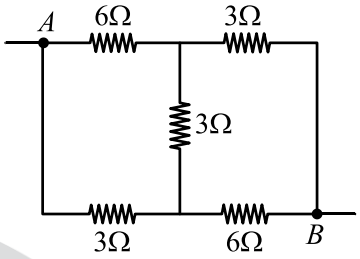


(1) $+\frac{1}{3a}$ (2) $\frac{1}{2a}$

(3) $-\frac{1}{a}$ (4) $-\frac{1}{3a}$

Integer Type Questions

21. The equivalent resistance between the points A and B in the following circuit is $\frac{x}{5}\Omega$. The value of x is _____.



22. A convex lens of refractive index 1.5 and focal length f = 18 cm is immersed in water. The difference in focal lengths of the given lens when it is in water and in air is $\alpha \times f$. The value of α is _____.

(refractive index of water = 4/3)

23. A solid sphere of radius 10 cm is rotating about an axis which is at a distance 15 cm from its centre. The radius of gyration about this axis is $\sqrt{n}$ cm. The value of n is

24. The displacement of a particle, executing simple harmonic motion with time period T, is expressed as $x(t) = A\sin\omega t$, where A is the amplitude. The maximum value of potential energy of this oscillator is found at $t = T/2\beta$. The value of β is _____.

25. The ratio of de Broglie wavelength of a deutron with kinetic energy E to that of an alpha particle with kinetic energy $2E$, is n : 1. The value of n is _____.

(Assume mass of proton = mass of neutron):

SECTION-II (CHEMISTRY)

Single Correct Type Questions

26. Given below are two statements:

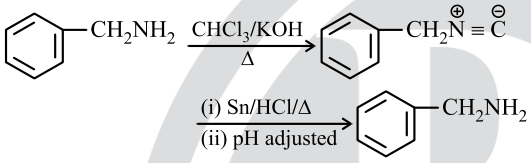
Statement I: Griss-Ilosvay test is used for the detection of nitrite ion, which involves the use of sulphanilic acid and α-naphthylamine reagent.

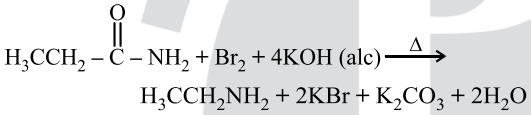
Statement II: In the above test, sulphanilic acid is diazotized by the acidified nitrite ion, which on further coupling with α-naphthylamine forms an azo-dye.

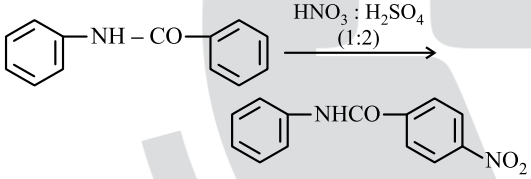
In the light of the above statements, choose the correct answer from the options given below

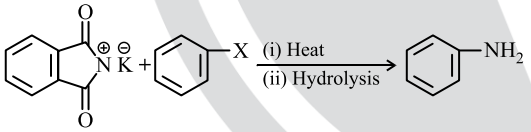
(1) Statement I is false but Statement II is true
(2) Both Statement I and Statement II are true
(3) Statement I is true but Statement II is false
(4) Both Statement I and Statement II are false

27. Consider the following reactions giving major product. Identify the correct reaction.

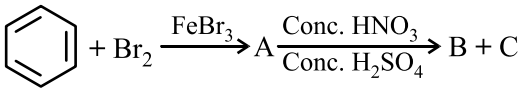
(1) 

(2) 

(3) 

(4) 

28. Method used for separation of mixture of products (B and C) obtained in the following reaction is



(1) steam distillation
(2) sublimation
(3) fractional distillation
(4) simple distillation

29. The correct statement among the following is:

(1) $Ni(CO)_4$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $[NiCl_4]^{2-}$ is paramagnetic.

(2) $[Ni(CN)_4]^{2-}$ and $[NiCl_4]^{2-}$ are diamagnetic and $Ni(CO)_4$ is paramagnetic.

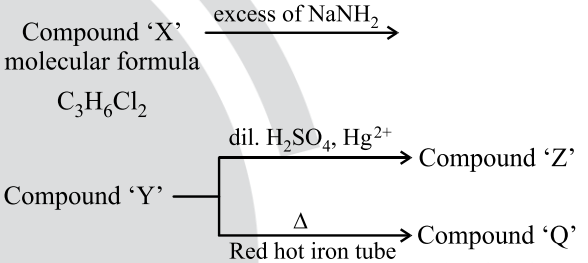
(3) $Ni(CO)_4$ is diamagnetic and $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are paramagnetic.

