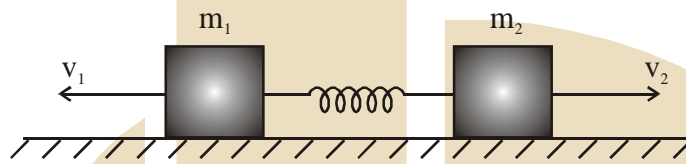


JEE-MAIN & AIEEE

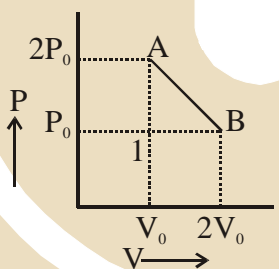
ONLINE EXAM TEST PAPERS OF 2012 (PAPER-4)

- Q.1 A 10 kW transmitter emits radio waves of 500 m wavelength. The number of photons emitted per second by the transmitter is of the order of :
 (A) 10^{25} (B) 10^{31} (C) 10^{43} (D) 10^{37}
- Q.2 A spring is compressed between two blocks of masses ' m_1 ' and ' m_2 ' placed on a horizontal frictionless surface as shown in the figure. When the blocks are released, they have initial velocity of ' v_1 ' and ' v_2 ' as shown. The blocks travel distances x_1 and x_2 respectively before coming to rest. The ratio $\left(\frac{x_1}{x_2}\right)$ is :



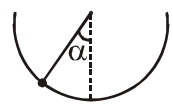
- (A) $\frac{m_2}{m_1}$ (B) $\sqrt{\frac{m_2}{m_1}}$ (C) $\frac{m_1}{m_2}$ (D) $\sqrt{\frac{m_1}{m_2}}$

- Q.3 n moles of an ideal gas undergo a process A \rightarrow B as shown in the figure. Maximum temperature of the gas during the process is:-



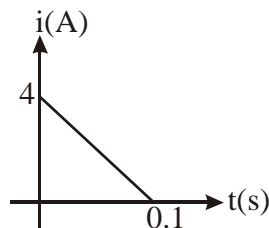
- (A) $\frac{9P_0 V_0}{4nR}$ (B) $\frac{9P_0 V_0}{nR}$ (C) $\frac{3P_0 V_0}{2nR}$ (D) $\frac{9P_0 V_0}{2nR}$

- Q.4 An insect crawls up a hemispherical surface very slowly, in figure. The coefficient of friction between the insect and the surface is $1/3$. If the line joining the centre of the hemispherical surface to the insect makes an angle α with the vertical, the maximum possible value of α so that the insect does not slip is given by:-



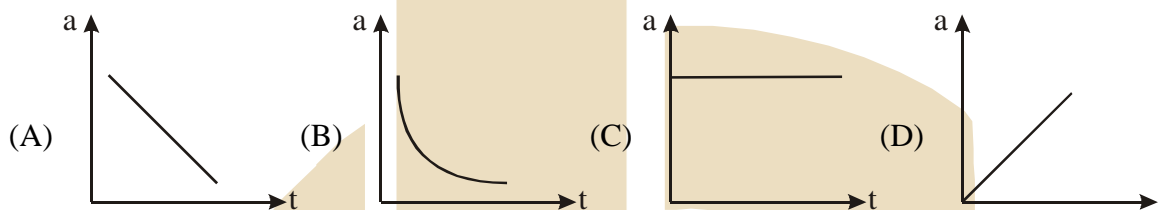
- (A) $\cos \alpha = 3$ (B) $\operatorname{cosec} \alpha = 3$ (C) $\sec \alpha = 3$ (D) $\cot \alpha = 3$

Q.5 Magnetic flux through a coil of resistance 10Ω is changed by $\Delta\phi$ in 0.1 s. The resulting induced current in the coil varies with time as shown in the figure. Then $|\Delta\phi|$ is equal to (in weber) :-



- (A) 4 (B) 6 (C) 2 (D) 8

Q.6 The distance travelled by a body moving along a line in time t is proportional to t^3 . The acceleration-time (a, t) graph for the motion of the body will be:-



Q.7 A series combination of n_1 capacitors, each of value C_1 is charged by a source of potential difference 4 V. When another parallel combination of n_2 capacitors each of value C_2 is charged by a source of potential difference V, it has the same total energy stored in it as the first combination has. The value of C_2 in terms of C_1 is then:-

- (A) $\frac{2C_1}{n_1 n_2}$ (B) $2 \frac{n_2}{n_1} C_1$ (C) $16 \frac{n_2}{n_1} C_1$ (D) $\frac{16C_1}{n_1 n_2}$

Q.8 A wave represented by the equation $y_1 = a \cos(kx - \omega t)$ is superimposed with another wave to form a stationary wave such that the point $x = 0$ is a node. The equation for the other wave is :-

- (A) $a \cos(kx - \omega t + \pi)$ (B) $a \cos(kx - \omega t + \pi/2)$
 (C) $a \cos(kx + \omega t + \pi/2)$ (D) $a \cos(kx + \omega t + \pi)$

Q.9 This question has statement 1, statement 2. Of the four choices given after the statements, choose the one that best describes the two statements.

