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

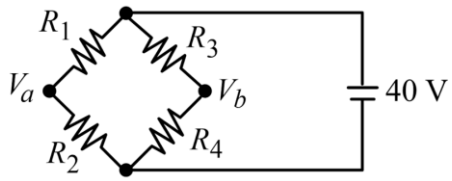
Choose the correct answer from the options given below:

(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?

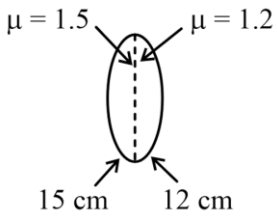
(1) Voltage
(2) Displacement current
(3) Resistance
(4) Voltage difference

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).

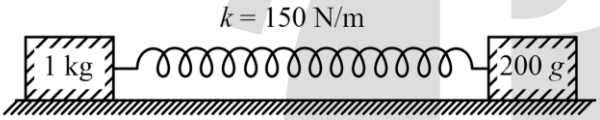
(1) 2×10^{-8}
(2) $2\sqrt{2}\times10^{-10}$
(3) $2\sqrt{2}\times10^{-8}$
(4) $10\sqrt{2}\times10^{-8}$

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

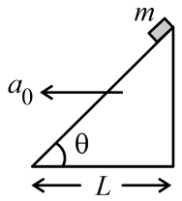
13. Match List-I with List-II.

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) $1 < n < 2$

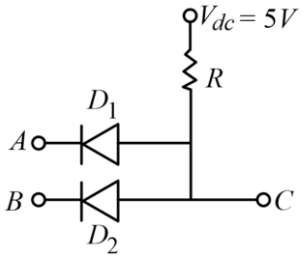
17. A long cylindrical conductor with large cross section carries an electric current distributed uniformly over its cross-section. Magnetic field due to this current is:

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:

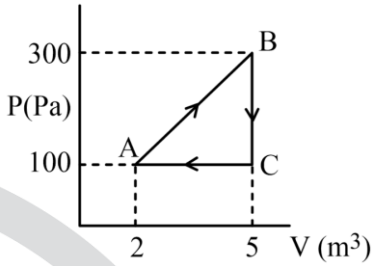
A. Effective capacitance of a series combination of capacitors is always smaller than the smallest capacitance of the capacitor in the combination.
B. When a dielectric medium is placed between the charged plates of a capacitor, displacement of charges cannot occur due to insulation property of dielectric.
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)

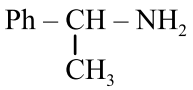
24. A beam of light consisting of wavelengths 650 nm and 550 nm illuminates the Young's double slits with separation of 2 mm such that the interference fringes are formed on a screen, placed at a distance of 1.2 m from the slits. The least distance of a point from the central maximum, where the bright fringes due to both the wavelengths coincide, is _____ $\times 10^{-5}$ m.

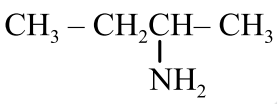
25. An inductor stores 16 J of magnetic field energy and dissipates 32 W of thermal energy due to its resistance when an a.c. current of 2 A (rms) and frequency 50 Hz flows through it. The ratio of inductive reactance to its resistance is ____.
(π = 3.14)

SECTION-II (CHEMISTRY)

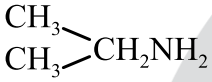
Single Correct Type Questions

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]

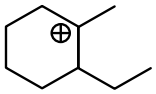
(1) I < II < III < IV

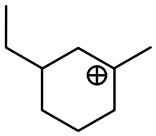
(2) III < I < II < IV

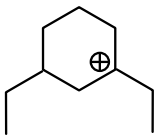
(3) II < III < IV < I

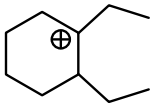
(4) II < III < I < IV

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

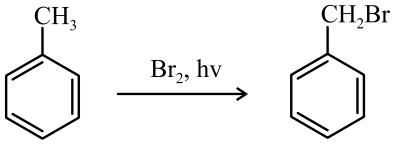
(4) B and C Only

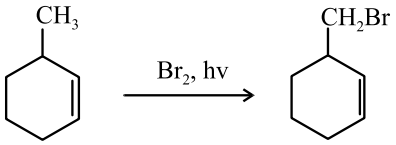
35. The wavelength of photon 'A' is 400 nm. The frequency photon 'B' is 10^{16} s^{-1}. The wave number of photon 'C' is 10^4 cm^{-1}. The correct order energy of these photons is:

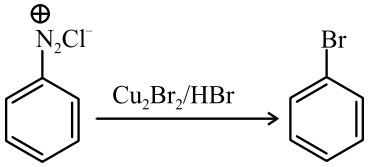
(1) C > B > A (2) A > B > C

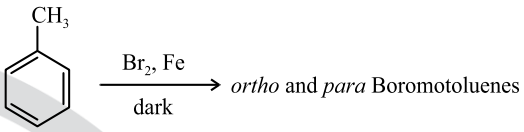
(3) A > C > B (4) B > A > C

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

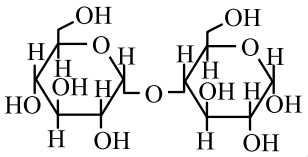
(3) C > B > A > D

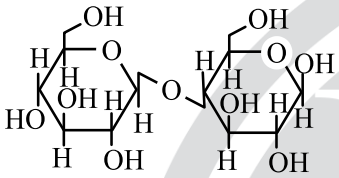
(4) A > D > B > C

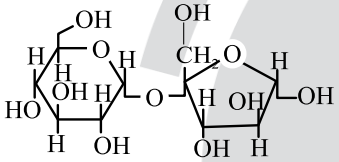
40. The correct increasing order of spin only magnetic moment values of the complex ions $[MnBr_4]^{2-}(A), [Cu(H_2O_6)]^{2+}(B), [Ni(CN)_4]^{2-}$ (C) and $[Ni(H_2O)_6]^{2+}(D)$ is:

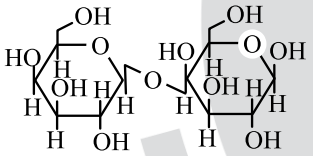
(1) C = D < B < A
(2) C < B < D < A
(3) A = B < C < D
(4) A = B < D < C

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: $E^\circ_{HSnO_2^-|Sn(OH)_6^{2-}} = -0.9V$

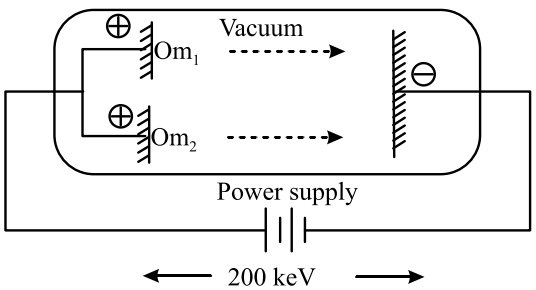
$E^\circ_{Bi_2O_3|Bi|} = -0.44V$

$pKa_{(H_2CO_3)} = 6.11$

$\frac{2.303RT}{F} = 0.059V$

$\text{Anti}\log(1.29) = 19.5$

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 _____.