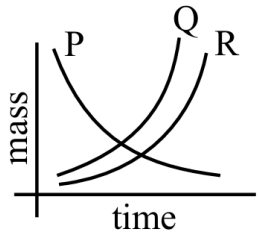
NEET-JEE

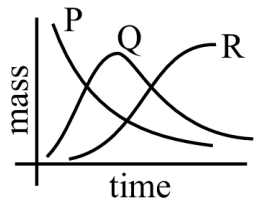
# 4th April shift 2

**Q1** A radioactive material P first decays into Q and then Q decays to non-radioactive material R. Which of the following figure represents time dependent mass of P, Q and R?

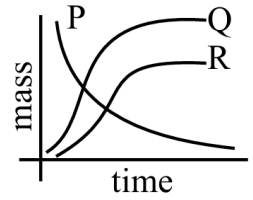
(A)



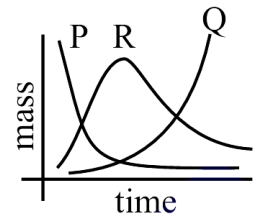

(B)




(C)




(D)




**Q2** There are 'n' number of identical electric bulbs, each is designed to draw a power p independently from the mains supply. They are now joined in series across the main supply. The total power drawn by the combination is :

(A) $\mathrm{np}$ (B) $\frac{\mathrm{p}}{\mathrm{n}^2}$

(C) $\frac{\mathrm{p}}{\mathrm{n}}$ (D) $\mathrm{p}$

**Q3** Consider a rectangular sheet of solid material of length $\ell = 9\ \mathrm{cm}$and width $\mathrm{d} = 4\ \mathrm{cm}$. The coefficient of linear expansion is $\alpha = 3.1 \times 10^{-5}\ \mathrm{K}^{-1}$ at room temperature and one atmospheric pressure. The mass of sheet $\mathrm{m} = 0.1\ \mathrm{kg}$ and the specific heat capacity $\mathrm{C_v} = 900\ \mathrm{J\ kg^{-1}\ K^{-1}}$. If the amount of heat supplied to the material is $8.1 \times 10^2\ \mathrm{J}$ then change in area of the rectangular sheet is :-

(A) $2.0 \times 10^{-6}\ \mathrm{m}^2$

(B) $3.0 \times 10^{-7}\ \mathrm{m}^2$

(C) $6.0 \times 10^{-7}\ \mathrm{m}^2$

(D) $4.0 \times 10^{-7}\ \mathrm{m}^2$

**Q4** Given below are two statements :

**Statement (I) :** The dimensions of Planck's constant and angular momentum are same.

**Statement (II) :** In Bohr's model electron revolve around the nucleus only in those orbits for which angular momentum is integral multiple of Planck's constant.

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

(A) Both Statement I and Statement II are correct

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

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

(D) Both Statement I and Statement II are incorrect

**Q5** A cylindrical rod of length $1$ m and radius $4$ cm is mounted vertically. It is subjected to a shear force of $10^5\ \mathrm{N}$ at the top. Considering infinitesimally small displacement in the upper edge, the angular displacement $\theta$ of the rod axis from its original position would be : (shear moduli, $\mathrm{G} = 10^{10}\ \mathrm{N/m^2}$ )

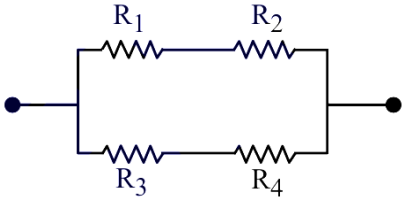
(A) $1/160\pi$ (B) $1/4\pi$

(C) $1/40\pi$ (D) $1/2\pi$

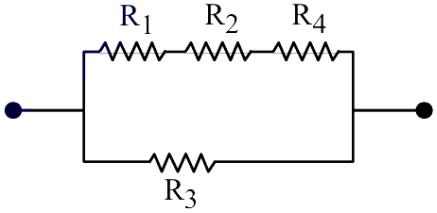
**Q6**

From the combination of resistors with resistance values $R_1 = R_2 = R_3 = 5\Omega$ and $R_4 = 10\Omega$, which of the following combination is the best circuit to get an equivalent resistance of $6\Omega$SS ?

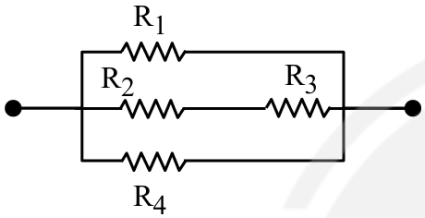
(A)



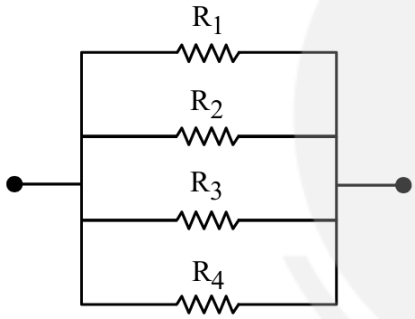

(B)



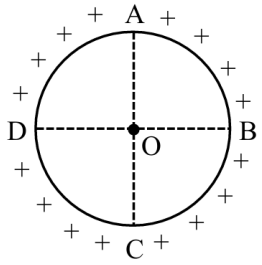

(C)




(D)




**Q7** A metallic ring is uniformly charged as shown in figure. AC and BD are two mutually perpendicular diameters. Electric field due to arc AB to 'O' is 'E' is magnitude. What would be the magnitude of electric field at 'O' due to arc ABC ?




