
All The Best....!!!!

Part - A Physics

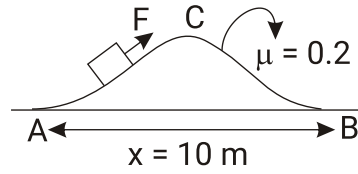
Section - I: Single Correct

*This section contains a total of 20 questions.
All questions in this section are mandatory.
For every correct response you shall be awarded 4 marks.
For every incorrect response -1 marks shall be deducted.
For more details refer the first page of this booklet.*

1. A Black metal foil receives radiation of power P from a small hot sphere at an absolute temperature T , kept at a distance d . If the temperature is doubled and the distance is halved, then the new power received by the foil will be
- (a) $64P$
 - (b) $16P$
 - (c) $4P$
 - (d) $8P$

2. A body of mass 60 kg is pushed up a rough incline of inclination 60° with just enough force to start its motion. The coefficient of static friction is, $\mu_s = 0.5$ and the coefficient of kinetic friction is, $\mu_k = 0.4$ and the force continues to act afterwards. What is the acceleration of the body? ($g = 9.8 \text{ m/s}^2$)
- (a) 14.7 m/s^2
 - (b) 1.96 m/s^2
 - (c) 0.49 m/s^2
 - (d) 4.9 m/s^2

3. A block of mass 1 kg is pulled along the curved path ACB by a tangential force (F) as shown in the figure. The work done by the frictional force when the block moves from A to B is ($g = 10 \text{ m/s}^2$)

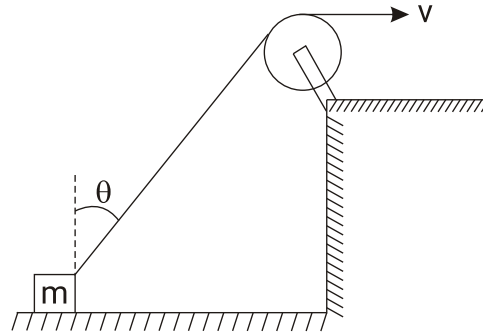


- (a) -5 J
- (b) -10 J
- (c) -20 J
- (d) None of these

4. A free electron is placed at rest in the path of a plane electromagnetic wave. The initial motion of the electron is
- (a) opposite to the electric field
 - (b) in the direction of the electric field
 - (c) along the direction of propagation of the wave
 - (d) along the magnetic field

5. The sides of a certain closed cube are increasing at a constant rate uniformly such that at the instant when the side length is 25 cm, the rate of change of the volume enclosed within the cube is exactly equal to 3 cc/s. The rate of change of the total surface area of the cube is
- (a) 12 cm²/s
 - (b) 0.12 cm²/s
 - (c) 4.8 cm²/s
 - (d) 0.48 cm²/s

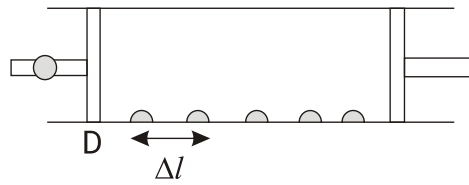
6. A block is dragged on smooth plane with the help of a rope which moves with velocity v . The horizontal velocity of the block is:



- (a) v
 (b) $\frac{v}{\sin \theta}$
 (c) $v \sin \theta$
 (d) $\frac{v}{\cos \theta}$

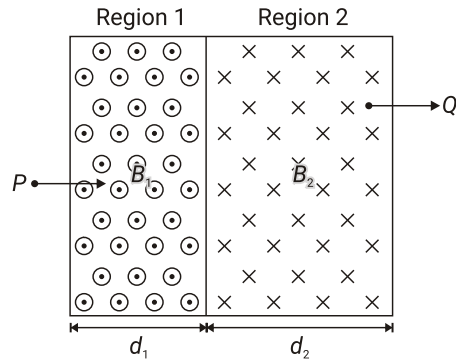
7. A deflated balloon weighs W_1 . If air equal in weight to W is pumped into the balloon, the measured weight of the balloon becomes W_2 . Suppose that the density of the air inside and outside the balloon is the same. Then
- (a) $W_2 = W_1 + W$
 - (b) $W_2 = \sqrt{W_1 + W}$
 - (c) $W_2 = W_1$
 - (d) $W_2 = W_1 - W$