(4) $Ni(CO)_4$ and $[NiCl_4]^{2-}$ are diamagnetic and $[Ni(CN)_4]^{2-}$ is paramagnetic.

30. At T(K), 2 moles of liquid A and 3 moles of liquid B are mixed. The vapour pressure of ideal solution formed is 320 mm Hg. At this stage, one mole of A and one mole of B are added to the solution. The vapour pressure is now measured as 328.6 mm Hg. The vapour pressure (in mm Hg) of A and B are respectively:

(1) 400, 300 (2) 300, 200
(3) 600, 400 (4) 500, 200

31. Given below are two statements for the following reaction sequence.



Statement I: Compound 'Z' will give yellow precipitate with NaOI.

Statement II: Compound 'Q' has two different types of 'H' atoms (aromatic : aliphatic) in the ratio 1:3.

In the light of the above statements, choose the correct answer from the options given below:

(1) Statement I is false but Statement II is true
(2) Both Statement I and Statement II are false
(3) Both Statement I and Statement II are true
(4) Statement I is true but Statement II is false

32. Given below are two statements:

Statement I: The number of species among BF_4^-, SiF_4, XeF_4 and SF_4, that have unequal $E-F$ bond lengths is two. Here, E is the central atom.

Statement II: Among O_2^-, O_2^{2-}, F_2 and O_2^+, O_2^- has the highest bond order.

In the light of the above statements, choose the correct answer from the options given below

(1) Both Statement I and Statement II are true
(2) Statement I is true but Statement II is false
(3) Statement I is false but Statement II is true
(4) Both Statement I and Statement II are false

33. Given below are two statements:

Statement I: The number of pairs, from the following, in which both the ions are coloured in aqueous solution is 3.

$\left[Sc^{3+}, Ti^{3+}\right], \left[Mn^{2+}, Cr^{2+}\right], \left[Cu^{2+}, Zn^{2+}\right]$ and $\left[Ni^{2+}, Ti^{4+}\right]$

Statement II: Th^{4+} is the strongest reducing agent among $Th^{4+}, Ce^{4+}, Gd^{3+}$ and Eu^{2+}.

In the light of the above statements, choose the correct answer from the options given below

(1) Both Statement I and Statement II are true
(2) Both Statement I and Statement II are false
(3) Statement I is false but Statement II is true
(4) Statement I is true but Statement II is false

34. 20.0 dm^3 of an ideal gas 'X' at 600 K and 0.5 MPa undergoes isothermal reversible expansion until pressure of the gas is 0.2 MPa. Which of the following option is correct?

(Given: log2 = 0.3010 and log5 = 0.6989)

(1) $w = +4.1\ kJ, \Delta U = 0, \Delta H = 0; q = -4.1\ kJ$
(2) $w = 9.1\ J, \Delta U = 9.1\ J, \Delta H = 0; q = 0$
(3) $w = -9.1\ kJ, \Delta U = 0, \Delta H = 0, q = 9.1\ kJ$
(4) $w = -3.9\ kJ, \Delta U = 0, \Delta H = 0; q = 3.9\ kJ$

35. Regarding the hydrides of group 15 elements EH_3 (E = N, P, As, Sb), select the correct statement from the following:

A. The stability of hydrides decreases down the group.
B. The basicity of hydrides decreases down the group.
C. The reducing character increases down the group.
D. The boiling point increases down the group.

Choose the correct answer from the options given below:

(1) A, B & C only (2) A, B, C & D
(3) A & D only (4) B & C only

36. In period 4 of the periodic table, the elements with highest and lowest atomic radii are respectively.

(1) K & Se (2) Na & Cl
(3) K & Br (4) Rb & Br

37. The wave numbers of three spectral lines of H atom are considered. Identify the set of spectral lines belonging to Balmer series.