(A) $2\mathrm{E}$ (B) $\sqrt{2}\mathrm{E}$

(C) $\mathrm{E}/2$ (D) Zero

**Q8** There are two vessels filled with an ideal gas where volume of one is double the volume of other. The large vessel contains the gas at 8 kPa at 1000 K while the smaller vessel contains the gas at 7 kPa at 500 K. If the vessels are connected to each other by a thin tube allowing the gas to flow and the temperature of both vessels is maintained at 600 K, at steady state the pressure in the vessels will be (in kPa).

(A) 4.4 (B) 6

(C) 24 (D) 18

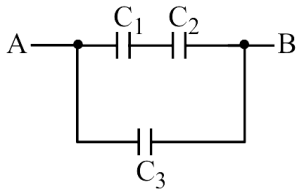
**Q9** An object is kept at rest at a distance of 3R above the earth's surface where R is earth's radius. The minimum speed with which it must be projected so that it does not return to earth is :

(Assume M = mass of earth, G = Universal gravitational constant)

(A) $\sqrt{\frac{\mathrm{GM}}{2\mathrm{R}}}$ (B) $\sqrt{\frac{\mathrm{GM}}{\mathrm{R}}}$

(C) $\sqrt{\frac{3\ \mathrm{GM}}{\mathrm{R}}}$ (D) $\sqrt{\frac{2\ \mathrm{GM}}{\mathrm{R}}}$

**Q10** Three parallel plate capacitors $\mathrm{C}_1$, $\mathrm{C}_2$and $\mathrm{C}_3$ each of capacitance $5\mu\ \mathrm{F}$are connected as shown in figure. The effective capacitance between points A and B, when the space between the parallel plates of $\mathrm{C}_1$ capacitor is filled with a dielectric medium having dielectric constant of $4$ , is :



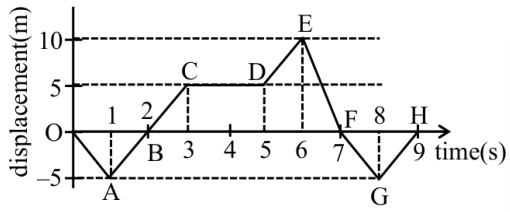

(A) $22.5\ \mu\mathrm{F}$

(B) $7.5\ \mu\mathrm{F}$

(C) $9\ \mu\mathrm{F}$

(D) $30\ \mu\mathrm{F}$

**Q11** The displacement x versus time graph is shown below.




(A) The average velocity during 0 to 3 s is 10 m/s

(B) The average velocity during 3 to 5 s is 0 m/s
(C) The instantaneous velocity at t = 2 s is 5 m/s
(D) The average velocity during 5 to 7 s and instantaneous velocity at t = 6.5 s are equal
(E) The average velocity from t = 0 to t = 9 s is zero
Choose the correct answer from the options given below:
(A) (A), (D), (E) only
(B) (B), (C), (D) only
(C) (B), (D), (E) only
(D) (B), (C), (E) only

**Q12** A wheel is rolling on a plane surface. The speed of a particle on the highest point of the rim is $8\ \mathrm{m/s}$. The speed of the particle on the rim of the wheel at the same level as the centre of wheel, will be :
(A) $4\sqrt{2}\ \mathrm{m/s}$ (B) $8\ \mathrm{m/s}$
(C) $4\ \mathrm{m/s}$ (D) $8\sqrt{2}\ \mathrm{m/s}$

**Q13** For the determination of refractive index of glass slab, a travelling microscope is used whose main scale contains 300 equal divisions equals to 15 cm. The vernier scale attached to the microscope has 25 divisions equals to 24 divisions of main scale. The least count (LC) of the travelling microscope is (in cm) :
(A) $0.001$ (B) $0.002$
(C) $0.0005$ (D) $0.0025$

**Q14** A block of mass 25 kg is pulled along a horizontal surface by a force at an angle 45° with the horizontal. The friction coefficient between the block and the surface is 0.25. The displacement of 5 m of the block is:
(A) $970\ \mathrm{J}$ (B) $735\ \mathrm{J}$
(C) $245\ \mathrm{J}$ (D) $490\ \mathrm{J}$

**Q15** Two polarisers $P_1$ and $P_2$ are placed in such a way that the intensity of the transmitted light will be zero. A third polariser $P_3$ is inserted in between $P_1$ and $P_2$, at the particular angle between $P_2$ and $P_3$. The transmitted intensity of the light passing the through all three polarisers is maximum. The angle between the polarisers $P_2$ and $P_3$ is :
(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{6}$
(C) $\frac{\pi}{8}$ (D) $\frac{\pi}{3}$

**Q16** Consider a n-type semiconductor in which $n_e$ and $\mathrm{n_h}$ are number of electrons and holes, respectively.
(A) Holes are minority carriers
(B) The dopant is a pentavalent atom
(C) $\mathrm{n_e n_h} \neq \mathrm{n_i^2}$
(where $n_i$ is number of electrons or holes in semiconductor when it is intrinsic form)
(D) $\mathrm{n_e n_h} \geq \mathrm{n_i^2}$
(E) The holes are not generated due to the donors
Choose the correct answer from the options given below :
(A) (A), (C), (D) only
(B) (A), (C), (E) only
(C) (A), (B), (E) only
(D) (A), (B), (C) only

