SINCE 1984

Brilliant®

STUDY CENTRE, PALA

# JEE MAIN 2025

## SESSION-2

## DAY 3

SCAN ME

# VIDEO SOLUTION

# MEMORY BASED QUESTIONS

1. In the following, the number of paramagnetic molecules are: $O_2$, $N_2$, $F_2$, $B_2$, $Cl_2$

2. Which of the following pair of ions have equal number of unpaired electrons

1) $V^{2+}$ and $Ni^{2+}$ 2) $Cr^{2+}$ and $Mn^{2+}$ 3) $Fe^{2+}$ and $Sc^{2+}$ 4) $Mn^{3+}$ and $Fe^{2+}$

3. Incorrect order of atomic radius is

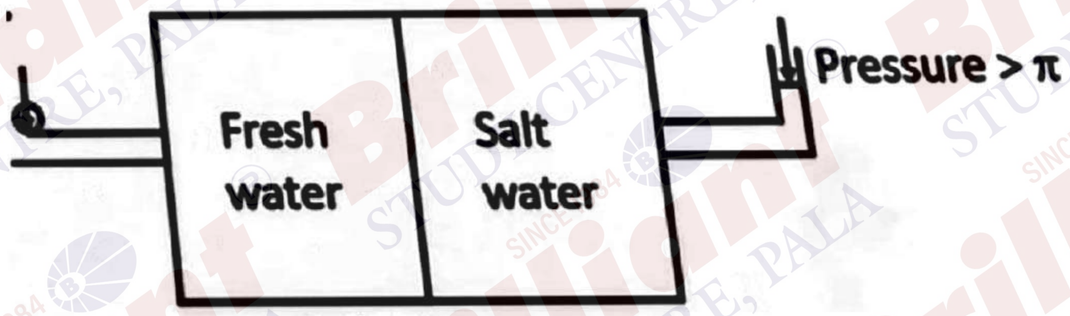
1) B < Al 2) In < Tl 3) Al < Ga 4) Ga < ln

4. One mole of an ideal gas expands from 10 $dm^3$ to 20 $dm^3$ through isothermal reversible process. Find ΔU, q & w

1) ΔU = 0, q = 0, w = 0 2) ΔU = 0, q≠0, w≠0

3) ΔU ≠ 0, q=0, w≠ 0 4) ΔU ≠ 0, q≠0, w≠0

5. Observe the following diagram



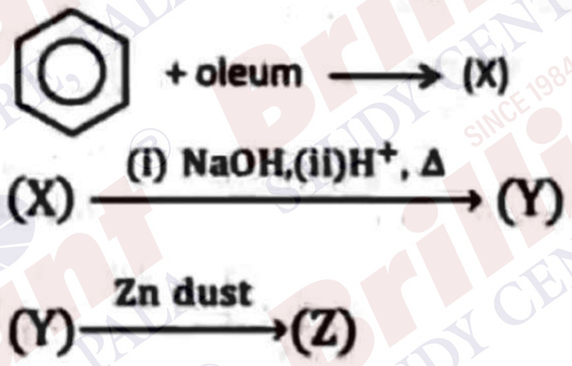

For reverse osmosis, which of the following can be used for porous membrane

1) Cellulose acetate 2) Porous silicate 3) Silicone 4) Glass membrane

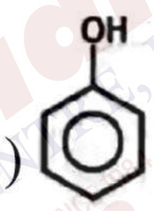
6. Which of the following is the ratio of 5th Bohr orbit ($r_5$) of $He^+$ and $Li^{2+}$?

1) 2/3 2) 3/2 3) 9/4 4) 4/9

7. In the reaction sequence:

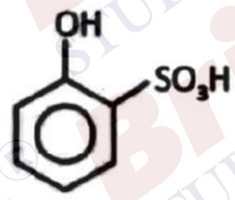


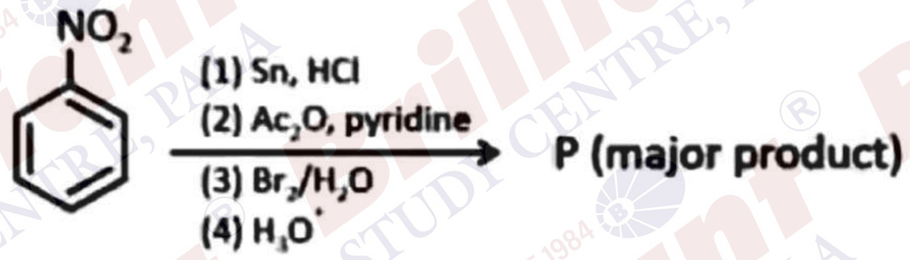

The compound (Z) is

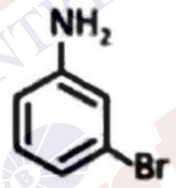
1) 