Statement-1 : When moment of inertia I of a body rotating about an axis with angular speed ω increases, its angular momentum L is unchanged but the kinetic energy K decreases if there is no torque applied on it.

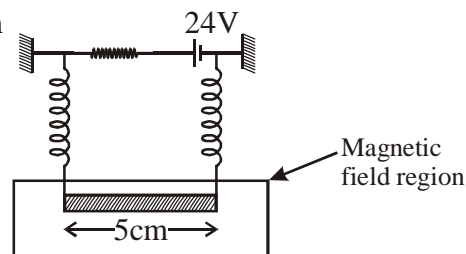
Statement-2 : $L = I \omega$, kinetic energy of rotation = $1/2 I \omega^2$.

- (A) Statement-1 is false, Statement-2 is true.
 (B) Statement-1 is true, Statement-2 is true and Statement-2 is not the correct explanation of statement-1.
 (C) Statement-1 is true, Statement-2 is false.
 (D) Statement-1 is true, Statement-2 is true and Statement-2 is the correct explanation of Statement-1.

Q.10 A student measured the diameter of a wire using a screw gauge with the least count 0.001 cm and listed the measurements. The measured value should be recorded as :-

- (A) 5.320 cm (B) 5.32 cm (C) 5.3 cm (D) 5.3200 cm

Q.11. The circuit in figure consists of wires at the top and bottom and identical metal springs as the left and right sides. The wire at the bottom has a mass of 10 g and is 5 cm long. The wire is hanging as shown in the figure. The spring stretch 0.5 cm under the weight of the wire and the circuit has a total resistance of 12Ω . When the lower wire is subjected to a static magnetic field, the springs stretch an additional 0.3 cm.



The magnetic field is:-

- (A) 1.2 T and directed out of page
- (B) 0.6 T and directed into the plane of page
- (C) 1.2 T and directed into the plane of page
- (D) 0.6 T and directed out of page

Q.12 Water is flowing through a horizontal tube having cross-sectional areas of its two ends being A and A' such that the ratio A/A' is 5. If the pressure difference of water between the two ends is $3 \times 10^5 \text{ N/m}^2$ the velocity of water with which it enters the tube will be : (neglect gravity effects)

- (A) 10 m/s
- (B) 25 m/s
- (C) 5 m/s
- (D) $50\sqrt{10}$ m/s

Q.13 This question has Statement 1, Statement 2. Of the four choices given after the statement, choose the one that best describes the two statements.

Statement-1 : Bats emitting ultrasonic waves can detect the location of a prey by hearing the waves reflected from it.

Statement-2 : When the source and the detector are moving, the frequency of reflected waves is changed.

- (A) Statement-1 is false. Statement-2 is true.
- (B) Statement-1 is true, Statement-2 is true and Statement-2 is not the correct explanation of statement-1.
- (C) Statement-1 is true, Statement-2 is false.
- (D) Statement-1 is true, Statement-2 is true and Statement-2 is the correct explanation of Statement-1.

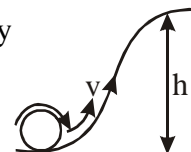
Q.14 This question has Statement 1, Statement 2. Of the four choices given after the statement, choose the one that best describes the two statements.

Statement-1 : A pure semiconductor has negative temperature coefficient of resistance.

Statement-2 : On raising the temperature, more charge carriers are released into the conduction band.

- (A) Statement-1 is true, Statement-2 is true and Statement-2 is the correct explanation of Statement-1.
- (B) Statement-1 is true, Statement-2 is true and Statement-2 is not the correct explanation of statement-1.
- (C) Statement-1 is true. Statement-2 is false.
- (D) Statement-1 is false. Statement-2 is true.

Q.15 A solid sphere is rolling on a surface as shown in figure, with a translation velocity v m/s. If it is to climb the inclined surface continuing to roll without slipping, then minimum v for this to happen is:-



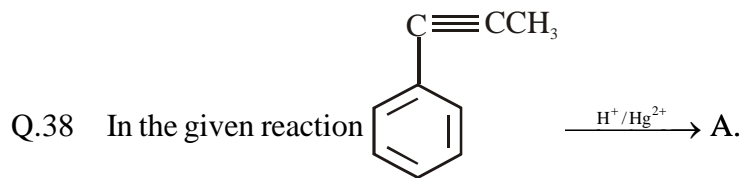
- (A) $\sqrt{\frac{10}{7}gh}$
- (B) $\sqrt{\frac{7}{2}gh}$
- (C) $\sqrt{\frac{7}{5}gh}$
- (D) $\sqrt{2gh}$