**Q17** Match **List-I** with **List-II**.

| List-I | List-II |
|---|---|
| (A) Isobaric | (I) $\Delta Q = \Delta W$ |
| (B) Isochoric | (II) $\Delta Q = \Delta U$ |
| (C) Adiabatic | (III) $\Delta Q$ = zero |
| (D) Isothermal | (IV) $\Delta Q = \Delta U + P\Delta V$ |

$\Delta Q$ = Heat supplied
$\Delta W$ = Work done by the system
$\Delta U$ =Change in internal energy
$P$ = Pressure of the system
$\Delta V$ =Change in volume of the system

Choose the correct answer from the options given below :

(A) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)

(B) (A)-(IV), (B)-(I), (C)-(III), (D)-(II)

(C) (A)-(IV), (B)-(II), (C)-(III), (D)-(I)

(D) (A)-(II), (B)-(IV), (C)-(III), (D)-(I)

**Q18** Displacement of a wave is expressed as $x(t) = 5\cos\left(628t + \frac{\pi}{2}\right)m$. The wavelength of the wave when its velocity is $300\ m/s$ is :

(A) $5\ m$ (B) $3\ m$

(C) $0.5\ m$ (D) $0.33\ m$

**Q19** A finite size object is placed normal to the principal axis at a distance of 30 cm from a convex mirror of focal length 30 cm. A plane mirror is now placed in such a way that the image produced by both the mirrors coincide with each other. The distance between the two mirrors is :

(A) $45\ cm$ (B) $7.5\ cm$

(C) $22.5\ cm$ (D) $15\ cm$

**Q20** In an electromagnetic system, a quantity defined as the ratio of electric dipole moment and magnetic dipole moment has dimension of $[M^P L^Q T^R A^S]$. The value of P and Q are :

(A) $-1,\ 0$ (B) $-1,\ 1$

(C) $1,\ -1$ (D) $0,\ -1$

**Q21** A particle of charge $1.6\mu C$ and mass $16\mu\ g$ is present in a strong magnetic field of 6.28 T . The particle is then fired perpendicular to magnetic field. The time required for the particle to return to original location for the first time is _____s. $(\pi = 3.14)$

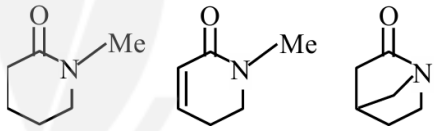
**Q22** A solid sphere with uniform density and radius R is rotating initially with constant angular velocity $(\omega_1)$ about its diameter. After some time during the rotation its starts loosing mass at a uniform rate, with no change in its shape. The angular velocity of the sphere when its radius become $R/2$ is $x\omega_1$. The value of x is _____ .

**Q23** If an optical medium possesses a relative permeability of $\frac{10}{\pi}$ and relative permittivity of $\frac{1}{0.0885}$, then the velocity of light is greater in vacuum than that in this medium by _____ times. $\left(\mu_0 = 4\pi \times 10^{-7} H/m, \in_0 = 8.85 \times 10^{-12}\ F/\right.$ $\left. c = 3 \times 10^8\ m/s\right)$

**Q24** In a Young's double slit experiment, two slits are located 1.5 mm apart. The distance of screen from slits is 2 m and the wavelength of the source is 400 nm . If the 20 maxima of the double slit pattern are contained within the centre maximum of the single slit diffraction pattern, then the width of each slit is $x \times 10^{-3}\ cm$, where x -value is_____.

**Q25** An inductor of self inductance 1 H connected in series with a resistor of $100\pi\ ohm$ and an ac supply of $100\pi$ volt, 50 Hz . Maximum current flowing in the circuit is _____ A.

**Q26** The correct order of basicity for the following molecules is:



(P) (Q) (R)

(A) P > Q > R

(B) R > P > Q

(C) Q > P > R

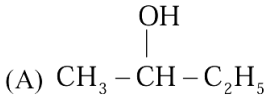
(D) R > Q > P

**Q27** The incorrect relationship in the following pairs in relation to ionisation enthalpies is :

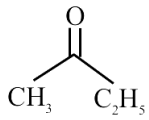
(A) $Mn^+ < Cr^+$ (B) $Mn^+ < Mn^{2+}$

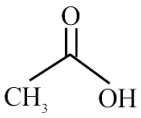
(C) $Fe^{2+} < Fe^{3+}$ (D) $Mn^{2+} < Fe^{2+}$

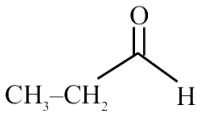
**Q28** Which among the following compounds give yellow solid when reacted with NaOI/NaOH?

(A) 

(B) 

(C) 

(D) 

(E) 

Choose the correct answer from the options given below :

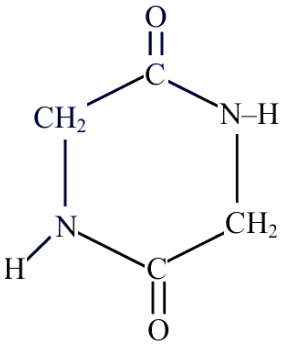
(A) (B), (C) and (E) Only

(B) (A) and (C) Only

(C) (C) and (D) Only

(D) (A), (C) and (D) Only

**Q29** A dipeptide, "x" on complete hydrolysis gives "y" and "z". "y" on treatment with aq. $HNO_2$ produces lactic acid. On the other hand "z" on heating gives the following cyclic molecule.