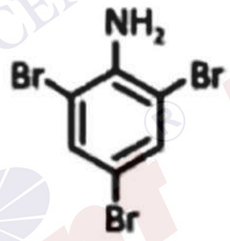

2) 

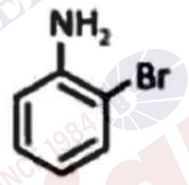

3) 

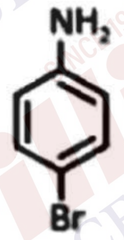
4) 

8. 


1) 


2) 


3) 


4) 


9. Which of the following is correct option regarding 1s orbital

1) it is symmetrical 2) it is non-symmetrical

3) it is directional 4) it has two radial nodes

10. Total number of stereoisomers possible for complexes $[Cr(Cl_3)(Py)_3]$ and $[CrCl_2(C_2O_4)_2]$ respectively are

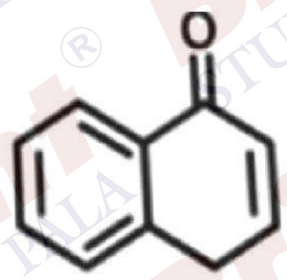
1) 2, 3 2) 3, 2 3) 3, 3 4) 2, 2

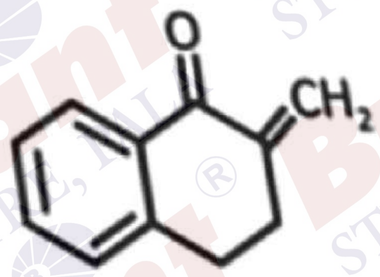
11. In lead storage battery during charging oxidation state of lead show changes at anode from $x_1$ to $y_1$ at cathode from $x_2$ to $y_2$. Find the value of $x_1$, $y_1$, $x_2$, $y_2$

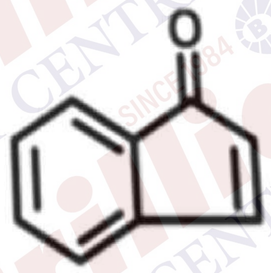
1) $x_1 = +2$, $y_1 = 0$; $x_2 = +2$, $y_2 = +4$ 2) $x_1 = +4$, $y_1 = 0$; $x_2 = +2$, $y_2 = +4$

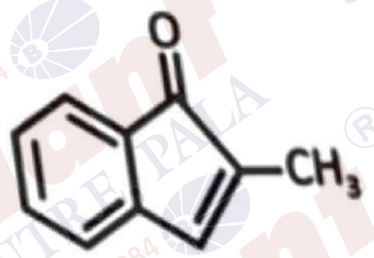
3) $x_1 = 0$, $y_1 = +2$; $x_2 = +4$, $y_2 = +2$ 4) $x_1 = +2$, $y_1 = 0$; $x_2 = +4$, $y_2 = 0$

12. Which of the following compound is not a product of intramolecular aldol condensation reaction?

1) 


2) 


3) 


4) 


13. 0.01 M HX ($K_a = 4 \times 10^{-10}$) is diluted till the solution has pH = 6. If the new concentration is $x \times 10^{-4}$ M, then find x.

14. Consider the reaction A + B →Product. $R = k[A]^m[B]^n$. When conc. of A and B taken are $A_1$ and $B_1$ respectively, then rate of reaction is $R_1$. When conc. of A & B taken are $2A_1$ & $\frac{B_1}{2}$, then rate of reaction is $R_2$. Find $\frac{R_2}{R_1}$ ?

1) $2^{m+n}$ 2) $2^{n-m}$ 3) $2^{m-n}$ 4) 1

15. Statement-I : (A) $C_2H_5 - CH = \overset{2}{C}H - \overset{1}{C}HO$ has higher diopole moment than (B)

$C_2H_5 - \overset{2}{C}H_2 - \overset{1}{C}HO$.

