Rankers

SAMPLE PAPER - 09


Physics

Section A

Q. 1. If x grams of steam at 100°C becomes water at 100°C which converts y grams of ice at 0°C into water at 100°C, then the ratio x/y will be :

L_{ice} = 80 cal/g

L_{steam} = 540 cal/g

S_{water} = 1 cal/g°C

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

(2) $\dfrac{27}{4}$

(3) 3

(4) $\dfrac{4}{27}$

Q. 2. A vessel is filled with a gas at a pressure of 76 cm of mercury at a certain temperature. The mass of the gas is increased by 50 % by introducing more gas in the vessel at the same temperature. The resultant pressure, in cm of Hg, is :

(1) 76

(2) 152

(3) 114

(4) 1117

Q. 3. The temperature drop through a two layer furnace wall is 900°C. Each layer is of equal area of cross-section. Which of the following actions will result in lowering the temperature θ of the interface ?

| Inner layer	Outer layer
1000ºC	100ºC

θ
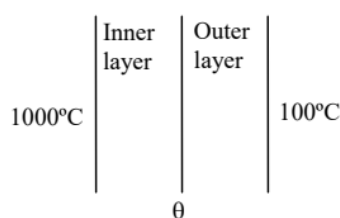
(1) By increasing the thermal conductivity of outer layer

(2) By increasing the thermal conductivity of inner layer

(3) By increasing thickness of outer layer

(4) By decreasing thickness of inner layer

Q. 4. In a resonance pipe the first and second resonance are obtained at lengths 22.7 cm and 70.2 cm, respectively. Which of the following is an appropriate estimate of the end correction of the pipe?

(1) 1.05 cm

(2) 115.5 mm

(3) 92.5 mm

(4) 2.135 cm

Q. 5. A swimmer is swimming with constant velocity $2\sqrt{2}$ m/s due North-East in a calm lake. He observes his image in a mirror fitted at the rear of a boat moving with constant velocity 1 m/s due East. Velocity of his image as observed by him in the mirror will be :

(1) 2 m/s

(2) $2\sqrt{2}$ m/s

(3) $2\sqrt{5}$ m/s

(4) 3 m/s

Q. 6. White light is incident normally on a glass surface ($n = 1.52$) that is coated with a film of MgF_2 ($n = 1.38$). For what minimum thickness of the film will yellow light of wavelength 550 nm (in air) be missing in the reflected light?
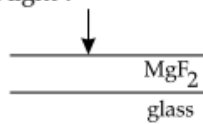
(1) 99.6 nm   (2) 49.8 nm
(3) 19.6 nm   (4) 10.6 nm

Q. 7. A prism has a refractive index of cot A/2. Then minimum angle of deviation is:
(1) $180° – A$ (2) $180° – 2A$
(3) $90° – A$ (4) $A/2$

Q. 8. Two coherent point sources S_1 and S_2 vibrating in phase emit light of wavelength λ. The separation between the sources is 2λ. The smallest distance from S_2 on a line passing through S_2 and perpendicular to S_1S_2 where a minimum intensity occurs is:
(1) $\dfrac{7\lambda}{12}$ (2) $\dfrac{15\lambda}{4}$
(3) $\dfrac{\lambda}{2}$ (4) $\dfrac{3\lambda}{4}$

Q. 9. In Young's experiment, the ratio of maximum and minimum intensities in the fringe system is $9 : 1$. The ratio of amplitudes of coherent sources is:
(1) $9 : 1$ (2) $3 : 1$
(3) $2 : 1$ (4) $1 : 1$

Q. 10. An p-n junction (D) shown in the figure can act as a rectifier. An alternating current source (V) is connected in the circuit.
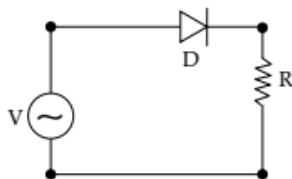

The current (I) in the resistor R can be shown by
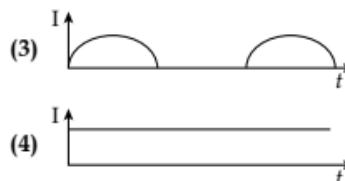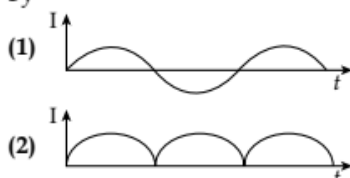
Q. 11. A material whose K absorption edge is 0.15 Å is irradiated with 0.1 Å X-rays. The maximum kinetic energy of photoelectrons that are emitted from K-shell is:
(1) 41 KeV   (2) 51 KeV
(3) 61 KeV   (4) 71 KeV