8. In a Kundt's tube, the distance between two consecutive heaps is Δl for air, while it is increased by 50% for a gas in the same tube. The source with which the tube resonates is the same in both cases. If the speed of sound in air is $\frac{1000}{3}$ m/s, then the speed of sound in gas at the same temperature is



- (a) 1500 m/s
- (b) 1000 m/s
- (c) 500 m/s
- (d) 250 m/s

9. Consider the figure shown. A charged particle enters magnetic field at P and emerges out of magnetic field at Q moving parallel to its direction of motion at P . If r_1 and r_2 are the radii of circular path of the particle in region 1 and region 2 respectively, which of the following relations is correct?



- (a) $\frac{r_1}{r_2} = \frac{d_1}{d_2}$
- (b) $\frac{r_1}{r_2} = \frac{d_1 + d_2}{d_2}$
- (c) $\frac{r_1}{r_2} = \frac{B_2 + B_1}{B_1}$
- (d) $\frac{r_1}{r_2} = \frac{B_1}{B_2}$

10. An electric dipole when placed in a uniform electric field of strength E will have minimum potential energy, when the angle made by the dipole moment with the field is
- (a) π
 - (b) $\frac{3\pi}{2}$
 - (c) Zero
 - (d) $\frac{\pi}{2}$

11. An oil bath (the density of oil = $0.85 \times 10^3 \text{ kg/m}^3$) has a spherical cavity of diameter $26 \times 10^{-6} \text{ m}$ at a depth of 0.2 m. If the surface tension of oil is $26 \times 10^{-3} \text{ N/m}$ and the pressure of air over the surface of oil is 76 cm of mercury, the pressure inside the cavity will be (the density of mercury = 13.6 gm/cm^3 and $g = 10 \text{ m/s}^2$)
- (a) $1.03 \times 10^5 \text{ N/m}^2$
 - (b) $1.09 \times 10^5 \text{ N/m}^2$
 - (c) $1.17 \times 10^5 \text{ N/m}^2$
 - (d) $3.07 \times 10^5 \text{ N/m}^2$

12. The wavelength of matter waves is independent of
- (a) Mass
 - (b) Velocity
 - (c) Momentum
 - (d) Charge

13. Two Brass rods of same length but with different diameters are heated by equal amounts of heat. The expansion is
- (a) the same in both rods
 - (b) more in the thick rod
 - (c) more in the thin rod
 - (d) it's not possible to draw a definite conclusion

14. The angular frequency of a fan increases uniformly from 30 rpm to 60 rpm in π s. A dust particle is present at a distance of 20 cm from the axis of rotation. The tangential acceleration of the particle is
- (a) 0.8 ms^{-2}
 - (b) 0.34 ms^{-2}
 - (c) 0.2 ms^{-2}
 - (d) 1.2 ms^{-2}

15. At constant volume, the temperature is increased. Then
- (a) The frequency of collisions of the molecules with the walls of the container (in which the gas is kept) will be less
 - (b) The frequency of collisions of the molecules with the walls of the container (in which the gas is kept) will be more
 - (c) The frequency of collisions of the molecules with the walls of the container (in which the gas is kept) will not change
 - (d) We can't comment on what happens to the frequency of collisions of the molecules with the walls of the container (in which the gas is kept)

16. Which of the following laws of thermodynamics defines internal energy?
- (a) Zeroth law
 - (b) Second law
 - (c) First law
 - (d) Third law

17. In a step-up transformer, the voltage in the primary is 220 V and the current is 5 A. The secondary voltage is found to be 22000 V. The current in the secondary (neglect losses) is
- (a) 5 A
 - (b) 50 A
 - (c) 500 A
 - (d) 0.05 A