(R = Rydberg constant)

(1) $\frac{3R}{4}, \frac{3R}{16}, \frac{7R}{144}$ (2) $\frac{5R}{36}, \frac{8R}{9}, \frac{15R}{16}$
(3) $\frac{7R}{144}, \frac{3R}{16}, \frac{16R}{255}$ (4) $\frac{5R}{36}, \frac{3R}{16}, \frac{21R}{100}$

38. $Ph-CH=CH_2 \xrightarrow[HBr]{(PhCOO)_2}$ Product

Consider the above reaction

A. The reaction proceeds through a more stable radical intermediate.
B. The role of peroxide is to generate $H^{\bullet}$ (Hydrogen radical).
C. During this reaction, benzene is formed as a byproduct.
D. 1-Bromo-2-phenylethane is formed as the minor product.
E. The same reaction in absence of peroxide proceeds via carbocation intermediate.

Identify the correct statements. Choose the correct answer from the options given below:

(1) A & E Only (2) A, B & D Only
(3) C, D & E Only (4) A, C & E Only

39. Consider a weak base 'B' of pK_b = 5.699. 'x' mL of 0.02 M HCl and 'y' mL of 0.02 M weak base 'B' are mixed to make 100 mL of a buffer of pH 9 at 25°C. The values of 'x' and 'y' respectively are:

[Given: log2 = 0.3010, log3 = 0.4771, log5 = 0.699]

(1)

x	y
14.3	85.7

(2)

x	y
11.1	88.9

(3)

x	y
85.7	14.3

(4)

x	y
42.7	57.3

40. Consider the following reaction sequence

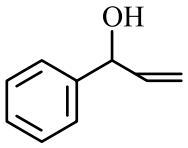
Compound (x) [76.6% C, 6.38% H, vapour density 47] $\xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } CO_2, NaOH, 120°C, \text{ high pressure}}$ Compound (y) (Major Product)

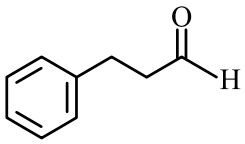
Compound (y) develops characteristic colour with neutral $FeCl_3$ solution.

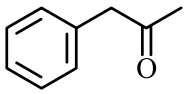
Identify the INCORRECT statement from the following for the above sequence.

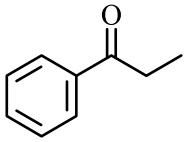
(1) Compound y will dissolve in $NaHCO_3$ and evolve a gas.
(2) Both compounds x and y will burn with sooty flame.
(3) Compound x is more acidic than compound y.
(4) Both compounds x and y will dissolve in NaOH.

41. Given below are the four isomeric compounds (P, Q, R, S)

(P) 

(Q) 

(R) 

(S) 

Identify correct statements from below.

A. Q, R and S will give precipitate with 2,4-DNP.

B. P and Q will give positive Bayer's test.

C. Q and R will give sooty flame.

D. R and S will give yellow precipitate with I_2/NaOH.

E. Q alone will deposit silver with Tollen's reagent

Choose the correct option.

(1) A and E only (2) C and E only

(3) A, C and E only (4) A, B, D and E only

42. CORRECT order of stability for the following is

$CH_2=CH^-, CH_3-CH_2^-, CH\equiv C^-$

(1) $CH\equiv C^- > CH_2=CH^- > CH_3-CH_2^-$

(2) $CH_3-CH_2^- > CH_2=CH^- > CH\equiv C^-$

(3) $CH_2=CH^- > CH\equiv C^- > CH_3-CH_2^-$

(4) $CH\equiv C^- > CH_3-CH_2^- > CH_2=CH^-$

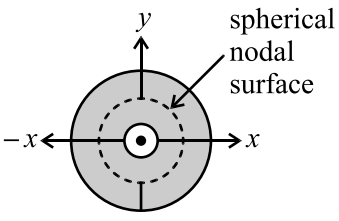
43. 

Figure 1. electron probability density for 2s orbital

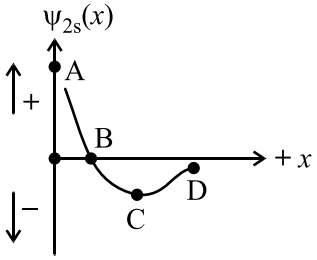


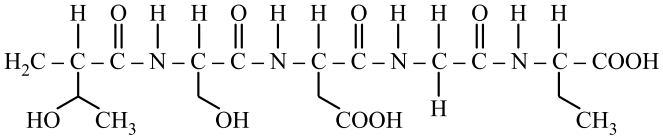
Figure 2. wave function for 2s orbital

Which of the following point in Figure 2 most accurately represents the nodal surface as shown in Figure 1?