Q. 12. An electron is moving with a velocity of $\dfrac{c}{10}$. The de-Broglie wavelength associated with it will be:
(1) 0.48×10^{-10} m   (2) 0.24×10^{-10} Å
(3) 0.24×10^{-10} m   (4) 1.24×10^{-10} m

Q. 13. Stopping potentials of 24, 100, 110, 115 kV are measured for photoelectrons emitted from a certain element when it is irradiated with monochromatic X-rays. If the element is used as a target in an X-ray tube. The energy of $K\alpha$ line is:
(1) 54 KeV   (2) 76 KeV
(3) 88 KeV   (4) 32 KeV

Q. 14. A heavy nucleus having mass number 200 gets disintegrated into two small fragments of mass number 80 and 120. If binding energy per nucleon for parent atom is 6.5 MeV and for daughter nuclei is 7 MeV and 8 MeV, respectively, then the energy released in the decay will be:
(1) 200 MeV   (2) –220 MeV
(3) 220 MeV   (4) 180 MeV

Q. 15. A particle of mass 'm' is executing oscillations about the origin on the x-axis. Its potential energy is $U(x) = K|x|^3$ where K is a positive constant. If the amplitude of oscillation is 'a' then its time period T is:
(1) Proportional to $\dfrac{1}{\sqrt{a}}$
(2) Independent of a
(3) Proportional to $\sqrt{a}$
(4) Proportional to $a^{3/2}$

Q. 16. Two blocks are connected by a massless string through an ideal pulley as shown. A force of 22 N is applied on block B when initially the blocks are at rest. Then acceleration of centre

of mass of block A and block B, 2 sec, after the application of force is (masses of A and B are 4 kg and 6 kg, respectively and surfaces are smooth) :
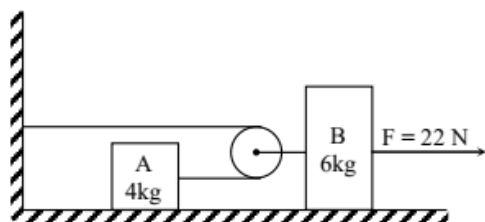
(1) 1.4 m/s^2 (2) 1 m/s^2

(3) 2 m/s^2 (4) None of these

Q. 17. Observe the following circuit.
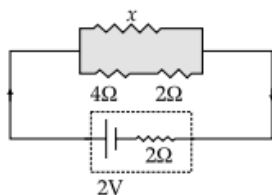
In order that the power dissipated in external circuit is maximum, the value of x should be (in ohm) ?

(1) 4Ω (2) 3Ω

(3) 2Ω (4) 1Ω

Q. 18. In series LCR circuit voltage drop across resistance is 8 volt; across inductor voltage drop = 6V and across capacitor is 12 volt. Then :

(1) Voltage of the source will be leading current in the circuit.

(2) Voltage drop across each element will be less than the applied voltage.

(3) Power factor of circuit will be $\frac{4}{3}$.

(4) None of these

Q. 19. If an electron revolves around a proton, then its time period T is (R = radius of orbit) :

(1) $\propto R^2$ (2) $\propto R^{3/2}$

(3) $\propto R^3$ (4) $\propto R$

Q. 20.
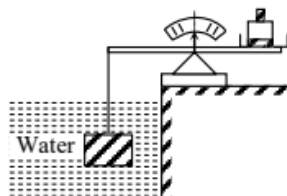
The volume of brick is 2.197 litres. The submerged brick is balanced by a 2.54 kg mass on the beam scale. The weight of the brick is : ($g = 9.8 \text{ m/s}^2$)
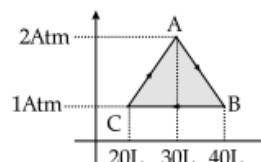
(1) 46 N   (2) 50 N

(3) 56 N   (4) 72 N

Section B

Q. 21. A cube of mass 3 kg is kept on a frictionless horizontal surface. The block is given an impulse so that point 'A' acquires velocity 4 m/s in the direction shown. If speed of point B is $4\sqrt{2}$ m/s, K.E. of block is .... J.
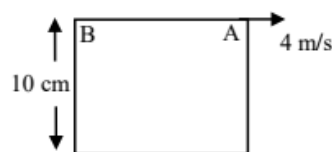

Q. 22. Consider a pv–cyclic process ABCA as per described by the graph below.

Heat of 1205. J is provided for the process to take place. The amount of heat rejected (in joule) in one cycle is ?