Based on the information given, the dipeptide X is:

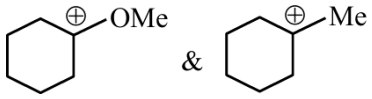
(A) valine-glycine

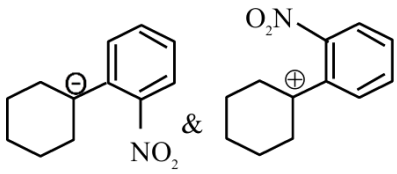
(B) alanine-glycine

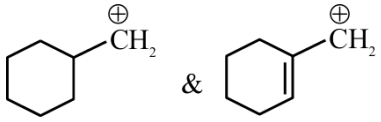
(C) valine-leucine

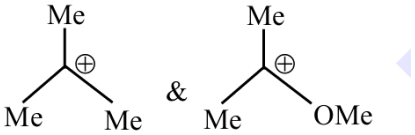
(D) alanine-alanine

**Q30** In which pairs, the first ion is more stable than the second ?

(A) 

(B) 

(C) 

(D) 

(A) (B) & (D) only

(B) (A) & (B) only

(C) (B) & (C) only

(D) (A) & (C) only

**Q31** Given below are two statements :

**Statement (I) :** Alcohols are formed when alkyl chlorides are treated with aqueous potassium hydroxide by elimination reaction.

**Statement (II) :** In alcoholic potassium hydroxide, alkyl chlorides form alkenes by abstracting the hydrogen from the $\beta-$carbon.

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

(A) Both Statement I and Statement II are incorrect

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

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

(D) Both Statement I and Statement II are correct

**Q32** Given below are two statements

Statement (I) : Molal depression constant $K_f$ is given by $\frac{M_1 R T_f}{\Delta S_{fus}}$, where symbols have their usual meaning.

Statement (II) : $K_f$ for benzene is less than the $K_f$ for water.

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

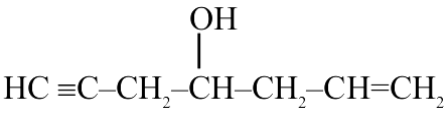
(A) Statement I is incorrect but Statement II is correct

(B) Both Statement I and Statement II are incorrect

(C) Both Statement I and Statement II are correct

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

**Q33** The IUPAC name of the following compound is –



(A) 4-Hydroxyhept-1-en-6-yne

(B) 4- Hydroxyhept-6-en-1-yne

(C) Hept-6-en-1-yn-4-ol

(D) Hept-1-en-6-yn-4-ol

**Q34** Match **List-I** with **List-II** -

| | **List-I (Separation of)** | | **List-II (Separation Technique)** |
|---|---|---|---|
| (A) | Aniline from aniline-water mixture | (I) | Simple distillation |
| (B) | Glycerol from spent-lye in soap industry | (II) | Fractional distillation |
| (C) | Different fractions of crude oil in petroleum industry | (III) | Distillation at reduced pressure |
| (D) | Chloroform-Aniline mixture | (IV) | Steam distillation |

Choose the correct answer from the options given below :

(A) (A)-(IV), (B)-(III), (C)-(II), (D)-(I)

(B) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)

(C) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

(D) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)

**Q35** A toxic compound "A" when reacted with NaCN in aqueous acidic medium yields an edible cooking component and food preservative 'B'. "B" is converted to "C" by diborane and can be used as an additive to petrol to reduce emission. "C" upon reaction with oleum at 140°C yields an inhalable anesthetic "D". Identify "A", "B", "C" and "D", respectively.

(A) Methanol; formaldehyde; methyl chloride; chloroform

(B) Ethanol; acetonitrile; ethylamine; ethylene

(C) Methanol; acetic acid; ethanol; diethyl ether

(D) Acetaldehyde;2- hydroxypropanoic acid; propanoic acid; dipropyl ether

**Q36** The correct order of $[FeF_6]^{3-}$, $[CoF_6]^{3-}$, $[Ni(CO)_4]$ and $[Ni(CN)_4]^{2-}$ complex species based on the number of unpaired electrons present is :

(A) $[FeF_6]^{3-} > [CoF_6]^{3-} > [Ni(CN)_4]^{2-} > [Ni(CO)_4]$

(B) $[Ni(CN)_4]^{2-} > [FeF_6]^{3-} > [CoF_6]^{3-} > [Ni(CO)_4]$

(C) $[CoF_6]^{3-} > [FeF_6]^{3-} > [Ni(CO)_4] > [Ni(CN)_4]^{2-}$

(D) $[FeF_6]^{3-} > [CoF_6]^{3-} > [Ni(CN)_4]^{2-} = [Ni(CO)_4]$

**Q37** Consider the given data:

(a)

$$HCl(g) + 10H_2O(l) \rightarrow HCl.10H_2O \quad \Delta H = -69.01 \text{ kJ mol}^{-1}$$

(b)

$$HCl(g) + 40H_2O(l) \rightarrow HCl.40H_2O \quad \Delta H = -72.79 \text{ kJ mol}^{-1}$$

Choose the correct statement :

(A) Dissolution of gas in water is an endothermic process

(B) The heat of solution depends on the amount of solvent.

(C) The heat of dilution for the $HCl\,(HCl \cdot 10H_2O$ to $HCl.40H_2O)$ is $3.78 \text{ kJ mol}^{-1}$.

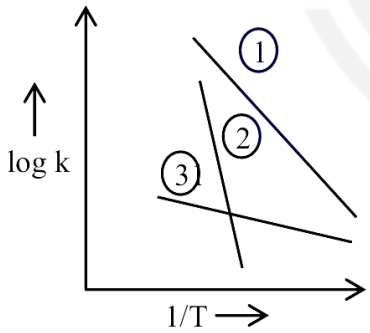
(D) The heat of formation of HCl solution is represented by both (a) and (b)

**Q38** Consider the ground state of chromium atom (Z = 24). How many electrons are with Azimuthal quantum number l = 1 and l = 2 respectively ?