18. The coefficients of self-induction of two inductor coils are 20 mH and 40 mH respectively. If the coils are connected in series so as to support each other and the resultant inductance is 80 mH then the value of mutual inductance between the coils will be
- (a) 5 mH
 - (b) 10 mH
 - (c) 20 mH
 - (d) 40 mH

19. Two stones are thrown with same speed u at different angles from ground in air. If both stones have same range and height attained by them are h_1 and h_2 , then $h_1 + h_2$ is equal to

(a) $\frac{u^2}{g}$

(b) $\frac{u^2}{2g}$

(c) $\frac{u^2}{3g}$

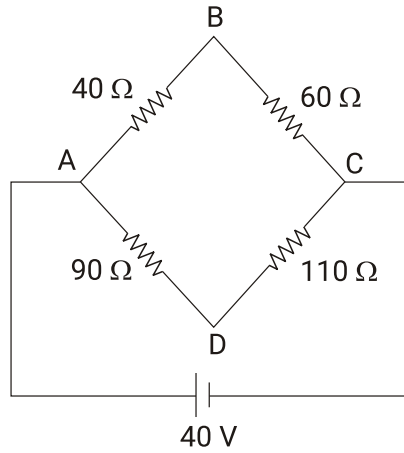
(d) $\frac{u^2}{4g}$

20. When a ferromagnetic substance is heated to a temperature above its Curie Temperature, it
- (a) Behaves like a paramagnetic substance
 - (b) Behaves like a diamagnetic substance
 - (c) Remains ferromagnetic
 - (d) Is permanently demagnetised

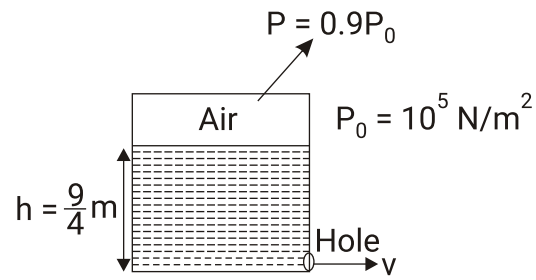
Section - II: Numerical

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21. Four resistances $40\ \Omega$, $60\ \Omega$, $90\ \Omega$ and $110\ \Omega$ make the arms of a quadrilateral ABCD. Across AC a battery of emf 40 V and internal negligible resistance is connected. The potential difference across BD in V is:

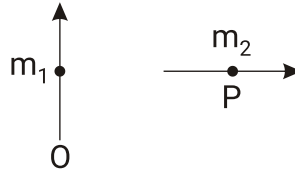


22. A closed vessel has a small hole in one of its faces near the bottom as shown. The pressure of the air trapped at the top is, $P = 0.9P_0$, where P_0 is the atmospheric pressure. The velocity (in m/s) of water coming out from the given hole at the given instant is (The density of water is, $\rho = 10^3 \text{ kg/m}^3$ and $P_0 = 1 \times 10^5 \text{ N/m}^2$)



23. The temperature of 5 mole of an ideal gas is changed from 100°C to 120°C . The change in its internal energy is 80 J. The total heat capacity of the gas at constant volume will be :- (in JK^{-1})

24. Two short magnetic dipoles M_1 and M_2 each having magnetic moment of 1 Am^2 are placed at point O and P respectively. The distance between OP is 1 meter. The torque experienced by the magnetic dipole M_2 due to the presence of M_1 is $\times 10^{-7} \text{ Nm}$.



25. An electromagnetic wave of frequency 5 GHz, is traveling in a medium whose relative electric permittivity and relative magnetic permeability both are 2. Its velocity in this medium is _____ $\times 10^7$ m/s.

26. Consider three vectors $\vec{A} = \hat{i} + \hat{j} - 2\hat{k}$, $\vec{B} = \hat{i} - \hat{j} + \hat{k}$ and $\vec{C} = 2\hat{i} - 3\hat{j} + 4\hat{k}$. A vector \vec{X} of the form $\alpha\vec{A} + \beta\vec{B}$ (α and β are numbers) is perpendicular to \vec{C} . Find $\frac{\alpha}{\beta}$.