Q. 23. Each of the blocks shown in figure has mass 1 kg. The rear block moves with a speed of 2m/s towards the front block kept at rest. The spring attached to the front block is light and has a spring constant 50 N/m. The maximum compression of the spring is given by $\frac{X}{10}$ m, then the value of X is .... m.
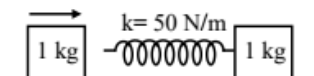
Q. 24. A rectangular plate of mass 20 kg is suspended from points A and B as shown. If the pin B is suddenly removed then the angular acceleration of the plate is .... rad/sec^2 ($g = 10 \text{ m/s}^2$).
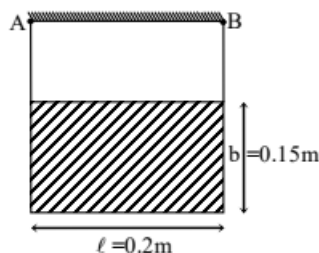
Q. 25. In a certain region of space, electric potential V is given by $V = ax^2 + ay^2 + 2az^2$ (where 'a' is a constant of proper dimensions). Work done by electric field in moving a $2\mu C$ charge from origin to (0, 0, 0.1 m) is (-5×10^{-8}) J.

The approximate value of 'a' is V/m^2 is ....

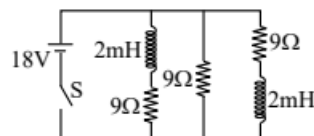**Q. 26.** In figure $C_1 = 2 \mu F$ $C_2 = 6 \mu F$ and $C_3 = 3.5 \mu F$. If break down voltages of the individual capacitors are $V_1 = 100$ V, $V_2 = 50$ V and $V_3 = 400$ V. Maximum voltage can be placed across points a and b is ....$\times \dfrac{100}{3}$ volt.
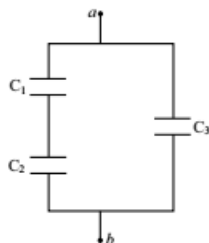
Q. 27. Consider the circuit shown in figure. What is the current through the battery just after the switch is closed is .... A.

Q. 28. Position of a particle moving along a straight line is given by $x = 2t^2 + t$. Find the velocity at $t = 2$ sec is .... m/s.

Q. 29. A particle moving towards a concave mirror of focal length 20 cm has a speed of 9 m/s when it is 30 cm away from the focus. The speed of the image is _____ m/s.

Q. 30. A wire of length '2 m' is clamped horizontally between two fixed support. A mass $m = 5$ kg is hanged from middle of wire. The vertical and depression in wire in equilibrium is .... cm.

(Young modulus of wire $= 2.4 \times 10^9$ N/m^2, cross-sectional area $= 1$ cm^2)

Chemistry

Section A

Q. 31. For a molecule Br_2, total distance between two nuclei is 3.2 Å. What will be the co-valent radius of Br atom ?

(1) 1.6 Å   (2) 6.4 Å

(3) 2.4 Å   (4) 4.9 Å

Q. 32. Match the items under list (1) with items under list (2) select the correct answers from the sets (1), (2),(3) and (4) :

List (1) **Molecule**

(a) PCl_5 (b) F_2O

(c) BCl_3 (d) NH_3

List (2) **Shape**

(i) V-shaped

(ii) Triangular planar

(iii) Trigonal bipyramidal

(iv) Trigonal pyramidal
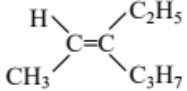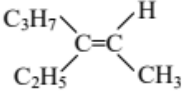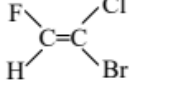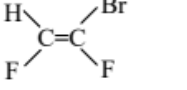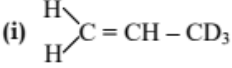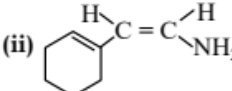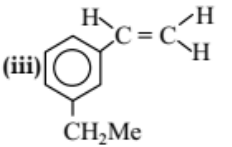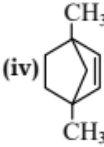
(v) Tetrahedral