- Q.16 The maximum number of possible interference maxima for slit separation equal to 1.8λ , where λ is the wavelength of light, in a Young's double slit experiment is :-
(A) Infinite (B) Zero (C) 5 (D) 3
- Q.17 It is preferable to measure the e.m.f. of a cell by potentiometer than by a voltmeter because of the following possible reasons:-
(a) In case of potentiometer, no current flows through that
(b) The length of the potentiometer allows greater precision
(c) Measurement by the potentiometer is quicker
(d) The sensitivity of the galvanometer, when using a potentiometer is not relevant.
Which of these reason are correct?
(A) b, c, d (B) a, b (C) a, c, d (D) a, b, c, d
- Q.18 In a sensitive meterbridge apparatus the bridge wire possess:-
(A) High resistivity and high temperature coefficient
(B) High resistivity and low temperature coefficient
(C) Low resistivity and low temperature coefficient
(D) Low resistivity and high temperature coefficient
- Q.19 A resistance R and a capacitance C are connected in series to a battery of negligible internal resistance through a key. The key is closed at $t = 0$. If after t sec the voltage across the capacitance was seven times the voltage across R , the value of t is :-
(A) $3RC \ln 7$ (B) $3 RC \ln 2$ (C) $2 RC \ln 2$ (D) $2 RC \ln 7$
- Q.20 We wish to make a microscope with the help of two positive lenses both with a focal length of 20 mm each and the object is positioned 25 mm from the objective lens. How far apart the lenses should be so that the final image is formed at infinity?
(A) 120 mm (B) 100 mm (C) 20 mm (D) 80 mm
- Q.21 A projectile moving vertically upwards with a velocity of 200 m/s breaks into two equal parts at a height of 490 m. One part starts moving vertically upward with a velocity of 400 m/s. How much time after the break up will the other part hit the ground?
(A) 5s (B) $2\sqrt{10}$ s (C) 10 s (D) $\sqrt{10}$ s
- Q.22 A given ideal gas with $\gamma = C_p/C_v = 1.5$ is at a temperature T . If the gas is compressed adiabatically to one-fourth of its initial volume, the final temperature will be:-
(A) $2T$ (B) $8T$ (C) $2\sqrt{10} T$ (D) $4T$
- Q.23 Three resistance of 4Ω , 6Ω and 12Ω are connected in parallel and the combination is connected in series with a 1.5 V battery of 1Ω internal resistance. The rate of Joule heating in the 4Ω resistor is:-
(A) 0.86 W (B) 0.25 W (C) 0.33 W (D) 0.55 W
- Q.24. A hypothetical atom has only three energy levels. The ground level has energy, $E_1 = -8\text{eV}$. The two excited states have energies, $E_2 = -6\text{eV}$ and $E_3 = -2\text{eV}$. Then which of the following wavelength will not be present in the emission spectrum of this atom?
(A) 620 nm (B) 207 nm (C) 465 nm (D) 310 nm

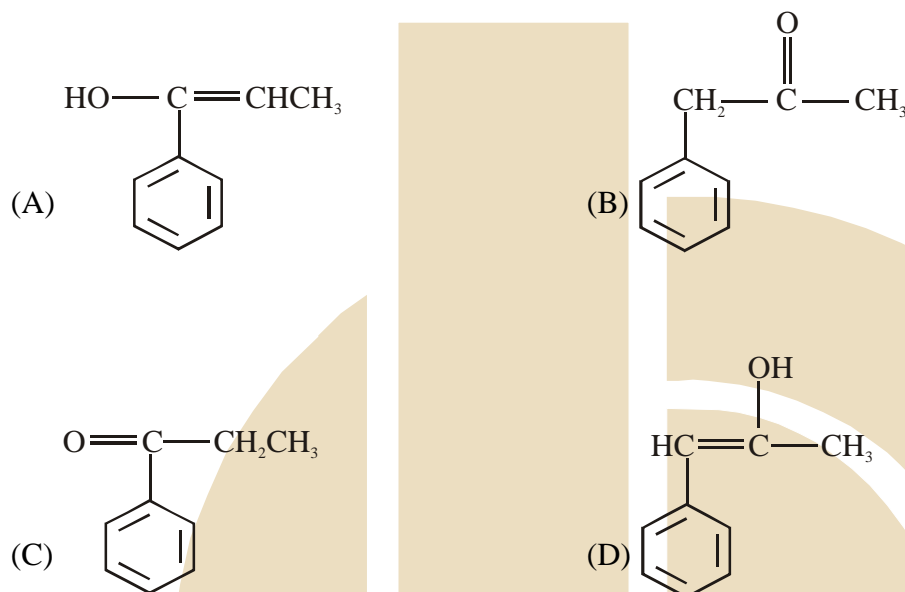
- Q.25 The magnetic force acting on a charged particle of charge $2 \mu\text{C}$ in a magnetic field of 2 T acting in y -direction, when the particle velocity is $(2\hat{i} + 3\hat{j}) \times 10^6 \text{ ms}^{-1}$ is :-
- (A) 4 N in y -direction
(B) 8 N in z -direction
(C) 8 N in y - direction
(D) 4 N in z - direction
- Q.26 Two bodies A and B of mass m and $2m$ respectively are placed on a smooth floor. They are connected by a spring of negligible mass. A third body C of mass m is placed on the floor. The body C moves with a velocity v_0 along the line joining A and B and collides elastically with A. At a certain time after the collision it is found that the instantaneous velocities of A and B are same and the compression of the spring is x_0 . The spring constant k will be :-
- (A) $2m \frac{v_0}{x_0}$ (B) $\frac{2}{3} m \left(\frac{v_0}{x_0} \right)^2$ (C) $m \frac{v_0}{2x_0}$ (D) $m \frac{v_0^2}{x_0^2}$
- Q.27 Which of the following statement is correct?
- (A) Nuclei of atoms having same number of neutrons are known as isobars
(B) The rate of radioactive decay cannot be controlled but that of nuclear fission can be controlled
(C) Nuclear force are short range, attractive and charge dependent
(D) Wavelength of matter wave is given by de-Broglie formula but that of photons is not given by the same formula
- Q.28 A doubly ionized Li atom is excited from its ground state ($n = 1$) to $n = 3$ state. The wavelengths of the spectral lines are given by λ_{32} , λ_{31} and λ_{21} . The ratio $\lambda_{32}/\lambda_{31}$ and $\lambda_{21}/\lambda_{31}$ are, respectively:-
- (A) $8.1, 0.67$ (B) $6.4, 1.2$ (C) $6.4, 0.67$ (D) $8.1, 1.2$
- Q.29 The first diffraction minimum due to a single slit diffraction is seen at $\theta = 30^\circ$ for a light of wavelength 5000 \AA falling perpendicularly on the slit. The width of the slit is:-
- (A) $5 \times 10^{-5} \text{ cm}$ (B) $2.5 \times 10^{-5} \text{ cm}$ (C) $1.25 \times 10^{-5} \text{ cm}$ (D) $10 \times 10^{-5} \text{ cm}$
- Q.30 Assuming the earth to be a sphere of uniform density, the acceleration due to gravity inside the earth at a distance of r from the centre is proportional to:-
- (A) r^{-2} (B) r^2 (C) r^{-1} (D) r