Statement-II : C1 - C2 bond length in (A) is longer than (B)

In the light of the above statements, choose the correct option

1) Both statement-I and statement-II are correct

2) Both statement-I and statement-II are incorrect

3) Statement-I is correct but statement-II is incorrect

4) Statement-I is incorrect but statement-II is correct

16. The complex ion having crysta field stabilization energy is zero and value of spin only magnetic moment is 5.92 BM

1) $[FeF_6]^{4-}$ 2) $[Mn(SCN)_6]^{4-}$ 3) $[Co(NH_3)_6]^{3+}$ 4) $[Fe(CN)_6]^{3-}$

17. $KMnO_4$ oxidises others in acidic medium, Difference between two oxidation states of Mn is x. Neutral $FeCl_3$ reacts with oxalate to form a complex compound having y-d-electrons. Find x + y.

1) 5 2) 10 3) 6 4) 8

18. The activation energy of forward reaction and backward reaction is 100 kJ/mol and 180 kJ/mol respectively. Find the correct statement if catalyst is added under same condition of temperature

1) Catalyst does not change $\Delta G$ of reaction

2) Catalyst can make non-spontaneous reaction spontaneous

3) Catalyst changes $\Delta H$ of reaction

4) Enthalpy of reaction $\Delta H$ is 280 kJ/mo

19. In the following sequence of reaction. A is converted to D

$$\underset{A}{C_3H_6O} \xrightarrow{H_2/Pd} B \xrightarrow{HBr} C \xrightarrow{Mg/Ether} D$$

D is treated with A followed by hydrolysis to give

2, 3-dimethyl-butan-2-ol. Then identify A, B, C

1) $A = CH_3COCH_3$, $B = CH_3–CH(OH)CH_3$, $C = CH_3–CH(Br)CH_3$

2) $A = CH_3CH_2CHO$, $B = CH_3CH_2CH_2OH$, $C = CH_3CH_2CH_2Br$

3) $A = CH_2=CH–CH_2OH$, $B = CH_3CH_2CH_2OH$, $C = CH_3CH_2CH_2Br$

4) A = Cyclopropanol, B = Cyclopropenone, C = Bromo propane

15. Statement-I : (A) $C_2H_5 - CH = \overset{2}{C}H - \overset{1}{C}HO$ has higher diopole moment than (B)

$C_2H_5 - \overset{2}{C}H_2 - \overset{1}{C}HO$.

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3) $A = CH_2=CH–CH_2OH$, $B = CH_3CH_2CH_2OH$, $C = CH_3CH_2CH_2Br$

4) A = Cyclopropanol, B = Cyclopropenone, C = Bromo propane

20. In Duma's method for estimatino of N, 0.5 g of an organic compound gave 150 mL of $N_2$ collected at 300 K and 900 mm Hg pressure (Aq. tension is 15 mm Hg). Find $ of N

21. Given below is a sample of DNA strand 5'GGCAATGCTACAG3". Find the number of hydrogen bonds prevent in this DNa strand.

22. A sample of 150 kg wheat contains Fe-metal. Find mass of $FeSO_4.7H_2O$ in g. So that sample contains 12 ppm Fe-metal. (Atomic mass of Fe = 55.85 g/mol)

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04-04-2025 SHIFT 1-MORNING

MEMORY BASED QUESTIONS

MATHEMATICS

1. The number of integral values of $n \in N$ for which the equation $x^2 + 4x - n = 0, n \in [20,100]$ have integral roots, is

1) 4 2) 5 3) 6 4) 7

2. In binomial expansion, $\left(2^{\frac{1}{3}} + 3 - ^{\frac{1}{3}}\right)^m$ if ratio of $15^{th}$ term from beginning and $15^{th}$ term from end is 1:6, find n