(1) a - i, b - v, c - iv, d - iii

(2) a - ii, b -iii, c - i , d - ii

(3) a - iv, b - iii, c - ii, d - v

(4) a - iii, b - i, c - ii, d - iv

Q. 33. When an open container of volume V is heated from normal temperature T_1 K to T_2 K, the volume of expelled air at temperature T_1 K is $\Delta V'$. Therefore value $\Delta V'/V$ is :

(1) $1 - \dfrac{T_2}{T_1}$ (2) $1 - \dfrac{T_1}{T_2}$

(3) $1 + \dfrac{T_1}{T_2}$ (4) $\dfrac{T_2}{T_1} - 1$

Q. 34. Calculate the work done when 2 moles of hydrogen expand isothermally and reversibly at 27°C from 15 to 50 litres.

(1) 14.45 k cal   (2) 1445 J

(3) −1445 cal   (4) 14.45 kJ

Q. 35. The equilibrium constant expression for the equilibrium

$$2NH_3(g) + 2O_2(g) \rightleftharpoons N_2O(g) + 3H_2O(g) \text{ is}$$

(1) $K_c = \dfrac{[N_2O][H_2O]^3}{[NH_3][O_2]}$

(2) $K_c = \dfrac{[H_2O]^3[N_2O]}{[NH_3]^2[O_2]^2}$

(3) $K_c = \dfrac{[NH_3]^2[O_2]^2}{[N_2O][H_2O]^3}$

(4) $K_c = \dfrac{[NH_3][O_2]}{[N_2O][H_2O]}$

Q. 36. Calculate pH of 0.1 M CH_3COOH

(Given $K_{a_{CH_3COOH}} = 2 \times 10^{-5}$)

(1) 2.5   (2) 2.2

(3) 2.85   (4) 3.15

Q. 37. IUPAC name of

$$H_3C - \underset{\underset{C_2H_5}{|}}{CH} - CH_2 - \underset{\underset{OH}{|}}{CH} - CH_2Cl \text{ is:}$$

(1) 1-chloro-4-methylhexan-2-ol

(2) 1-chloro-4-methylhexan-2-al

(3) 1-chloro-4-ethylpentan-2-ol

(4) 1-chloro-2-hydroxy-4-methylhexane

Q. 38. The Z-configuration in the following is :

(1) $\underset{CH_3}{\overset{H}{\diagdown}} C = C \overset{C_2H_5}{\underset{C_3H_7}{\diagup}}$ (2) $\underset{C_2H_5}{\overset{C_3H_7}{\diagdown}} C = C \overset{H}{\underset{CH_3}{\diagup}}$

(3) $\underset{H}{\overset{F}{\diagdown}} C = C \overset{Cl}{\underset{Br}{\diagup}}$ (4) $\underset{F}{\overset{H}{\diagdown}} C = C \overset{Br}{\underset{F}{\diagup}}$

Q. 39. Metals like Pt and Pd can take up large volume of hydrogen under special conditions. Hydrogen thus retained by the metal is called :

(1) Absorbed hydrogen

(2) Nascent hydrogen

(3) Reactive hydrogen

(4) Occluded hydrogen

Q. 40. The power of halides of boron to act as lewis acids decreases in the order :

(1) $BF_3 > BCl_3 > BBr_3$ (2) $BBr_3 > BCl_3 > BF_3$

(3) $BCl_3 > BF_3 > BBr_3$ (4) $BCl_3 > BBr_3 > BF_3$

Q. 41. Which M—M bond has highest bond energy :

(1) Sn—Sn   (2) Ge—Ge

(3) Si—Si   (4) Pb—Pb

Q. 42. Match compounds given in (X) with their uses in (Y) :

	X		Y
a.	Na_2CO_3	1	glass
b.	Na_2SO_4	2	bleach
c.	NaOH	3.	SO_2 absorber
d.	NaOCl	4.	detergent

hence correct order is :

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

Q. 43. Hyperconjugation is possible in :

(i) $\underset{H}{\overset{H}{\diagdown}} C = CH - CD_3$

(ii) $\underset{H}{\overset{H}{\diagdown}} C = C \overset{H}{\underset{NH_2}{\diagup}}$ (with cyclohexene ring)

(iii) $\underset{H}{\overset{H}{\diagdown}} C = C \overset{H}{\underset{H}{\diagup}}$ (with benzene ring, CH_2Me)

(iv) (bicyclic structure with CH_3, CH_3)