- Q.31 If the radius of first orbit of H atom is a_0 , the de-Broglie wavelength of an electron in the third orbit is :-
 (A) $6\pi a_0$ (B) $8\pi a_0$ (C) $2\pi a_0$ (D) $4\pi a_0$
- Q.32 In the following balanced reaction, $\text{XMnO}_4^- + \text{YC}_2\text{O}_4^{2-} + \text{ZH}^+ = \text{XMn}^{2+} + 2\text{YCO}_2 + \frac{\text{Z}}{2} \text{H}_2\text{O}$ the values of X, Y and Z, respectively are:-
 (A) 8, 2, 5 (B) 5, 2, 16 (C) 2, 5, 16 (D) 5, 8, 4
- Q.33 The difference between the reaction enthalpy change ($\Delta_r H$) and reaction internal energy change ($\Delta_r U$) for the reaction:
 $2\text{C}_6\text{H}_6(l) + 15\text{O}_2(g) \rightarrow 12\text{CO}_2(g) + 6\text{H}_2\text{O}(l)$ at 300 K is ($R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$)
 (A) 0 J mol^{-1} (B) 2490 J mol^{-1} (C) -2490 J mol^{-1} (D) -7482 J mol^{-1}
- Q.34 8 mol of $\text{AB}_3(g)$ are introduced into a 1.0 dm^3 vessel.
 If it dissociates as $2\text{AB}_3(g) \rightleftharpoons \text{A}_2(g) + 3\text{B}_2(g)$
 At equilibrium, 2mol of A_2 are found to be present. The equilibrium constant of this reaction is:-
 (A) 36 (B) 3 (C) 27 (D) 2
- Q.35 Although CN^- ion and N_2 molecule are isoelectronic, yet N_2 molecule is chemically inert because of:-
 (A) Uneven electron distribution
 (B) Absence of bond polarity
 (C) Presence of more number of electrons in bonding orbital's
 (D) Long bond energy
- Q.36 The reaction,

$$\text{CH}_3\text{CHO} \xrightarrow[\text{Zn(Hg)/Conc. HCl}]{[\text{H}]} \text{CH}_3\text{CH}_3$$
 is:-
 (A) Cannizaro's reaction (B) Wolf-Kishner reduction
 (C) Rosenmund reduction (D) Clemmenson reduction
- Q.37 In a chemical reaction A is converted into B. The rates of reaction, starting with initial concentration of A as $2 \times 10^{-3} \text{ M}$ and $1 \times 10^{-3} \text{ M}$, are equal to $2.40 \times 10^{-4} \text{ Ms}^{-1}$ and $0.60 \times 10^{-4} \text{ Ms}^{-1}$ respectively. The order of reaction with respect to reactant A will be :-
 (A) 1.5 (B) 2 (C) 0 (D) 1