1) $\left\{x, y \in Z : x^2 + y^2 = 5\right\}$

2) $\left\{x, y \in Z : x^2 + 9y^2 = 144\right\}$

3) $\left\{x, y \in N : x^2 + y^2 \le 4\right\}$

4) $A \cap B$

Number of one-one functions from $D \to C$

3. Let $|x-5| \le y \le 4\sqrt{x}$. If the area enclosed is A, then 3A equals to

The sum of the series $1+3+5^2+7+9^2+....$ upto 80 terms is

1) 326870 2) 328160 3) 339400 4) 338160

4. Solve $\int_{-1}^{1} \frac{1+2x}{e^{-x}+ex} dx$

1) $2\left(\tan^{-1} e - \frac{\pi}{4}\right)$ 2) $2\left(\tan^{-1} e - \frac{\pi}{3}\right)$ 3) $2\left(\tan^{-1} e - \frac{\pi}{2}\right)$ 4) $2\left(\frac{\pi}{2} - \tan^{-1} e\right)$

5. Let there be two A.P's with each having 2025 terms. Find the number of distinct in union of these two A.P.'s, i.e, $A \cup B$ if first A.P is 1,6,11,...and second A.P is 9,16,23,.....

1) 3761 2) 4035 3) 3022 4) 2025

6. If the equation of an ellipse E is $\frac{x^2}{9} + \frac{y^2}{16} = 1$ then the length of latus rectum of E is

1) $\frac{32}{5}$ 2) $\frac{9}{2}$ 3) $\frac{16}{3}$ 4) $\frac{9}{5}$

7. The sum of the series $1+3+5^2+7+9^2+....$ upto 80 terms is

1) 328160 2) 338160 3) 339400 4) 326870

8. In 10 balls, 3 are defective. If 2 are chosen at random, find variance $\left(\sigma^2\right)$ of the defective balls

9. Let $A=\begin{bmatrix}\cos\theta & 0 & -\sin\theta\\ 0 & 1 & 0\\ \sin\theta & 0 & \cos\theta\end{bmatrix}$. Here $A^2=A^T$

Then find trace $\left[(A+I)^3+(A-I)^3-6A\right]$

10. If $\lim\limits_{x\to1^+}\dfrac{(x-1)\left[6+\lambda\cos(x-1)\right]+\mu\sin(x-1)}{(x-1)^3}=-1$. Then the value of $\lambda+\mu$

1) –6 2) –4 3) 4 4) 2

11. Find the length of latus rectum of an ellipse if foci are (2,5) and (2,–3) and the eccentricity of the ellipse is $\dfrac{4}{5}$

1) $\dfrac{32}{3}$ 2) $\dfrac{32}{5}$ 3) $\dfrac{18}{5}$ 4) $\dfrac{16}{5}$

12. $\int_{-1}^{1}\dfrac{\left[1+\sqrt{|x|-x}\right]e^x+\left(\sqrt{|x|-x}\right)e^{-x}}{e^x+e^{-x}}$

13. If $10\sin^4\theta+15\cos^4\theta=6$, then find the value of $\dfrac{27\,\mathrm{cosec}^6\theta+8\sec^6\theta}{8\sec^8\theta}$

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

14. Consider a committee of 12 members is formed randomly out of 4 Engineers, 2 Doctors and 10 Professors. Find the probability that the committee has exactly 3 Engineers and 1 Doctor

15. If $\vec{v}=2\hat{i}+\hat{j}-\lambda\hat{k},(\lambda>0),\vec{u}=3\hat{i}-\hat{j}$ and $\vec{v}_1$ is parallel to $\vec{u},\vec{v}_2$ is perpendicular to $\vec{u}$ and $\vec{v}=\vec{v}_1+\vec{v}_2$

. If angle between $\vec{v}$ nad $\vec{v}_1$ is $\cos^1\left(\dfrac{\sqrt{5}}{2\sqrt{7}}\right)$, then $\left|\vec{v}_1\right|^2+\left|\vec{v}_2\right|^2$ equals to

16. Given two lines

$$L_1 : \frac{x-3}{3} = \frac{y-a}{1} = \frac{z+z}{-2} \text{ and } L_2 : \frac{x+1}{z} = \frac{y+z}{1} = \frac{z-\beta}{-1}$$

If shortest distance between $L_1$ and $L_2$ is $30\sqrt{3}$. Then the value of $|\alpha+\beta|$

17. Let A and B be two distinct points on the line $L : \frac{x-6}{3} = \frac{y-7}{3} = \frac{z-7}{-2}$ Both A and B are at a distance $2\sqrt{17}$ from the foot of the perpendicular drawn from the point (1,2,3) on the line L. If O is origine then $\overline{OA}.\overline{OB}$ is equal to