27. A carrier wave $V_C(t) = 160 \sin(2\pi \times 10^6 t)$ volts is made to vary between $V_{\max} = 200$ V and $V_{\min} = 120$ V by a message signal $V_m(t) = A_m \sin(2\pi \times 10^3 t)$ volts. The peak voltage A_m of the modulating signal is _____.

28. In an L–R series circuit, a sinusoidal voltage, $v = v_0 \sin \omega t$ is applied. It is given that $L = 35 \text{ mH}$, $R = 11 \Omega$, $V_{\text{rms}} = 220 \text{ V}$, $\frac{\omega}{2\pi} = 50 \text{ Hz}$ and $\pi = \frac{22}{7}$. The amplitude of the current is $4n \text{ A}$. Find n .

29. In a Young's double slit experiment, the slits are separated by 0.3 mm and the screen is 1.5 m away from the plane of slits. Distance between fourth bright fringes on both sides of central bright is 2.4 cm. The frequency of light used is _____ $\times 10^{14}$ Hz.

30. An object is being heated by a heater supplying 60 W heat. The temperature of the surroundings is 20°C and the temperature of the object becomes constant at 50°C . Now the heater is switched off. The rate at which the object will lose heat when its temperature has dropped to 30°C is $4y$ watt. Then y is equal to (Use Binomial Approximation)

Part - B Chemistry

Section - I: Single Correct

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31. The chair form is _____ stable than boat form by potential energy _____ kJ/mol.
- (a) More, 44 kJ/mol
 - (b) Less, 44 kJ/mol
 - (c) More, 12.55 kJ/mol
 - (d) Less, 4 kJ/mol

32. $\text{Mn}^{2+} + \text{oxidising agent} \rightarrow \text{MnO}_4^-$; The oxidizing agent could be:

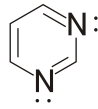
- (a) $\text{S}_2\text{O}_8^{2-}$
- (b) NaBiO_3
- (c) PbO_2
- (d) All

33. Which is not correct match?
- (a) Carius method – Halogens
 - (b) Leibig's method – C and hydrogen
 - (c) Kjeldahl's method – N_2
 - (d) Lassaigne's test – O_2

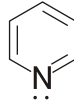
34. Which of the following combination will produce H_2 gas ?
- (a) Fe metal and conc. HNO_3
 - (b) Cu metal and conc. HNO_3
 - (c) Au metal and $NaCN(aq)$ in the presence of air
 - (d) Zn metal and $NaOH(aq)$

35. Order of basic strength of following compound

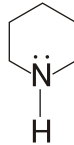
(i)



(ii)



(iii)



(iv)



(a) $iv > iii > ii > i$

(b) $iii > iv > i > ii$

(c) $i > iv > iii > ii$

(d) $iv > i > iii > ii$

36. Which of the following compound's prefix 'iso' is not correct according to rules of IUPAC nomenclature, but is commonly used in its naming –
- (a) Isopentane
 - (b) Isohexane
 - (c) Isobutane
 - (d) Isooctane

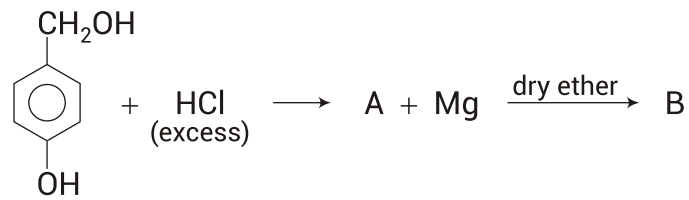
37. In chlorination the relation rate of abstraction of H at 3^0 , 2^0 , and 1^0 C atom respectively.
- (a) 5 : 3.8 : 2
 - (b) 5 : 3.8 : 1
 - (c) 1600 : 82 : 1
 - (d) 1600 : 5 : 82