The product 'A' is :-

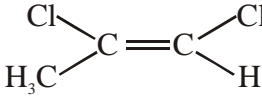
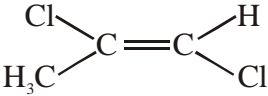


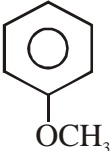
- Q.39 In the electrolysis of alumina to obtain aluminum cryolite is added mainly to:-
 (A) Dissolve alumina in molten cryolite (B) Lower the melting point of alumina
 (C) Remove the impurities of alumina (D) Increase the electrical conductivity

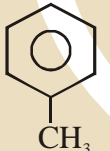
- Q.40 Which of the following complex ions will exhibit optical isomerism?
 (en = 1, 2-diamine ethane)
 (A) $[Co(en)_2Cl_2]^+$ (B) $[Zn(en)_2]^{2+}$ (C) $[Co(NH_3)_4Cl_2]^+$ (D) $[Cr(NH_3)_2Cl_2]^+$

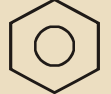
- Q.41 Chemically heroin is :-
 (A) Morphine diacetate (B) Morphine dibenzoate
 (C) Morphine monoacetate (D) Morphine monobenzoate


- Q.42 The correct statement for both the processes of physisorption and chemisorption is:-
 (A) Both are endothermic
 (B) Physisorption is endothermic but chemisorption is exothermic
 (C) Both are exothermic
 (D) Chemisorption is endothermic but physisorption is exothermic

- Q.43 The formation of molecular complex $\text{BF}_3 - \text{NH}_3$ results in a change in hybridization of boron:-
 (A) from sp^3 to sp^3d (B) from sp^2 to dsp^2 (C) from sp^3 to sp^2 (D) from sp^2 to sp^3
- Q.44 Synthetic polymer bakelite can be prepared from following compounds :-
 (A) Styrene and vinyl chloride (B) Phenol and formaldehyde
 (C) Acrylonitrile and vinyl chloride (D) Adipic acid and ethylene glycol
- Q.45 Among the following chloro-compound having the lowest dipole moment is:-
 (A) CH_2Cl_2 (B) CH_3Cl (C)  (D) 
- Q.46 The conversion of benzene diazonium chloride to bromobenzene can be accomplished by :-
 (A) Azo coupling reaction (B) Friedel-Crafts reaction
 (C) Reimer Tiemann reaction (D) Gattermann reaction
- Q.47 Amylopectin is a polymer of :-
 (A) β -D-glucose (B) α -D-glucose (C) Amylase (D) Amino acid
- Q.48 The ppm level of F^- in a 500 g sample of a tooth paste containing 0.2 g F^- is :-
 (A) 250 (B) 200 (C) 400 (D) 1000
- Q.49 Which of the following statement is wrong ?
 (A) Alkyl halides follow the following reactivity sequence on reaction with alkenes $\text{R-I} > \text{R-Br} > \text{R-Cl} > \text{R-F}$
 (B) The reaction of methyl magnesium bromide with acetone gives butanol-2
 (C) $\text{C}_2\text{H}_4\text{Cl}_2$ may exist in two isomeric forms
 (D) Ethyl chloride on reduction with Zn-Cu couple and alcohol gives ethane
- Q.50 A metal M on heating in nitrogen gas gives Y. Y on treatment with H_2O gives a colourless gas which when passed through CuSO_4 solution gives a blue colour, Y is :-
 (A) NH_3 (B) MgO (C) Mg_3N_2 (D) $\text{Mg}(\text{NO}_3)_2$
- Q.51 Magnetic moment of Gd^{3+} ion ($Z = 64$) is :-
 (A) 7.9BM (B) 3.62BM (C) 10.60 BM (D) 9.72 BM
- Q.52 5 g of benzene on nitration gave 6.6 g of nitrobenzene. The theoretical yield of the nitrobenzene will be :-
 (A) 5.6 g (B) 8.9g (C) 6.6 g (D) 4.5 g
- Q.53 Water sample is reported to be highly polluted if BOD (Biological Oxygen Demand) value of sample becomes:
 (A) Equal to 10 ppm (B) Equal 5 ppm (C) Less than 5 ppm (D) More than 17 ppm