18. There are 10 pens such that 3 pens are defective. Let X represent the number of defective pen selected. If two pens are selected at random then variance of X is

1) $\frac{38}{75}$ 2) $\frac{28}{75}$ 3) $\frac{14}{75}$ 4) $\frac{3}{75}$

19. Let $\alpha$ and $\beta$ be the number of points where the function $f(x) = \max\{x, x^3, x^5, ...., x^{21}\}$ is not continuous and not differentiable respectively, then find $\alpha+\beta$

1) 6 2) 3 3) 2 4) 4

20. If $f(x) = 1 - 2x + \int_0^x e^{x-t} f(t)\,dt$, then the area bounded by the curve y= f(x) and coordiante axes is (in square units)

1) $\frac{1}{2}$ 2) 1 3) $\frac{3}{2}$ 4) 2

21. The value of $\sin^{-1}\left(\frac{\sqrt{3}x}{2} + \frac{1}{2}\sqrt{1-x^2}\right) - \frac{1}{2} < x < \frac{1}{\sqrt{2}}$ is equivalent to

1) $\frac{2\pi}{3} - \cos^{-1} x, -\frac{1}{2} < x < \frac{1}{\sqrt{2}}$

2) $\pi - \cos^{-1} x, -\frac{1}{2} < x < \frac{1}{\sqrt{2}}$

3) $\frac{\pi}{3} - \cos^{-1} x, -\frac{1}{2} < x < \frac{1}{\sqrt{2}}$

4) $\frac{\pi}{2} - \sin^{-1} x, -\frac{1}{2} < x < \frac{1}{\sqrt{2}}$

1. Assertion : In photoelectric effect, if intensity of monochromatic light is increased then stopping potential increases.

   Reason: Increased intensity results in increment of photocurrent

   1) A is correct, R is correct and R is explanation of A

   2) A is correct, R is correct and R is not explanation of A

   3) A is incorrect and R is correct

   4) A is correct and R is incorrect

2. Longitudinal sound waves travel in three different gases namely helium, methane and carbon dioxide. Mean temperature of three gases are equal then ratio of speeds of wave in 3 gases respectively is

   1) $\sqrt{5}:\sqrt{7}:\frac{1}{\sqrt{11}}$ 2) $\sqrt{3}:\sqrt{5}:\frac{1}{\sqrt{11}}$ 3) $\sqrt{5}:1:\sqrt{\frac{21}{55}}$ 4) $\frac{1}{\sqrt{3}}:\frac{1}{\sqrt{5}}:\frac{1}{2}$

3. Assertion (A) : The minimum kinetic energy required to take a body of mass m from surface of earth to infinity is mgR.

   Reason (R) : Potential energy at surface of earth is zero

   1) (A) and (R) both are correct and (R) is correct explanation of (A)

   2) (A) and (R) both are correct and (R) is not correct explanation of (A)

   3) (A) is correct but (R) is incorrect

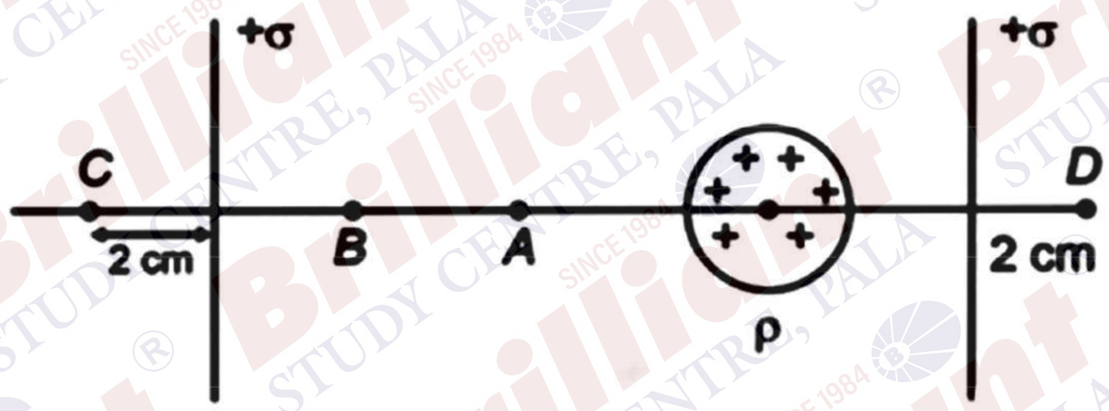
   4) (A) is incorrect but (R) is correct

4. If slit width is double then % change in fringe width

   1) 50% 2) remain same 3) 150% 4) 75%

5. In arrangement shown, has two non conducting plane sheet with charge density $\sigma$ and a non conducting sphere with volume charge density $\rho$.