(1) i and ii   (2) i, ii and iii

(3) only ii   (4) in all of these

Q. 44. When 1-alkyne is treated with Na + LiQ. NH_3 and product is reacted with methyl chloride, the end product of the reaction will be :

(1) Lower alkyne having two carbon less than 1-alkyne

(2) Lower alkyne having one carbon less than 1-alkyne

(3) Higher alkyne having one carbon more than 1-alkyne

(4) Higher alkyne having two carbon more than 1-alkyne

Q. 45.

$$\xrightarrow[\text{ether}]{\text{1 equivalent Mg}} X \xrightarrow{D_2O} Y \text{ is}$$

(1)

(2)

(3)

(4)
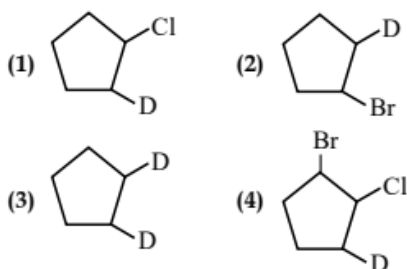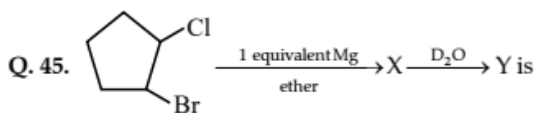
**Q. 46.** In 'nitration mixture' concentrated sulphuric acid is used :

(1) As sulphonating agent

(2) As dehydrating agent

(3) For the formation of nitronium ions

(4) As a solvent
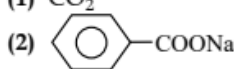
Q. 47. Methanol and ethanol are distinguished by :

(1) Treating with victor mayer test

(2) Treating with Lucas reagent

(3) Heating with iodine and alkali

(4) Treating with CrO_3 in dil. H_2SO_4

Q. 48. In which of the following crossed aldol condensations, only one kind of cross aldol is formed :

(1) CH_3CHO and CH_3CH_2CHO

(2) CH_3CHO and $(CH_3)_2CO$

(3) $(CH_3)_2CO$ and $(C_2H_5)_2CO$

(4) C_6H_5CHO and CH_3CHO

Q. 49.

$-COOH + NaH\overset{*}{C}O_3$

$\longrightarrow$ $-COONa + CO_2$
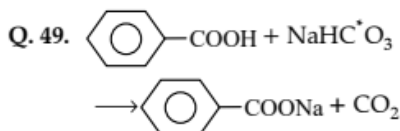
$\overset{*}{C}$ is with in the product –

(1) CO_2

(2) $-COONa$

(3) Both

(4) None of these

Q. 50. Name the products in the acid-base reaction:

(A) $CH_3CH_2NH_2 + HI$

(B) $(CH_3)_3N + HBr$

(1) (A) Trimethyl ammonium iodide
    (B) Trimethyl ammonium bromide

(2) (A) Ethyl ammonium iodide
   (B) Methyl ammonium bromide

(3) (A) Ethyl ammonium iodide
    (B) Trimethyl ammonium bromide

(4) All of these

Section B

Q. 51. Two substances A ($t_{1/2}$ = 5 min) and ($t_{1/2}$ = 15 min) are taken in such a way that initially [A] = 4[B]. The time after which both the concentration will be equal is .... (assuming reactions are of first order).

Q. 52. A radioactive element has atomic mass 90 amu and a half-life of 28 years. The number of disintegrations per second per g of the element is .... $\times 10^{12}$.

Q. 53. The standard free energy change for the reaction:

$H_2(g) + 2AgCl(s) \rightarrow 2Ag_{(s)} + 2H^+_{(aq)} + 2Cl^-_{(aq)}$
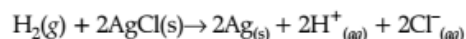
is –10.26 kcal mol^{-1} at 25°C. A cell using above reaction is operated at 25°C under P_{H_2} = 1 atm, [H$^+$] and [Cl$^-$] = 0.1. The e.m.f. of cell is .... V.

Q. 54. An element crystallizes into a structure which may be described by a cubic type of unit cell having one atom on each corner of the cube and two atoms on one of its body diagonals. If the volume of this unit cell is 24×10^{-24} cm^3 and density of element is 7.2 g cm^{-3}, the number of atoms present in 200 g of element is .... $\times 10^{24}$ atoms.