38. Sodium nitroprusside when added to an alkaline solution of sulphide ions produces purple colouration due to the formation of:
- (a) $\text{Na}[\text{Fe}(\text{H}_2\text{O})_5\text{NOS}]$
 - (b) $\text{Na}_4[\text{Fe}(\text{CN})_5\text{NOS}]$
 - (c) $\text{Na}_3\text{Fe}(\text{CN})_5\text{NOS}$
 - (d) $\text{Na}_4[\text{Fe}(\text{H}_2\text{O})_5\text{NOS}]$

39. Ethanol on reaction with acetic anhydride gives
- (a) Acetic ester
 - (b) Formic ester
 - (c) Ethanoic acid
 - (d) Acetic ester and Ethanoic acid both

40. Which one of the following is NOT correct?
- (a) Boron shows a diagonal relationship with silicon
 - (b) Boron occurs in nature as its oxide (borates)
 - (c) Boron shows allotropy but silicon does not
 - (d) Boron and silicon form a number of hydrides

41.



What is B?

- (a) $\begin{array}{c} \text{CH}_2\text{MgCl} \\ | \\ \text{C}_6\text{H}_4 \end{array}$
- (b) $\begin{array}{c} \text{MgCl} \\ | \\ \text{CH}_2\text{OH} \\ | \\ \text{C}_6\text{H}_4 \end{array}$
- (c) $\begin{array}{c} \text{MgCl} \\ | \\ \text{CH}_3 \\ | \\ \text{C}_6\text{H}_4 \end{array}$
- (d) $\begin{array}{c} \text{Cl} \\ | \\ \text{CH}_3 \\ | \\ \text{C}_6\text{H}_4 \\ | \\ \text{O}^- \text{Mg}^+ \text{Cl} \end{array}$

42. Which of the following ore is concentrated using group 1 cyanide salt?
- (a) Sphalerite
 - (b) Calamine
 - (c) Siderite
 - (d) Malachite

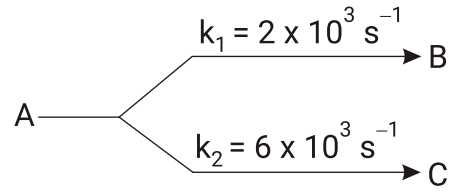
43. $(p\text{-ClC}_6\text{H}_4)_2\text{CHCCl}_3$ is used as a/an
- (a) Antiseptic for wounds
 - (b) Insecticide
 - (c) Pyrene
 - (d) Refrigerant

44. In which of the following order the given complex ions are arranged correctly with respect to their decreasing spin-only magnetic moment ?
- (i) $[\text{FeF}_6]^{3-}$
 - (ii) $[\text{Co}(\text{NH}_3)_6]^{3+}$
 - (iii) $[\text{NiCl}_4]^{2-}$
 - (iv) $[\text{Cu}(\text{NH}_3)_4]^{2+}$
- (a) (i) > (iii) > (iv) > (ii)
 - (b) (ii) > (iii) > (i) > (iv)
 - (c) (iii) > (iv) > (ii) > (i)
 - (d) (ii) > (i) > (iii) > (iv)

45. Which of the following is less than zero for ideal solutions ?
- (a) ΔH_{mix}
 - (b) ΔV_{mix}
 - (c) ΔG_{mix}
 - (d) ΔS_{mix}

46. Iodoform test is not given by
- (a) $C_6H_5COC_6H_5$
 - (b) CH_3COCH_3
 - (c) $CH_3CH_2COCH_3$
 - (d) $CH_3CH_2CHOHCH_3$

47. Consider the following parallel reaction in which reactant A can form two products B & C



find B%

- (a) 25%
- (b) 50%
- (c) 75%
- (d) 80%

48. $\text{C}_6\text{H}_5\text{CH}_3 \xrightarrow{\text{Br}_2/\text{FeBr}_3}$ the reaction is called

- (a) Nucleophilic substitution
- (b) Free radical addition
- (c) Electrophilic substitution
- (d) Free radical substitution

49. Which one of the following on reduction with lithium aluminium hydride yields a secondary amine?
- (a) Methyl isocyanide
 - (b) Acetamide
 - (c) Methyl cyanide
 - (d) Nitromethane