(A) 12 and 4 (B) 16 and 4
(C) 12 and 5 (D) 16 and 5

**Q39** Given below are two statements :
Statement (I) : The first ionisation enthalpy of group 14 elements is higher than the corresponding elements of group 13.
Statement (II) : Melting points and boiling points of group 13 elements are in general much higher than those the corresponding elements of group 14 .
In the light of the above statements, choose the most appropriate answer from the options given below :
(A) Statement I is correct but Statement II is incorrect
(B) Statement I is incorrect but Statement II is correct
(C) Both Statement I and Statement II are incorrect
(D) Both Statement I and Statement II are correct

**Q40** Consider the following plots of log of rate constant $k(\log k)$ vs $\frac{1}{T}$ for three different reactions. The correct order of activation energies of these reactions is

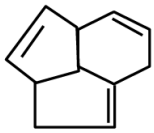



(A) $Ea_2 > Ea_1 > Ea_3$
(B) $Ea_1 > Ea_3 > Ea_2$
(C) $Ea_1 > Ea_2 > Ea_3$
(D) $Ea_3 > Ea_2 > Ea_1$

**Q41** ' X ' is the number of electrons in $t_{2g}$ orbitals of the most stable complex ion among $[Fe(NH_3)_6]^{3+}$, $[Fe(Cl_6)]^{3-}$, $[Fe(C_2O_4)_3]^{3-}$ and $[Fe(H_2O)_6]^{3+}$. The nature of oxide of vanadium of the type $V_2O_x$ is:
(A) Acidic (B) Neutral
(C) Basic (D) Amphoteric

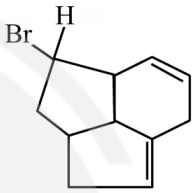
**Q42** The elements of Group 13 with highest and lowest first ionisation enthalpies are respectively:
(A) B & Ga
(B) B & Tl
(C) Tl & B
(D) B & In

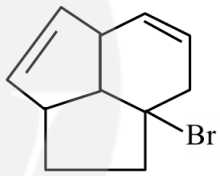
**Q43** Consider the following molecule (X).

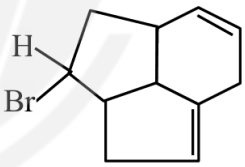


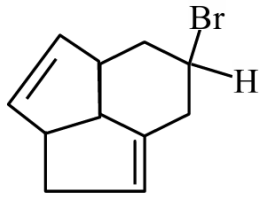
(X)

The structure of X is

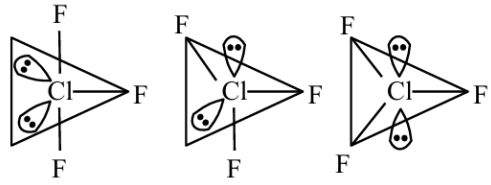
(A)



(B)



(C)



(D)



**Q44** Given below are two statements:
Statement (I) : for  , all three possible structures may be drawn as follows.



Statement (II) : Structure III is most stable, as the orbitals having the lone pairs are axial, where the $\ell p$ - bp repulsion is minimum.

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

(A) Statement I is incorrect but statement II is correct.

(B) Statement I is correct but statement II is incorrect.

(C) Both Statement I and statement II are correct.

(D) Both Statement I and statement II are incorrect.

**Q45** Half life of zero order reaction $A \rightarrow$ product is 1 hour, when initial concentration of reaction is $2.0\ \text{mol}\ \text{L}^{-1}$. The time required to decrease concentration of A from $0.50$ to $0.25\ \text{mol}\ \text{L}^{-1}$ is:

(A) $0.5\ hour$ (B) $4\ hour$

(C) $15\ min$ (D) $60\ min$

**Q46** Sea water, which can be considered as a 6 molar (6 M) solution of NaCl , has a density of $2\ \text{g}\ \text{mL}^{-1}$. The concentration of dissolved oxygen $(O_2)$ in sea water is 5.8 ppm . Then the concentration of dissolved oxygen $(O_2)$in sea water, is $x \times 10^{-4}$ m. x =_____ . (Nearest integer)

Given: Molar mass of NaCl is $58.5\ \text{g}\ \text{mol}^{-1}$

Molar mass of $O_2$ is $32\ \text{g}\ \text{mol}^{-1}$

**Q47** The amount of calcium oxide produced on heating $150$ kg limestone ($75\%$ pure) is _____ kg. (Nearest integer)

Given : Molar mass (in $\text{gmol}^{-1}$ ) of

$\text{Ca} - 40, \text{O} - 16, \text{C} - 12$

**Q48** A metal complex with a formula $MCl_4 \cdot 3NH_3$ is involved in $sp^3d^2$ hybridisation. It upon reaction with excess of $AgNO_3$ solution gives ' x' moles of $AgCl$ . Consider ' x ' is equal to the number of lone pairs of electron present in central atom of $BrF_5$. Then the number of geometrical isomers exhibited by the complex is _____

**Q49** The molar conductance of an infinitely dilute solution of ammonium chloride was found to be $185\ \text{S}\ \text{cm}^2\ \text{mol}^{-1}$ and the ionic conductance of hydroxyl and chloride ions are $170$ and $70\ \text{S}\ \text{cm}^2\ \text{mol}^{-1}$, respectively. If molar conductance of $0.02$ M solution of ammonium hydroxide is $85.5\ \text{S}\ \text{cm}^2\ \text{mol}^{-1}$, its degree of dissociation is given by $x \times 10^{-1}$. The value of x is _____ . (Nearest integer)