(1) C (2) B

(3) A (4) D

44. In the given pentapeptide, find out an essential amino acid (Y) and the sequence present in the pentapeptide:



Choose the correct answer from the options given below:

(1)

(Y)	(Sequence)
Threonine	Ser – Thr – Asp – Gly – Ala

(2)

(Y)	(Sequence)
Serine	Ser – Asp – Thr – Ala – Gly

(3)

(Y)	(Sequence)
Serine	Thr – Ser – Asp – Ala – Gly

(4)

(Y)	(Sequence)
Threonine	Thr – Ser – Asp – Gly – Ala

45. An organic compound undergoes first order decomposition. The time taken for decomposition to $\left(\frac{1}{8}\right)^{th}$ and $\left(\frac{1}{10}\right)^{th}$ of its initial concentration are $t_{1/8}$ and $t_{1/10}$ respectively.

What is the value of $\frac{t_{1/8}}{t_{1/10}}\times 10$?

(log2 = 0.3)

(1) 0.9 (2) 9

(3) 30 (4) 3

Integer Type Questions

46. X is the number of geometrical isomers exhibited by $\left[Pt(NH_3)(H_2O)BrCl\right]$.

Y is the number of optically inactive isomer(s) exhibited by $\left[CrCl_2(ox)_2\right]^{3-}$

Z is the number of geometrical isomers exhibited by $\left[Co(NH_3)_3(NO_2)_3\right]$.

The value of X + Y + Z is _____.

47. Consider the following redox reaction taking place in acidic medium

$$BH_4^-(aq) + ClO_3^-(aq) \longrightarrow H_2BO_3^-(aq) + Cl^-(aq)$$

If the Nernst equation for the above balanced reaction is

$$E_{cell} = E^\circ_{cell} - \frac{RT}{nF}\ln Q$$

then the value of n is _____. (Nearest integer)

48. 0.53 g of an organic compound (x) when heated with excess of nitric acid (concentrated) and then with silver nitrate gave 0.75 g of silver bromide precipitate. 1.0 g of (x) gave 1.32 g of CO_2 gas on combustion. The percentage of hydrogen in the compound (x) is _____%. [Nearest Integer]
[Given: Molar mass in g mol^{-1} H : 1, C : 12, Br : 80, Ag : 108, O : 16; Compound (x) : $C_xH_yBr_z$]

49. 500 mL of 1.2 M KI solution is mixed with 500 mL of 0.2 M $KMnO_4$ solution in basic medium. The liberated iodine was titrated with standard 0.1 M $Na_2S_2O_3$ solution in the presence of starch indicator till the blue color disappeared. The volume (in L) of $Na_2S_2O_3$ consumed is _____. (Nearest integer)

50. Consider the dissociation equilibrium of the following weak acid

$$HA \rightleftharpoons H^+(aq) + A^-(aq)$$

If the pKa of the acid is 4, then the pH of 10 mM HA solution is ____ . (Nearest integer)
[Given: The degree of dissociation can be neglected with respect to unity]

SECTION-III (MATHEMATICS)

Single Correct Type Questions

51. Let $S = \{x^3 + ax^2 + bx + c : a,b,c \in N$ and $a,b,c \le 20\}$ be a set of polynomials. Then the number of polynomials in *S*, which are divisible by $x^2 + 2$, is
(1) 6 (2) 120
(3) 20 (4) 10

52. Let *z* be a complex number such that $|z-6| = 5$ and $|z+2-6i| = 5$. Then the value of $z^3 + 3z^2 - 15z + 141$ is equal to
(1) 37 (2) 42
(3) 61 (4) 50

53. The mean and variance of 10 observations are 9 and 34.2, respectively. If 8 of these observations are 2, 3, 5, 10, 11, 13, 15, 21, then the mean deviation about the median of all the 10 observations is
(1) 4 (2) 6
(3) 5 (4) 7

54. Let f be a polynomial function such that $f(x^2+1) = x^4 + 5x^2 + 2$, for all $x \in \mathbb{R}$.
Then $\int_0^3 f(x)\,dx$ is equal to
(1) $\frac{41}{3}$ (2) $\frac{33}{2}$
(3) $\frac{5}{3}$ (4) $\frac{27}{2}$