Q. 55. The concentration of an aqueous solution of common salt must be .... g/l. If it is to be isotonic with a solution of this substance which freezes at –0.0186°C? (Assuming NaCl is fully ionized in the first solution).

Q. 56. The coagulation of 10cm^3 of Gold sol by 1 ml 10 % NaCl solution is completely prevented by addition of 0.025g of starch to it. The gold number of starch is ....

Q. 57. NaBr, used to produce AgBr for use in photography can itself be prepared as follows :

$Fe + Br_2 \rightarrow FeBr_2$

$FeBr_2 + Br_2 \rightarrow Fe_3Br_8$
(not balanced)
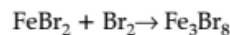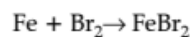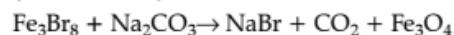
$Fe_3Br_8 + Na_2CO_3 \rightarrow NaBr + CO_2 + Fe_3O_4$
(not balanced)

To produce 2.50×10^{-3} kg NaBr, Fe will be consumed .... $\times 10^{-3}$ kg.

Q. 58. The number of photons emitted in 10 hours by a 60 W sodium lamp is .... $\times 10^{24}$ m. (λ_{photon} = 5893 Å).

Q. 59. At 500 kilobar pressure density of diamond and graphite are 3 g/cc and 2 g/cc respectively, at certain temperature 'T'. The value of $|\Delta H - \Delta U|$ is .... kJ/mol (kJ /mol) for the conversion of 1 mole of graphite to 1 mole of diamond at temperature 'T' .

Q. 60. 1 gm of an iron ore containing 50% ferrous (Fe^{2+}) and ferric ion (Fe^{3+}) and rest 50% impurities was dissolved in concentrated hydrochloric acid and the filtered solution was raised to 100 ml in flask. 50 ml of the solution were treated with M/10 $K_2Cr_2O_7$, which give titre value of 5 ml. The percentage of ferric ion in the ore is ....

Mathematics

Section A

Q. 61. The number of $x = [0, 2\pi]$ for which

$$\left| \sqrt{2\sin^4 x + 18\cos^2 x} - \sqrt{2\cos^4 x + 18\sin^2 x} \right| = 1,$$

has number of solutions

(1) 2   (2) 6

(3) 4   (4) 8

Q. 62. If $\left(a^{\log_b x} \right)^2 - 5\, x^{\log_b a} + 6 = 0$ where $a > 0$, $b > 0$ and $ab \neq 1$. Then the value of x is equal to

(1) $2^{\log_b a}$ (2) $3^{\log_a b}$

(3) $2^{\log_a 2}$ (4) $a^{\log_b 3}$

Q. 63. Sum $\dfrac{1}{5} + \dfrac{1}{7} + \dfrac{1}{5^2} + \dfrac{1}{7^2} + \dfrac{1}{5^3} + \dfrac{1}{7^3} + \ldots$

(1) $\dfrac{5}{12}$ (2) $\dfrac{3}{4}$

(3) $\dfrac{7}{12}$ (4) $\dfrac{3}{49}$

Q. 64. If $x = 2 + 2^{1/3} + 2^{2/3}$, then the values of $x^3 - 6x^2 + 6x$ is :

(1) –2   (2) 3

(3) 4   (4) 2

Q. 65. If the rth term is the middle term in the expansion of $\left(x^2 - \dfrac{1}{2x} \right)^{20}$ then the $(r + 3)^{th}$ term is : (in descending terms of x)

(1) $^{20}C_{14} \cdot \dfrac{1}{2^{14}} \cdot x$ (2) $^{20}C_{12} \cdot \dfrac{1}{2^{12}} \cdot x^2$

(3) $-\dfrac{1}{2^{13}} \cdot {}^{20}C_7 \cdot x$ (4) $^{20}C_{13} \cdot \dfrac{x}{2^{13}}$

Q. 66. If the equation of the locus of a point equidistant from the point (a_1, b_1) and (a_2, b_2) is $(a_1 - b_2) x + (a_1 - b_2) y + c = 0$, then the value of '$c$' is

(1) $\sqrt{a_1^2 + b_1^2 - a_2^2 - b_2^2}$ (2) $\dfrac{1}{2} a_2^2 + b_2^2 - a_1^2 - b_1^2$

(3) $a_1^2 - a_2^2 + b_1^2 - b_2^2$ (4) $\dfrac{1}{2}(a_1^2 + a_2^2 + b_1^2 + b_2^2)$