**Q50** $x$ mg of $Mg(OH)_2$ (molar mass = 58) is required to be dissolved in 1.0 L of water to produce a pH of 10.0 at 298 K . The value of x is _____ mg. (Nearest integer)

(Given : $Mg(OH)_2$ is assumed to dissociate completely in $H_2O$ )

**Q51** Let $a > 0$. If the function $f(x) = 6x^3 - 45ax^2 + 108a^2x + 1$ attains its local maximum and minimum values at the points $x_1$ and $x_2$ respectively such that $x_1x_2 = 54$, then $a + x_1 + x_2$ is equal to :-

(A) $15$ (B) $18$

(C) $24$ (D) $13$

**Q52** Let f be a differentiable function on $\mathbf{R}$ such that $f(2) = 1, f'(2) = 4$. Let $\lim\limits_{x \to 0}\left(f\left(2+x\right)\right)^{3/x} = e^{\alpha}$. Then the number of times the curve $y = 4x^3 - 4x^2 - 4(\alpha - 7)x - \alpha$ meets x -axis is :-

(A) $2$ (B) $1$

(C) $0$ (D) $3$

**Q53** The sum of the infinite series $\cot^{-1}\left(\frac{7}{4}\right) + \cot^{-1}\left(\frac{19}{4}\right) + \cot^{-1}\left(\frac{39}{4}\right)$ . is :- $+ \cot^{-1}\left(\frac{67}{4}\right) + \ldots$.

(A) $\frac{\pi}{2} + \tan^{-1}\left(\frac{1}{2}\right)$ (B) $\frac{\pi}{2} - \cot^{-1}\left(\frac{1}{2}\right)$

(C) $\frac{\pi}{2} + \cot^{-1}\left(\frac{1}{2}\right)$ (D) $\frac{\pi}{2} - \tan^{-1}\left(\frac{1}{2}\right)$

**Q54**

Let $A=\{-3,-2,-1,0,1,2,3\}$ and R be a relation on A defined by $xRy$ if and only if $2x-y\in\{0,1\}$. Let $l$ be the number of elements in R. Let $m$ and $n$ be the minimum number of elements required to be added in R to make it reflexive and symmetric relations, respectively. Then $l+m+n$ is equal to :-

(A) 18 (B) 17

(C) 15 (D) 16

**Q55** Let the product of $\omega_1=(8+i)\sin\theta+(7+4i)\cos\theta$ and $\omega_2=(1+8i)\sin\theta+(4+7i)\cos\theta$ be $\alpha+i\beta$, $i=\sqrt{-1}$. Let $p$ and $q$ be the maximum and the minimum values of $\alpha+\beta$ respectively.

(A) 140 (B) 130

(C) 160 (D) 150

**Q56** Let the values of $p$, for which the shortest distance between the lines $\frac{x+1}{3}=\frac{y}{4}=\frac{z}{5}$ and $\vec{r}=\left(p\hat{i}+2\hat{j}+\hat{k}\right)+\lambda\left(2\hat{i}+3\hat{j}+4\hat{k}\right)$ is $\frac{1}{\sqrt{6}}$, be $a, b, (a<b)$. Then the length of the latus rectum of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is :-

(A) 9 (B) $\frac{3}{2}$

(C) $\frac{2}{3}$ (D) 18

**Q57** The axis of a parabola is the line $y=x$ and its vertex and focus are in the first quadrant at distances $\sqrt{2}$ and $2\sqrt{2}$ units from the origin, respectively. If the point $(1,\ k)$ lies on the parabola, then a possible value of $k$ is :-

(A) 4 (B) 9

(C) 3 (D) 8

**Q58** Let the domains of the functions $f(x)=\log_4\log_3\log_7\left(8-\log_2\left(x^2+4x+5\right)\right)$ and $g(x)=\sin^{-1}\left(\frac{7x+10}{x-2}\right)$ be $(\alpha,\ \beta)$ and $[\gamma,\ \delta]$, respectively. Then $\alpha^2+\beta^2+\gamma^2+\delta^2$is equal to :-

(A) 15 (B) 13

(C) 16 (D) 14

**Q59** A line passing through the point $A(-2,0)$, touches the parabola $P: y^2=x-2$ at the point B in the first quadrant. The area, of the region bounded by the line AB, parabola P and the x-axis, is :-

(A) $\frac{7}{3}$ (B) 2

(C) $\frac{8}{3}$ (D) 3

**Q60** Let the sum of the focal distances of the point $P(4,3)$ on the hyperbola $H: \frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ be $8\sqrt{\frac{5}{3}}$. If for H , the length of the latus rectum is $l$ and the product of the focal distances of the point P is m , then $9l^2+6m$ is equal to :-

(A) 184 (B) 186

(C) 185 (D) 187

**Q61** Let the matrix $A=\begin{bmatrix}1&0&0\\1&0&1\\0&1&0\end{bmatrix}$ satisfy $A^n=A^{n-2}+A^2-I$ or $n\geq 3$. Then the sum of all the elements of $A^{50}$ is :-

(A) 53 (B) 52

(C) 39 (D) 44

**Q62** If the sum of the first 20 terms of the series $\frac{4.1}{4+3.1^2+1^4}+\frac{4.2}{4+3.2^2+2^4}+\frac{4.3}{4+3.3^2+3^4}+\frac{4.4}{4+3.4^2+4^4}+\ldots$ is $\frac{m}{n}$, where m and n are coprime, then m + n is equal to :-