50. The specific conductance of saturated solution of CaF_2 is $3.86 \times 10^{-5} \text{ mho cm}^{-1}$ and that of water used for the solution is $0.15 \times 10^{-5} \text{ mho cm}^{-1}$. The specific conductance of CaF_2 alone is (in mho cm^{-1})

- (a) 3.71×10^{-5}
- (b) 4.01×10^{-5}
- (c) 3.7×10^{-4}
- (d) 3.86×10^{-4}

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51. 100 g of propane is completely reacted with 1000 g of oxygen. The mole fraction of carbon dioxide in the resulting mixture is $Z \times 10^{-2}$. The value of Z is _____. (Nearest integer) [Atomic weight: H = 1.008; C = 12.00; O = 16.00]

52. The volume (in mL) of 0.125 M AgNO_3 required to quantitatively precipitate chloride ions in 0.3 g of $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ is

_____.

M.W. of $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3 = 267.46 \text{ g/mol}$

M.W. of $\text{AgNO}_3 = 169.87 \text{ g/mol}$

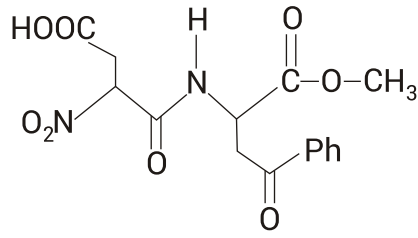
53. If 75% of a first-order reaction was completed in 90 minutes, 60% of the same reaction would be completed in approximately (in minutes) _____.
(Take : $\log 2 = 0.30$; $\log 2.5 = 0.40$)

54. An organic compound (A) C_5H_7OCl reacts rapidly with ethanol to give (B) $C_7H_{12}O_2$, (A) also reacts with water to produce acid which reacts with Br_2 to give $C_5H_8Br_2O_2$. 'B' on boiling with aqueous H_2SO_4 formed an acid (C). When C is oxidized with $KMnO_4$ to an acid (D) $C_4H_6O_3$ and CO_2 gas are produced. On mild heating, 'D' gives E. E cannot reduce Tollen's reagent. Calculate the molecular weight of E.

55. A transition metal of 3d-series exhibit its highest oxidation state in its amphoteric oxide as well as in fluoride.
The group number of this element in long form of periodic table = x .
Valency of metal in highest oxidation state = y
The value of $|x - y|$ is

56. Of the following four aqueous solutions, total number of those solutions whose freezing point is lower than that of 0.10 M C_2H_5OH is _____
(Integer answer)
- (a) 0.10 M $Ba_3(PO_4)_2$
 - (b) 0.10 M Na_2SO_4
 - (c) 0.10 M KCl
 - (d) 0.10 M Li_3PO_4

57. Total number of functional groups in following compound which can be reduced using NaBH_4



58. A compound with molecular formula $C_8H_{18}O_4$ does not give litmus test and does not give colour with 2, 4-DNP. If the compound reacts with excess $MeCOCl$, it gives a compound whose vapour density is 131. Compound A contains how many hydroxy groups?

59. 10.0 ml of Na_2CO_3 solution is titrated against 0.2 M HCl solution. The following titer values were obtained in 5 readings. 4.8 ml, 4.9 ml, 5.0 ml, 5.0 ml and 5.0 ml Based on these readings, and convention of titrimetric estimation of concentration of Na_2CO_3 solution is _____mM.
(Round off to the nearest integer)

60. Amongst the following, the total number of compounds which are expected to give blood red colouration when FeCl_3 is added to their respective Lassaigne's extract is Thiourea, benzene sulphonic acid, sulphanilic acid, diphenyl sulphide, urea, benzanilide, semicarbazide hydrochloride, p-toluidine, m-dinitrobenzene.