Q. 67. The equation of the tangent to the circle $x^2 + y^2 + 4x - 4y + 4 = 0$ which makes equal intercepts on the positive coordinate axis, is

(1) $x + y = 2$ (2) $x + y = 2\sqrt{2}$

(3) $x + y = 4$ (4) $x + y = 8$

Q. 68. The other extremity of the focal chord of the parabola $y^2 = 8x$ which is drawn at the point $(1/2, 2)$ is :

(1) $(2, -4)$ (2) $(2, 4)$

(3) $(8, -8)$ (4) $(8, 8)$

Q. 69. The equations of tangents to the ellipse $9x^2 + 16y^2 = 144$ which pass through the point $(2, 3)$ are :

(1) $x = 2$ and $y = -x + 5$

(2) $y = 3$ and $y = -x + 5$

(3) $y = 3$ and $x = 2$

(4) $x = 2$ and $y = 5 - x$

Q. 70. The position of the point $(2, 5)$ relative to the hyperbola $9x^2 - y^2 = 1$ is

(1) Inside   (2) Outside

(3) lie on   (4) Cannot decide

Q. 71 Let $f : R \to R$ be a function defined by $f(x) = \dfrac{x^2 + 2x + 5}{x^2 + x + 1}$ is :

(1) one-one and into

(2) one-one and onto

(3) many-one and onto

(4) many-one and into

Q. 72. $\lim\limits_{\theta \to -\frac{\pi}{4}} \dfrac{\cos\theta + \sin\theta}{\theta + \dfrac{\pi}{4}} =$

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

(3) 2   (4) Does not exist

Q. 73. Let $f(x) = \left| \left(x + \dfrac{1}{2}\right)[x] \right|$ when $-2 \le x \le 2$, where [.] represents greatest integer function, then

(1) $f(x)$ is continuous at $x = 2$

(2) $f(x)$ is continuous at $x = 1$

(3) $f(x)$ is continuous at $x = -1$

(4) $f(x)$ is discontinuous at $x = 0$

Q. 74. If $x^2 e^y + 2xye^x = 0$, then the value of $\dfrac{dy}{dx}$ when $y = 0, x = 1$ is :

(1) $\dfrac{-1}{1+e}$ (2) $\dfrac{2}{2+e}$

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

Q. 75. If the tangent at P of the curve $y^2 = x^3$ intersect the curve again at Q and the straight lines OP, OQ make angles α, β with the x-axis where 'O' is the origin then $\dfrac{\tan\alpha}{\tan\beta}$ has the value equal to :

(1) -1 (2) -2

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

Q. 76. The length of largest continuous interval in which function $f(x) = 4x - \tan 2x$ is monotonic, is

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

(3) $\dfrac{\pi}{8}$ (4) $\dfrac{\pi}{16}$

Q. 77. The set of value(s) of 'a' for which the function $f(x) = \dfrac{ax^3}{3} + (a+2)x^2 + (a-1)x + 2$ possesses a negative point of inflection is :

(1) $(-\infty, -2) \cup (0, \infty)$ (2) $\{-4/5\}$

(3) $\{-2, 0\}$ (4) empty set

Q. 78. The value of $\sin 10° \sin 30° \sin 50° \sin 70°$ is :

(1) $\dfrac{1}{16}$ (2) $\dfrac{1}{32}$

(3) $\dfrac{1}{18}$ (4) $\dfrac{1}{36}$

Q. 79. If α is non real and $\alpha = \sqrt[5]{-1}$ then the value of $2^{|1+\alpha+\alpha^2+\alpha^{-2}-\alpha^{-1}|}$ is equal to :

(1) 4 (2) 2

(3) 1 (4) 8

Q. 80. If the lines $\dfrac{x-1}{-3} = \dfrac{y-2}{2k} = \dfrac{z-3}{2}$ and $\dfrac{x-1}{3k} = \dfrac{y-5}{1} = \dfrac{z-6}{-5}$ are at right angles, then the value of k will be :

(1) $-\dfrac{10}{7}$ (2) $-\dfrac{7}{10}$

(3) -10 (4) -7

Section B

Q. 81. For $\triangle ABC$, let position vectors of A, B and C be respectively $6\hat{i} + \hat{j} + \hat{k}, 2\hat{i} + 4\hat{j} + \hat{k}$ and $4\hat{i} + 4\hat{j} + 7\hat{k}$. If interior and exterior bisectors of angle A meets BC at D and E respectively and $\dfrac{1}{BD} - \dfrac{1}{BE} = \dfrac{1}{\sqrt{k}}$, then [k] is equal to ....