- Q.54 An aqueous solution of oxalic acid dehydrates contains its 6.3 g in 250 ml. The volume of 0.1 N NaOH required to completely neutralize 10 mL of this solution:-
 (A) 4 mL (B) 40 mL (C) 20 mL (D) 2 ml.
- Q.55 Given :
 (i) $\text{HCN}(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{H}_3\text{O}^+(\text{aq}) + \text{CN}^-(\text{aq})$; $K_a = 6.2 \times 10^{-3}$
 (ii) $\text{CN}^-(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{HCN}(\text{aq}) + \text{OH}^-(\text{aq})$; $K_b = 1.6 \times 10^{-3}$
 The equilibrium show the following order of the relative base strength
 (A) $\text{CN}^- > \text{H}_2\text{O} > \text{OH}^-$ (B) $\text{OH}^- > \text{CN}^- > \text{H}_2\text{O}$
 (C) $\text{H}_2\text{O} > \text{CN}^- > \text{OH}^-$ (D) $\text{OH}^- > \text{H}_2\text{O} > \text{CN}^-$
- Q.56 The radius of a calcium ion is 94 pm and of the oxide ion is 146 pm. The possible crystal structure of calcium oxide will be :-
 (A) Octahedral (B) Tetrahedral (C) Pyramidal (D) Trigonal
- Q.57 A solution containing 0.85 g of ZnCl_2 in 125.0 g of water freezes at -0.23°C . The apparent degree of dissociation of the salt is: (k_f for water = $1.86 \text{ K kg mol}^{-1}$, atomic mass; Zn = 65.3 and Cl = 35.5)
 (A) 1.36% (B) 2.47% (C) 73.5% (D) 7.35%
- Q.58 Which among the following elements has the highest first ionization enthalpy?
 (A) Nitrogen (B) Boron (C) Carbon (D) Oxygen
- Q.59 In the below mentioned compounds the decreasing order of reactivity towards electrophilic substitution is:
- (i) 

(ii) 

(iii) 

(iv) 
- (A) (iii) > (i) > (iv) > (ii) (B) (iv) > (i) > (ii) > (iii)
 (C) (ii) > (iii) > (i) > (iv) (D) (i) > (ii) > (iii) > (iv)
- Q.60 α , v and u represent most probable velocity, average velocity and root mean square velocity respectively of a gas at a particular temperature. The correct order among the following is:-
 (A) $\alpha > u > v$ (B) $v > u > \alpha$ (C) $u > v > \alpha$ (D) $u > \alpha > v$

- Q.61 If a, b, c, d and p are distinct real numbers such that $(a^2 + b^2 + c^2)p^2 - 2p(ab + bc + cd) + (b^2 + c^2 + d^2) \leq 0$, then
- (A) a, b, c, d are in A.P. (B) $ab = cd$
 (C) a, b, c, d are in G.P. (D) $ac = bd$
- Q.62 **Statement-1** : If the points $(1, 2, 2), (2, 1, 2), (2, 2, z)$ and $(1, 1, 1)$ are coplanar, then $z = 2$.
Statement-2 : If the 4 points P, Q, R and S are coplanar, then the volume of the tetrahedron PQRS is 0.
- (A) Statement-1 is true, Statement-2 is true and Statement-2 is the correct explanation of Statement-1.
 (B) Statement-1 is true. Statement-2 is true and Statement-2 is not the correct explanation of statement-1.
 (C) Statement-1 is true, Statement-2 is false
 (D) Statement-1 is false, Statement-2 is true
- Q.63 If $\begin{vmatrix} -2a & a+b & a+c \\ b+a & -2b & b+c \\ c+a & b+c & -2c \end{vmatrix} = \alpha(a+b)(b+c)(c+a) \neq 0$ then α is equal to:-
- (A) 1 (B) $a + b + c$ (C) abc (D) 4
- Q.64 If two vertices of a triangle are $(5, -1)$ and $(-2, 3)$ and its orthocentre is at $(0, 0)$, then the third vertex is:-
- (A) $(4, -7)$ (B) $(-4, 7)$ (C) $(-4, -7)$ (D) $(4, 7)$
- Q.65 The sum of the series $\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \dots$ up to 15 terms is :-
- (A) 4 (B) 1 (C) 3 (D) 2
- Q.66 **Statement-1** : The degrees of the differential equations $\frac{dy}{dx} + y^2 = x$ and $\frac{d^2y}{dx^2} + y = \sin x$ are equal.
- Statement-2** : The degree of a differential equation, when it is a polynomial equation in derivatives, is the highest positive integral power of the highest order derivative involved in the differential equation, otherwise degree is not defined.
- (A) Statement-1 is true, Statement-2 is true and Statement-2 is the correct explanation of Statement-1.
 (B) Statement-1 is true, Statement-2 is true and Statement-2 is not the correct explanation of statement-1.
 (C) Statement-1 is true, Statement-2 is false
 (D) Statement-1 is false, Statement-2 is true
- Q.67 The number of terms in the expansion of $(y^{1/5} + x^{1/10})^{55}$, in which powers of x and y are free from radical signs are:-
- (A) Twelve (B) Seven (C) Six (D) Five