Part - C Mathematics

Section - I: Single Correct

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61. 5 Questions are asked in a question paper. Out of which two questions can be solved by two-two methods, two question by three-three and one question can be solved by only one method then the number of possible attempts to solve the question paper are -
- (a) 2^5
 - (b) $2^2 \cdot 3^2 \cdot 1$
 - (c) 144
 - (d) 288

62. If A and B are square matrices of size $n \times n$ such that $A^2 - B^2 = (A - B)(A + B)$, then which of the following will be always true:
- (a) $AB = BA$
 - (b) either of A or B is a zero matrix.
 - (c) either of A or B is an identify matrix.
 - (d) $A = B$

63. If two events A and B are such that $P(A + B) = \frac{5}{6}$, $P(AB) = \frac{1}{3}$ and $P(\bar{A}) = \frac{1}{2}$, then the events A and B are
- (a) Independent
 - (b) Mutually exclusive
 - (c) Mutually exclusive and independent
 - (d) None of these

64. The function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = (x - 1)(x - 2)(x - 3)$ is -
- (a) one-one but not onto
 - (b) onto but not one-one
 - (c) both one and onto
 - (d) neither one-one nor onto

65. The middle term in the expansion of $(1 - 3x + 3x^2 - x^3)^6$ is -
- (a) ${}^{18}C_{10}x^{10}$
 - (b) ${}^{18}C_9(-x)^9$
 - (c) ${}^{18}C_9x^9$
 - (d) $-{}^{18}C_{10}x^{10}$

66. If $ABCD$ is a rhombus whose diagonals cut at the origin O , then $\vec{OA} + \vec{OB} + \vec{OC} + \vec{OD}$ is equal to -
- (a) $\vec{AB} + \vec{AC}$
 - (b) $\vec{AB} + \vec{BC}$
 - (c) $2(\vec{AC} + \vec{BD})$
 - (d) 0

67. Let $y = y(x)$ be the solution of the differential equation $\operatorname{cosec}^2 x dy + 2dx = (1 + y \cos 2x)\operatorname{cosec}^2 x dx$, with $y\left(\frac{\pi}{4}\right) = 0$. Then, the value of $(y(0) + 1)^2$ is equal to
- (a) e
 - (b) $e^{\frac{1}{2}}$
 - (c) e^{-1}
 - (d) $e^{-\frac{1}{2}}$

68. If roots of the equation $3x^2 + 2(a^2 + 1)x + (a^2 - 3a + 2) = 0$ are of opposite signs, then a lies in the interval -
- (a) $(-\infty, 1)$
 - (b) $(-\infty, 0)$
 - (c) $(1, 2)$
 - (d) $\left(\frac{3}{2}, 2\right)$

69. The line $y = x + 2$ touches the hyperbola $5x^2 - 9y^2 = 45$ at the point-
- (a) $(0, 2)$
 - (b) $(3, 1)$
 - (c) $\left(-\frac{9}{2}, -\frac{5}{2}\right)$
 - (d) None of these

70. If $\cos^{-1} x - \cos^{-1} \frac{y}{2} = \alpha$, then $4x - 4xy \cos \alpha + y^2$ is equal to

- (a) $4 \sin^2 \alpha$
- (b) $-4 \sin^2 \alpha$
- (c) $2 \sin 2\alpha$
- (d) 4

71. If $\cos \theta + \cos 7\theta + \cos 3\theta + \cos 5\theta = 0$, then $\theta =$

(a) $\frac{n\pi}{4}; n \in I$

(b) $\frac{n\pi}{2}; n \in I$

(c) $\frac{n\pi}{8}; n \in I; n \neq 8k$

(d) $\frac{n\pi}{3}; n \in I$

72. The number $\log_2 7$ is
- (a) An integer
 - (b) A rational number
 - (c) An irrational number
 - (d) A prime number

73. The Mean of the first three terms is 14 and Mean of next two terms is 18. The Mean of all the five terms is -
- (a) 14.5
 - (b) 15.0
 - (c) 15.2
 - (d) 15.6

74. If the lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $\frac{x-3}{1} = \frac{y-3}{1} = \frac{z-k}{1} = \frac{z}{1}$ intersect, then $k =$
- (a) $\frac{2}{9}$
 - (b) $\frac{9}{2}$
 - (c) 0
 - (d) None of these

75.