(A) 423 (B) 420

(C) 421 (D) 422

**Q63** If $1^2\cdot\left({}^{15}C_1\right)+2^2\cdot\left({}^{15}C_2\right)+3^2\cdot\left({}^{15}C_3\right)+\ldots.+15^2\cdot\left({}^{15}C_{15}\right)=2^m\cdot3^n\cdot5^k$, where $m,n,k\in N$, then $m+n+k$ is equal to :-

(A) 19 (B) 21

(C) 18 (D) 20

**Q64** Let for two distinct values of p the lines y = x + p touch the ellipse E : $\frac{x^2}{4^2}+\frac{y^2}{3^2}=1$ at the points A and B. Let the line y = x intersect E at the points C and D . Then the area of the quadrilateral ABCD is equal to

(A) $36$ (B) $24$
(C) $48$ (D) $20$

**Q65** Consider two sets $A$ and $B$, each containing three numbers in A.P. Let the sum and the product of the elements of $A$ be $36$ and $p$ respectively and the sum and the product of the elements of $B$ be $36$ and $q$ respectively. Let $d$ and $D$ be the common differences of AP's in $A$ and $B$ respectively such that $\mathrm{D} = \mathrm{d} + 3,\ \mathrm{d} > 0$. If $\frac{\mathrm{p}+\mathrm{q}}{\mathrm{p}-\mathrm{q}} = \frac{19}{5}$, then $\mathrm{p} - \mathrm{q}$ is equal to
(A) $600$ (B) $450$
(C) $630$ (D) $540$

**Q66** If a curve y = y(x) passes through the point $\left(1, \frac{\pi}{2}\right)$ and satisfies the differential equation $\left(7\mathrm{x}^4\mathrm{coty} - \mathrm{e}^{\mathrm{x}}\,\mathrm{cosec}\,\mathrm{y}\right)\frac{\mathrm{dx}}{\mathrm{dy}} = \mathrm{x}^5, \mathrm{x} \geq 1$, then at $x = 2$, the value of $\cos y$ is:
(A) $\frac{2e^2-e}{64}$ (B) $\frac{2e^2+e}{64}$
(C) $\frac{2e^2-e}{128}$ (D) $\frac{2e^2+e}{128}$

**Q67** The centre of a circle C is at the centre of the ellipse $\mathrm{E}: \frac{\mathrm{x}^2}{\mathrm{a}^2} + \frac{\mathrm{y}^2}{\mathrm{b}^2} = 1, \mathrm{a} > \mathrm{b}$. Let $C$ pass through the foci $\mathrm{F}_1$ and $F_2$ of $E$ such that the circle $C$ and the ellipse $E$ intersect at four points. Let $P$ be one of these four points. If the area of the triangle $\mathrm{PF}_1\ \mathrm{F}_2$ is $30$ and the length of the major axis of $E$ is $17$, then the distance between the foci of $E$ is :
(A) $26$ (B) $13$
(C) $12$ (D) $\frac{13}{2}$

**Q68** Let $\mathrm{f}(\mathrm{x}) + 2\mathrm{f}\left(\frac{1}{\mathrm{x}}\right) = \mathrm{x}^2 + 5$ and $2g(x) - 3g\left(\frac{1}{2}\right) = x, x > 0$. If $\alpha = \int_1^2 f(x)\,dx$, and $\beta = \int_1^2 g(x)\,dx$, then the value of $9\alpha + \beta$ is :
(A) $1$ (B) $0$
(C) $10$ (D) $11$

**Q69** Let A be the point of intersection of the lines $\mathrm{L}_1 : \frac{\mathrm{x}-7}{1} = \frac{\mathrm{y}-5}{0} = \frac{\mathrm{z}-3}{-1}$ and $\mathrm{L}_2 : \frac{\mathrm{x}-1}{3} = \frac{\mathrm{y}+3}{4} = \frac{\mathrm{z}+7}{5}$. Let B and C be the point on the lines $\mathrm{L}_1$ and $\mathrm{L}_2$ respectively such that $\mathrm{AB} = \mathrm{AC} = \sqrt{15}$. Then the square of the area of the triangle ABC is :
(A) $54$ (B) $63$
(C) $57$ (D) $60$

**Q70** Let the mean and the standard deviation of the observation $2, 3, 3, 4, 5, 7, \mathrm{a}, \mathrm{b}$ be $4$ and $\sqrt{2}$ respectively. Then the mean deviation about the mode of these observations is :
(A) $1$ (B) $\frac{3}{4}$
(C) $2$ (D) $\frac{1}{2}$

**Q71** If $\alpha$ is a root of the equation $x^2 + x + 1 = 0$ and $\sum_{\mathrm{k}=1}^{\mathrm{n}} \left(\alpha^{\mathrm{k}} + \frac{1}{\alpha^{\mathrm{k}}}\right)^2 = 20$, then n is equal to _____

**Q72** If
$\int \frac{\left(\sqrt{1+\mathrm{x}^2}+\mathrm{x}\right)^{10}}{\left(\sqrt{1+\mathrm{x}^2}-\mathrm{x}\right)^{9}}\mathrm{dx} =$
$\frac{1}{\mathrm{m}}\left(\left(\sqrt{1+\mathrm{x}^2}+\mathrm{x}\right)^{\mathrm{n}}\left(\mathrm{n}\sqrt{1+\mathrm{x}^2}-\mathrm{x}\right)\right)+\mathrm{C}$
where C is the constant of integration and $m, n \in N$, then $\mathrm{m} + \mathrm{n}$ is equal to