- Q.68 The logically equivalent proposition of $p \Leftrightarrow q$ is:-
 (A) $(p \wedge q) \Rightarrow (q \vee p)$ (B) $p \wedge q$ (C) $(p \wedge q) \vee (q \Rightarrow p)$ (D) $(p \Rightarrow q) \wedge (q \Rightarrow p)$
- Q.69 If a straight line $y - x = 2$ divides the region $x^2 + y^2 \leq 4$ into two parts, then the ratio of the area of the smaller part to the area of the greater part is:-
 (A) $\pi - 2 ; 3\pi + 2$ (B) $\pi - 3 ; 3\pi + 3$ (C) $3\pi - 8 ; \pi + 8$ (D) $3\pi - 4 ; \pi + 4$
- Q.70 The area of the triangle formed by the lines joining the vertex of the parabola, $x^2 = 8y$, to the extremities of its latus rectum is:-
 (A) 4 (B) 2 (C) 1 (D) 8
- Q.71 A unit vector which is perpendicular to the vector $2\vec{i} - \vec{j} + 2\vec{k}$ and is coplanar with the vectors $\vec{i} + \vec{j} - \vec{k}$ and $2\vec{i} + \vec{j} - \vec{k}$ is:-
 (A) $\frac{3\vec{i} + 2\vec{j} - 2\vec{k}}{\sqrt{17}}$ (B) $\frac{2\vec{j} + \vec{k}}{\sqrt{5}}$ (C) $\frac{3\vec{i} + 2\vec{j} + 2\vec{k}}{\sqrt{17}}$ (D) $\frac{3\vec{i} + 2\vec{j} - \vec{k}}{3}$
- Q.72 If the sum of the square of the roots of the equation $x^2 - (\sin \alpha - 2)x - (1 + \sin \alpha) = 0$ is least, then α is equal to:-
 (A) $\pi/6$ (B) $\pi/3$ (C) $\pi/2$ (D) $\pi/4$
- Q.73 If $A = \{x \in \mathbb{Z}^+ ; x < 10 \text{ and } x \text{ is a multiple of 3 or 4}\}$, where \mathbb{Z}^+ is the set of positive integers, then the total number of symmetric relations on A is :-
 (A) 2^5 (B) 2^{20} (C) 2^{10} (D) 2^{15}
- Q.74 If $f(x) = xe^{x(1-x)}$, $x \in \mathbb{R}$, then $f(x)$ is :-
 (A) Increasing on \mathbb{R} (B) Increasing on $[-1/2, 1]$
 (C) Decreasing on \mathbb{R} (D) Decreasing on $[-1/2, 1]$
- Q.75 If $f'(x) = \sin(\log x)$ and $y = f\left(\frac{2x+3}{3-2x}\right)$, then $\frac{dy}{dx}$ equals:-
 (A) $\frac{12}{(3-2x)^2} \cos\left[\log\left(\frac{2x+3}{3-2x}\right)\right]$ (B) $\sin\left[\log\left(\frac{2x+3}{3-2x}\right)\right]$
 (C) $\frac{12}{(3-2x)^2} \sin\left[\log\left(\frac{2x+3}{3-2x}\right)\right]$ (D) $\frac{12}{(3-2x)^2}$

- Q.76 If the mean of 4, 7, 2, 8, 6 and 'a' is 7, then the mean deviation from the median of these observations is:-
 (A) 5 (B) 8 (C) 3 (D) 1
- Q.77 If the point (1, a) lies in between the straight lines $x + y = 1$ and $2(x + y) = 3$ then a lies in interval:-
 (A) $\left(1, \frac{3}{2}\right)$ (B) $\left(0, \frac{1}{2}\right)$ (C) $(-\infty, 0)$ (D) $\left(\frac{3}{2}, \infty\right)$
- Q.78 **Statement-1** : Let A and B be two sets having p and q elements respectively, where $q > p$. Then the total number of functions from set A to set B is q^p .
Statement-2 : The total number of selection of p different objects out of q objects is qC_p .
 (A) Statement-1 is true, Statement-2 is true and Statement-2 is the correct explanation of Statement-1
 (B) Statement-1 is true, Statement-2 is true and Statement-2 is not the correct explanation of statement-1
 (C) Statement-1 is true. Statement-2 is false
 (D) Statement-1 is false. Statement-2 is true
- Q.79 A number n is randomly selected from the set $\{1, 2, 3, \dots, 1000\}$. The probability that $\frac{\sum_{i=1}^n i^2}{\sum_{i=1}^n i}$ is an integer is :-
 (A) 0.334 (B) 0.331 (C) 0.332 (D) 0.333
- Q.80 The area enclosed by the curve $y = x^2$, $y = x^3$, $x = 0$ and $x = p$, where $p > 1$, is $1/6$. Then p equals:
 (A) $4/3$ (B) 2 (C) $8/3$ (D) $16/3$
- Q.81 The area of the triangle whose vertices are complex numbers z , iz , $z + iz$ in the Argand diagram is:-
 (A) $|z|^2$ (B) $\frac{1}{2}|z|^2$ (C) $4|z|^2$ (D) $2|z|^2$
- Q.82 If P_1 and P_2 are two points on the ellipse $\frac{x^2}{4} + y^2 = 1$ at which the tangents are parallel to the chord joining the points (0, 1) and (2, 0), then the distance between P_1 and P_2 is:-
 (A) $\sqrt{10}$ (B) $2\sqrt{2}$ (C) $\sqrt{5}$ (D) $2\sqrt{3}$
- Q.83 If $\vec{u} = \hat{j} + 4\hat{k}$, $\vec{v} = \hat{i} - 3\hat{k}$, and $\vec{w} = \cos \theta \hat{i} + \sin \theta \hat{j}$ are vectors in 3-dimensional space, then the maximum possible value of $|\vec{u} \times \vec{v} \cdot \vec{w}|$ is:-
 (A) $\sqrt{14}$ (B) 5 (C) 7 (D) $\sqrt{13}$

Q.84 Let A and B be real matrices of the form $\begin{bmatrix} \alpha & 0 \\ 0 & \beta \end{bmatrix}$ and $\begin{bmatrix} 0 & \gamma \\ \delta & 0 \end{bmatrix}$, respectively:-

Statement-1 : $AB - BA$ is always an invertible matrix.