55. The value of $\sum_{k=1}^{\infty}(-1)^{k+1}\left(\frac{k(k+1)}{k!}\right)$ is
(1) $e/2$ (2) $\sqrt{e}$
(3) $2/e$ (4) $1/e$

56. Let $y = x$ be the equation of a chord of the circle C_1 (in the closed half-plane $x \ge 0$) of diameter 10 passing through the origin. Let C_2 be another circle described on the given chord as its diameter. If the equation of the chord of the circle C_2, which passes through the point (2, 3) and is farthest from the center of C_2, is $x + ay + b = 0$, then $a - b$ is equal to
(1) 6 (2) –2
(3) 10 (4) –6

57. Let *A*, *B* and *C* be three 2 × 2 matrices with real entries such that $B = (I + A)^{-1}$ and $A + C = I$. If $BC = \begin{bmatrix} 1 & -5 \\ -1 & 2 \end{bmatrix}$ and $CB\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 12 \\ -6 \end{bmatrix}$, then $x_1 + x_2$ is
(1) 4 (2) –2
(3) 2 (4) 0

58. The common difference of the A.P.: $a_1, a_2, \ldots, a_m$ is 13 more than the common difference of the A.P.: $b_1, b_2, \ldots, b_n$. If $b_{31} = -277, b_{43} = -385$ and $a_{78} = 327$, then a_1 is equal to
(1) 24 (2) 16
(3) 19 (4) 21

59. Let $y = y(x)$ be the solution of the differential equation $x\frac{dy}{dx} - \sin 2y = x^3\left(2 - x^3\right)\cos^2 y$, $x \neq 0$. If $y(2) = 0$, then $\tan\left(y(1)\right)$ is equal to

(1) $-\frac{3}{4}$ (2) $\frac{3}{4}$

(3) $\frac{7}{4}$ (4) $-\frac{7}{4}$

60. The value of

$$\lim_{x\to 0}\frac{\log_e\left(\sec(ex)\cdot\sec\left(e^2x\right)\cdot\ldots\cdot\sec\left(e^{10}x\right)\right)}{e^2 - e^{2\cos x}}$$

is equal to

(1) $\frac{\left(e^{10}-1\right)}{2\left(e^2-1\right)}$ (2) $\frac{\left(e^{10}-1\right)}{2e^2\left(e^2-1\right)}$

(3) $\frac{\left(e^{20}-1\right)}{2e^2\left(e^2-1\right)}$ (4) $\frac{\left(e^{20}-1\right)}{2\left(e^2-1\right)}$

61. If $\int\left(\frac{1-5\cos^2 x}{\sin^5 x\cos^2 x}\right)dx = f(x) + C$, where C is the constant of integration, then $f\left(\frac{\pi}{6}\right) - f\left(\frac{\pi}{4}\right)$ is equal to

(1) $\frac{2}{\sqrt{3}}\left(4+\sqrt{6}\right)$ (2) $\frac{4}{\sqrt{3}}\left(8-\sqrt{6}\right)$

(3) $\frac{1}{\sqrt{3}}\left(26+\sqrt{3}\right)$ (4) $\frac{1}{\sqrt{3}}\left(26-\sqrt{3}\right)$

62. The area of the region $R = \left\{(x,y) : xy \le 8, 1 \le y \le x^2, x \ge 0\right\}$ is

(1) $\frac{2}{3}\left(20\log_e(2)+9\right)$

(2) $\frac{1}{3}\left(40\log_e(2)+27\right)$

(3) $\frac{2}{3}\left(24\log_e(2)-7\right)$

(4) $\frac{1}{3}\left(49\log_e(2)-15\right)$

63. If $\frac{\tan(A-B)}{\tan A} + \frac{\sin^2 C}{\sin^2 A} = 1, A, B, C \in \left(0, \frac{\pi}{2}\right)$, then

(1) $\tan A$, $\tan B$, $\tan C$ are in G.P.

(2) $\tan A$, $\tan C$, $\tan B$ are in G.P.

(3) $\tan A$, $\tan B$, $\tan C$ are in A.P.

(4) $\tan A$, $\tan C$, $\tan B$ are in A.P.