**Q73** A card from a pack of $52$ cards is lost. From the remaining $51$ cards, $n$ cards are drawn and are found to be spades. If the probability of the lost card to be a spade is $\frac{11}{50}$, then $n$ is equal to

**Q74** Let $m$ and $n$, $(m < n)$ be two 2-digit numbers. Then the total numbers of pairs $(m, n)$, such that $gcd\,(m, n) = 6$, is _____

**Q75** Let the three sides of a triangle ABC be given by the vectors $2\hat{\mathrm{i}} - \hat{\mathrm{j}} + \hat{\mathrm{k}}$, $\hat{\mathrm{i}} - 3\hat{\mathrm{j}} - 5\hat{\mathrm{k}}$ and $3\hat{i} - 4\hat{j} - 4\hat{k}$. Let G be the centroid of the triangle ABC . Then $6\left(\left|\overrightarrow{\mathrm{AG}}\right|^2 + \left|\overrightarrow{\mathrm{BG}}\right|^2 + \left|\overrightarrow{\mathrm{CG}}\right|^2\right)$ is equal to _____

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# Answer Key

| | |
|---|---|
| Q1 | (B) |
| Q2 | (C) |
| Q3 | (A) |
| Q4 | (C) |
| Q5 | (A) |
| Q6 | (A) |
| Q7 | (B) |
| Q8 | (B) |
| Q9 | (A) |
| Q10 | (C) |
| Q11 | (D) |
| Q12 | (A) |
| Q13 | (B) |
| Q14 | (C) |
| Q15 | (A) |
| Q16 | (C) |
| Q17 | (C) |
| Q18 | (B) |
| Q19 | (B) |
| Q20 | (D) |
| Q21 | 0.01 |
| Q22 | 32 |
| Q23 | 6 |
| Q24 | 15 |
| Q25 | 1 |
| Q26 | (D) |
| Q27 | (D) |
| Q28 | (B) |
| Q29 | (B) |
| Q30 | (B) |
| Q31 | (B) |
| Q32 | (D) |
| Q33 | (D) |
| Q34 | (A) |
| Q35 | (C) |
| Q36 | (D) |
| Q37 | (B) |
| Q38 | (C) |
| Q39 | (A) |
| Q40 | (A) |
| Q41 | (D) |
| Q42 | (D) |
| Q43 | (B) |
| Q44 | (B) |
| Q45 | (C) |
| Q46 | 2 |
| Q47 | 63 |
| Q48 | 2 |
| Q49 | 3 |
| Q50 | 3 |
| Q51 | (B) |
| Q52 | (A) |
| Q53 | (D) |
| Q54 | (B) |
| Q55 | (B) |
| Q56 | (C) |
| Q57 | (B) |
| Q58 | (A) |
| Q59 | (C) |
| Q60 | (C) |

**Q61** (A)

**Q62** (C)

**Q63** (A)

**Q64** (B)

**Q65** (D)

**Q66** (C)

**Q67** (B)

**Q68** (D)

**Q69** (A)

**Q70** (A)

**Q71** 11

**Q72** 379

**Q73** 2

**Q74** 64

**Q75** 164

# Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Video Solution:

Q2 Video Solution:

Q3 Video Solution:

Q4 Video Solution:

Q5 Video Solution:

Q6 Video Solution:

Q7 Video Solution:

Q8 Video Solution:

Q9 Video Solution:

Q10 Video Solution:

Q11 Video Solution:

Q12 Video Solution:

Q13 Video Solution:

Q14 Video Solution:

Q15 Video Solution:

Q16 Video Solution:

Q17 Video Solution:

Q18 Video Solution:

Q19 Video Solution:

Q20 Video Solution:

Q21 Video Solution:

Q22 Video Solution:

Q23 Video Solution:

**Q24** Video Solution:

**Q25** Video Solution:

**Q26** Video Solution:

**Q27** Video Solution:

**Q28** Video Solution:

**Q29** Video Solution:

**Q30** Video Solution:

**Q31** Video Solution:

**Q32** Video Solution:

**Q33** Video Solution:

**Q34** Video Solution:

**Q35** Video Solution:

**Q36** Video Solution:

**Q37** Video Solution:

**Q38** Video Solution:

**Q39** Video Solution:

**Q40** Video Solution:

**Q41** Video Solution:

**Q42** Video Solution:

**Q43** Video Solution:

**Q44** Video Solution:

**Q45** Video Solution:

**Q46** Video Solution:

**Q47** Video Solution:

Q48 Video Solution:

Q49 Video Solution:

Q50 Video Solution:

Q51 Video Solution:

Q52 Video Solution:

Q53 Video Solution:

Q54 Video Solution:

Q55 Video Solution:

Q56 Video Solution:

Q57 Video Solution:

Q58 Video Solution:

Q59 Video Solution:

**Q60** Video Solution:

**Q61** Video Solution:

**Q62** Video Solution:

**Q63** Video Solution:

**Q64** Video Solution:

**Q65** Video Solution:

**Q66** Video Solution:

**Q67** Video Solution:

**Q68** Video Solution:

**Q69** Video Solution:

**Q70** Video Solution:

**Q71** Video Solution:

**Q72 Video Solution:**

**Q73 Video Solution:**

**Q74 Video Solution:**

**Q75 Video Solution:**