The value of $\int_{-\pi/2}^{\pi/2} \frac{1}{1 + e^{\sin x}} dx$ is

- (a) π
- (b) $\frac{3\pi}{2}$
- (c) $\frac{\pi}{4}$
- (d) $\frac{\pi}{2}$

76. The area bounded by the curve $y = x|x|$, x -axis and the ordinates $x = 1$, $x = -1$ is given by
- (a) 0
 - (b) $\frac{1}{3}$
 - (c) $\frac{2}{3}$
 - (d) None

77. The value of the determinant $\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ bc & ca & ab \end{vmatrix}$ is -

- (a) $abc(a - b)(b - c)(c - a)$
- (b) $(a - b)(b - c)(c - a)(a + b + c)$
- (c) $(a - b)(b - c)(c - a)(ab + bc + ca)$
- (d) None of these

78. If $x = -2$ and $y = 1$, then the value of $(4y^2 - 9x^2)(16y^4 + 36x^2y^2 + 81x^4)$ is equal to
- (a) 46592
 - (b) -46592
 - (c) -45692
 - (d) 45692

79. $\int x \sin x \sec^3 x dx =$

(a) $\frac{1}{2}[\sec^2 x - \tan x] + c$

(b) $\frac{1}{2}[x \sec^2 x - \tan x] + c$

(c) $\frac{1}{2}[x \sec^2 x + \tan x] + c$

(d) $\frac{1}{2}[\sec^2 x + \tan x] + c$

80. $\lim_{x \rightarrow \infty} \left[\frac{1^3 + 2^3 + 3^3 + \dots + n^3}{n^4} \right] =$

- (a) $\frac{1}{2}$
- (b) $\frac{1}{3}$
- (c) $\frac{1}{4}$
- (d) None of these

Section - II: Numerical

*This section contains a total of 10 questions.
Out of the 10 questions, 5 questions are mandatory.
For every correct response you shall be awarded 4 marks.
For every incorrect response -1 marks shall be deducted.
For more details refer the first page of this booklet.*

81. The area of the triangle formed by any tangent to the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ with its asymptotes is

82. If $(0, 3 + \sqrt{5})$ is a point on the ellipse whose foci are $(2, 3)$, $(-2, 3)$ then the length of the semimajor axis is:

83.

If $\tan \theta = 4$, then the value of $\left(\frac{\tan \theta}{\frac{\sin^3 \theta}{\cos \theta} + \sin \theta \cos \theta} \right)$ is equal to

84. If the variance of the following frequency distribution:

Class :	10 – 20	20 – 30	30 – 40
Frequency :	2	x	2

is 50, then x is equal to

85. The domain of the function $y = \sqrt{\sin x + \cos x} + \sqrt{7x - x^2 - 6}$ is $\left[p, \frac{q\pi}{4} \right] \cup \left[\frac{r\pi}{4}, s \right]$ then value of $p + q + r + s$ is

86. If M is the foot of the perpendicular from point P on a parabola to its directrix & SPM is an equilateral triangle where S is focus then SP is equal to λa , where λ equals

87. The number of integral values of m , for which the x -coordinate of the point of intersection of the lines $3x + 4y = 9$ and $y = mx + 1$ is also an integer, is equal to _____ .

88. A man standing on a level plane observes the elevation of the top of a pole to be θ . He then walks a distance equal to double the height of the pole and then finds that the elevation is now 2θ . The $\cot \theta$ is equal to

89. If z_1, z_2, z_3 are three distinct complex numbers and a, b, c are three positive real numbers such that

$$\frac{a}{|z_2 - z_3|} = \frac{b}{|z_3 - z_1|} = \frac{c}{|z_1 - z_2|}, \text{ then } \frac{a^2}{z_2 - z_3} + \frac{b^2}{z_3 - z_1} + \frac{c^2}{z_1 - z_2} \text{ is equal to}$$

90. If in a ΔABC , $a = 5$, $b = 7$ and $\sin A = \frac{3}{4}$, then how many such triangles are possible?