64. If $g(x) = 3x^2 + 2x - 3$, $f(0) = -3$ and $4g\left(f(x)\right) = 3x^2 - 32x + 72$, then $f\left(g(2)\right)$ is equal to:

(1) $\frac{25}{6}$ (2) $-\frac{7}{2}$

(3) $\frac{7}{2}$ (4) $-\frac{25}{6}$

65. Let $S = \{1,2,3,4,5,6,7,8,9\}$. Let x be the number of 9-digit numbers formed using the digits of the set S such that only one digit is repeated and it is repeated exactly twice. Let y be the number of 9-digit numbers formed using the digits of the set S such that only two digits are repeated and each of these is repeated exactly twice. Then,

(1) $56x = 9y$ (2) $29x = 5y$

(3) $45x = 7y$ (4) $21x = 4y$

66. Let ABC be an equilateral triangle with orthocenter at the origin and the side BC on the line $x + 2\sqrt{2}y = 4$. If the co-ordinates of the vertex A are (α,β), then the greatest integer less than or equal to $\left|\alpha + \sqrt{2}\beta\right|$ is

(1) 4 (2) 2

(3) 3 (4) 5

67. If the distances of the point (1, 2, a) from the line $\frac{x-1}{1} = \frac{y}{2} = \frac{z-1}{1}$ along the lines

$L_1 : \frac{x-1}{3} = \frac{y-2}{4} = \frac{z-a}{b}$ and

$L_2 : \frac{x-1}{1} = \frac{y-2}{4} = \frac{z-a}{c}$

are equal, then $a + b + c$ is equal to

(1) 4 (2) 7

(3) 5 (4) 6

68. If α, β, where $\alpha < \beta$, are the roots of the equation $\lambda x^2 - (\lambda+3)x + 3 = 0$ such that $\frac{1}{\alpha} - \frac{1}{\beta} = \frac{1}{3}$, then the sum of all possible values of λ is

(1) 8 (2) 4

(3) 2 (4) 6

69. For three unit vectors $\vec{a}, \vec{b}, \vec{c}$ satisfying $\left|\vec{a} - \vec{b}\right|^2 + \left|\vec{b} - \vec{c}\right|^2 + \left|\vec{c} - \vec{a}\right|^2 = 9$ and $\left|2\vec{a} + k\vec{b} + k\vec{c}\right| = 3$, the positive value of k is

(1) 5 (2) 4

(3) 3 (4) 6

70. A bag contains 10 balls out of which k are red and $(10 - k)$ are black, where $0 \le k \le 10$. If three balls are drawn at random without replacement and all of them are found to be black, then the probability that the bag contains 1 red and 9 black balls is:

(1) $\frac{7}{55}$ (2) $\frac{7}{11}$

(3) $\frac{7}{110}$ (4) $\frac{14}{55}$

Integer Type Questions

71. In a G.P., if the product of the first three terms is 27 and the set of all possible values for the sum of its first three terms is $\mathbb{R}-(a,b)$, then a^2+b^2 is equal to_____.

72. The value of $\sum_{r=1}^{20}\left(\left|\sqrt{\pi\left(\int_0^r x|\sin \pi x|\,dx\right)}\right|\right)$ is _____

73. Let PQR be a triangle such that $\overrightarrow{PQ}=-2\hat{i}-\hat{j}+2\hat{k}$ and $\overrightarrow{PR}=a\hat{i}+b\hat{j}-4\hat{k}$, $a,b\in Z$. Let S be the point on QR, which is equidistant from the lines PQ and PR. If $\left|\overrightarrow{PR}\right|=9$ and $\overrightarrow{PS}=\hat{i}-7\hat{j}+2\hat{k}$, then the value of $3a - 4b$ is _____

74. For some $\theta\in\left(0,\frac{\pi}{2}\right)$, let the eccentricity and the length of the latus rectum of the hyperbola $x^2-y^2\sec^2\theta=8$ be e_1 and l_1, respectively, and let the eccentricity and the length of the latus rectum of the ellipse $x^2\sec^2\theta+y^2=6$ be e_2 and l_2, respectively. If $e_1^2=e_2^2\left(\sec^2\theta+1\right)$, then $\left(\frac{l_1l_2}{e_1e_2}\right)\tan^2\theta$ is equal to _____

75. If $k=\tan\left(\frac{\pi}{4}+\frac{1}{2}\cos^{-1}\left(\frac{2}{3}\right)\right)+\tan\left(\frac{1}{2}\sin^{-1}\left(\frac{2}{3}\right)\right)$, then the number of solutions of the equation $\sin^{-1}(kx-1)=\sin^{-1}x-\cos^{-1}x$ is _____