Statement-2 : $AB - BA$ is never an identity matrix.

- (A) Statement-1 is true, Statement-2 is true and Statement-2 is the correct explanation of Statement-1.
 (B) Statement-1 is true, Statement-2 is true and Statement-2 is not the correct explanation of statement-1.
 (C) Statement-1 is true, Statement-2 is false
 (D) Statement 1 is false, Statement-2 is true

Q.85 The coordinates of the foot of perpendicular from the point $(1, 0, 0)$ to the line $\frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8}$ are:-

- (A) $(5, -8, -4)$ (B) $(2, -3, 8)$ (C) $(3, -4, -2)$ (D) $(1, -1, -10)$

Q.86 **Statement-1** : A function $f : \mathbb{R} \rightarrow \mathbb{R}$ is continuous at x_0 if and only if $\lim_{x \rightarrow x_0} f(x)$ exists and

$$\lim_{x \rightarrow x_0} f(x) = f(x_0).$$

Statement-2 : A function $f : \mathbb{R} \rightarrow \mathbb{R}$ is discontinuous at x_0 if and only if $\lim_{x \rightarrow x_0} f(x)$ exists and

$$\lim_{x \rightarrow x_0} f(x) \neq f(x_0).$$

- (A) Statement-1 is true, Statement-2 is true and Statement-2 is the correct explanation of Statement-1.
 (B) Statement-1 is true, Statement-2 is true and Statement-2 is not the correct explanation of statement-1.
 (C) Statement-1 is true, Statement-2 is false
 (D) Statement-1 is false, Statement-2 is true

Q.87 If in a triangle ABC, $\frac{b+c}{11} = \frac{c+a}{12} = \frac{a+b}{13}$, then, $\cos A$ is equal to:-

- (A) $\frac{19}{35}$ (B) $\frac{5}{7}$ (C) $\frac{1}{5}$ (D) $\frac{35}{19}$

Q.88 Consider a rectangle whose length is increasing at the uniform rate of 2 m/sec, breadth is decreasing at the uniform rate of 3 m/sec and the area is decreasing at the uniform rate of 5 m²/sec. If after some time the breadth of the rectangle is 2m then the length of the rectangle is:-

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

Q.89 If $\frac{d}{dx}G(x) = \frac{e^{\tan x}}{x}$, $x \in \left(0, \frac{\pi}{2}\right)$, then $\int_{\frac{1}{4}}^{\frac{1}{2}} \frac{2}{x} e^{\tan(\pi x^2)} dx$ is equal to :-

(A) $G\left(\frac{\pi}{4}\right) - G\left(\frac{\pi}{16}\right)$

(B) $G\left(\frac{1}{\sqrt{2}}\right) - G\left(\frac{1}{2}\right)$

(C) $\pi \left[G\left(\frac{1}{2}\right) - G\left(\frac{1}{4}\right) \right]$

(D) $2 \left[G\left(\frac{\pi}{4}\right) - G\left(\frac{\pi}{16}\right) \right]$

Q.90 The integral of $\frac{x^2 - x}{x^3 - x^2 - 1 + x}$ w.r.t. x is :-

(A) $\log|x^2 - 1| + C$

(B) $\log|x^2 + 1| + C$

(C) $\frac{1}{2} \log|x^2 + 1| + C$

(D) $\frac{1}{2} \log|x^2 - 1| + C$

ANSWER KEY										PAPER-4
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	Bonus	A	D	C	D	D	D	A	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	D	Bonus	D	A	A	D	B	B	B	D
Q.	21	22	23	24	25	26	27	28	29	30
A.	B	A	B	C	B	B	B	B	D	D
Q.	31	32	33	34	35	36	37	38	39	40
A.	A	B	D	C	B	D	B	C	B	A
Q.	41	42	43	44	45	46	47	48	49	50
A.	A	C	D	B	A	D	B	D	B	C
Q.	51	52	53	54	55	56	57	58	59	60
A.	A	B	D	B	B	A	C	A	D	C
Q.	61	62	63	64	65	66	67	68	69	70
A.	C	D	D	C	C	A	C	D	A	D
Q.	71	72	73	74	75	76	77	78	79	80
A.	A	C	A	B	C	C	B	B	A	A
Q.	81	82	83	84	85	86	87	88	89	90
A.	B	A	B	D	C	B	C	C	A	C