Q. 82. The area of the region enclosed between the curves $y + 4 = x^2$ and $y = |x|\sqrt{4 - x^2}$ is $2k$, then the value of k is ....

Q. 83. Let $\displaystyle\lim_{n \to \infty} n^8 \sum_{r=1}^{n} \left(\dfrac{r^7}{r^{16} + n^{16}} \right) = \dfrac{\pi}{4k}$, then k is equal to ....

Q. 84. The value of $\displaystyle\int_0^\infty [x] . 2^{-[x]} dx$ is equal to ....

(where [.] denotes greatest integer function)

Q. 85. Let A be the set of all 3×3 symmetric matrices whose diagonal elements are 1, then the number of matrices A for which the system of linear equations $A\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ represents three perpendicular planes is ....

Q. 86. If $\begin{vmatrix} 1 & \cos\alpha - \sin\alpha & \cos\alpha + \sin\alpha \\ 1 & \cos\beta - \sin\beta & \cos\beta + \sin\beta \\ 1 & \cos\gamma - \sin\gamma & \cos\gamma + \sin\gamma \end{vmatrix} = k \begin{vmatrix} 1 & \cos\alpha & \sin\alpha \\ 1 & \cos\beta & \sin\beta \\ 1 & \cos\gamma & \sin\gamma \end{vmatrix}$, then the value of '$k$' is ....

Q. 87. The curve $y = f(x)$ passes through the origin and satisfies $\dfrac{dy}{dx} + \displaystyle\int_0^3 y\,dx = 11$. Let a and b are chosen randomly from the set $S = \{1, 2, 3, \dots 10\}$ with replacement. If the probability that the curve $y = f(x)$ passes through (a, b) is $\dfrac{p}{q}$ (where p and q are coprime), then $(p + q)$ is ....

Q. 88. $\sin(A + 2B) = \cos(2A + B)$ and $B - A = \dfrac{\pi}{3}$ where A, B $\in \left(-\dfrac{\pi}{2}, \dfrac{\pi}{2}\right)$, then $\left|\dfrac{B}{A}\right|$ is ....

Q. 89. If the set of values of x satisfying the inequality $\tan x \cdot \tan 3x < -1$ in the interval $\left(0, \dfrac{\pi}{2}\right)$ is (a, b), then the value of $\left(\dfrac{36(b-a)}{\pi}\right)$ is ....

Q. 90. If $\sin^2 x \cos y = (a^2 - 1)^2 + 1$ and $\cos^2 x \sin y = a + 1$, where $x, y \in [0, \pi]$ and $a \in$ R, then number of ordered pairs (x, y) is ....

Answers

Physics

Q. No.	Answer	Q. No.	Answer
1	(1)	16	(1)
2	(3)	17	(2)
3	(1)	18	(4)
4	(1)	19	(2)
5	(1)	20	(1)
6	(1)	21	16
7	(2)	22	205.00
8	(1)	23	2.00
9	(3)	24	48.00
10	(3)	25	1.20
11	(1)	26	4.00
12	(3)	27	2.00
13	(2)	28	9.00
14	(3)	29	4.00
15	(1)	30	5.00

Chemistry

Q. No.	Answer	Q. No.	Answer
31	(1)	46	(3)
32	(4)	47	(3)
33	(2)	48	(4)
34	(3)	49	(1)
35	(2)	50	(3)
36	(3)	51	15.00
37	(1)	52	5.24
38	(1)	53	0.34
39	(4)	54	3.472
40	(2)	55	0.2925
41	(3)	56	25.00
42	(1)	57	5.376
43	(2)	58	6.40
44	(3)	59	100
45	(1)	60	16.40

Mathematics

Q. No.	Answer	Q. No.	Answer
61	(4)	76	(2)
62	(2)	77	(1)
63	(1)	78	(1)
64	(4)	79	(1)
65	(3)	80	(1)
66	(2)	81	10.00
67	(2)	82	16.00
68	(3)	83	8.00
69	(2)	84	2.00
70	(1)	85	5.00
71	(4)	86	2.00
72	(1)	87	21.00
73	(4)	88	3.00
74	(3)	89	3.00
75	(2)	90	1.00