   Choose the correct relation between the magnitude of electric field at A, B, C and D. Point A is at the middle of two sheets.




   1) $E_A = E_B, E_C \neq E_D$ 2) $E_A > E_B, E_C \neq E_D$ 3) $E_A > E_B, E_C = E_D$ 4) $E_A \neq E_B, E_C = E_D$

6. Two simple pendulums with amplitudes $\theta_1$ and $\theta_2$ have length of strings as $l_1$ and $l_2$ respectively. Choose the correct options if the maximum angular accelerations are same.

1) $\theta_1 l_1 = \theta_2 l_2$ 2) $\theta_1 l_2 = \theta_2 l_1$ 3) $\theta_1 l_1^2 = \theta_2 l_2^2$ 4) $\theta_1 l_2^2 = \theta_2 l_1^2$

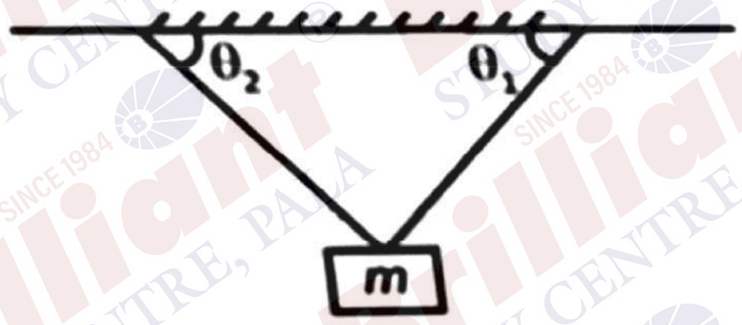
7. In YDSE setup, distance between slits d = 0.2 mm. If d is changed to 0.4 mm, then % change in fringe width

1) 25% 2) 50% 3) 100% 4) 75%

8. A closed organ pipe having fundamental frequency $f_0$. Now $\frac{1}{5}$ of volume its filled with water then % change in the fundamental frequency.

1) +10% 2) +25% 3) –20% 4) –10%

9. A block of mass m kg is connected two strings as shown. If $T_1 = \sqrt{3}T_2$. then choose correct option




1) $\theta_1 = 60°, \theta_2 = 30°, T_1 = \frac{mg}{2}$ 2) $\theta_1 = 60°, \theta_2 = 30°, T_2 = \frac{mg}{2}$

3) $\theta_1 = 30°, \theta_2 = 60°, T_1 = \frac{3mg}{4}$ 4) $\theta_1 = 30°, \theta_2 = 30°, T_2 = \frac{3mg}{4}$

10. Which of the following is correct expression for torque

1) $\vec{\tau} = \vec{r} \times \vec{L}$ 2) $\vec{\tau} = \vec{r} \times \vec{F}$ 3) $\frac{d}{dt}(\vec{r} \times \vec{p})$ 4) $\vec{r} \times \frac{d}{dt}(\vec{p})$

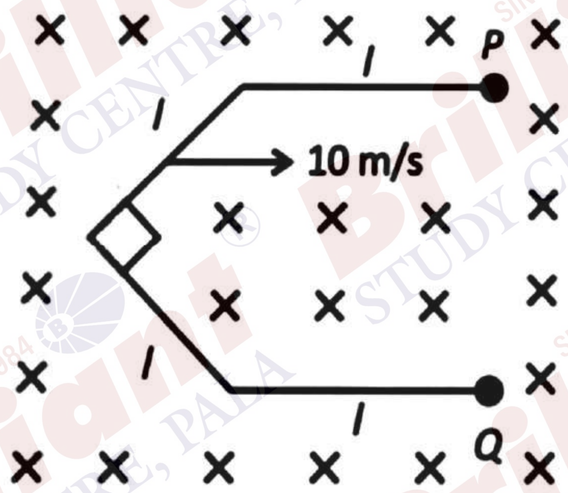
11. An electric dipole with charges 2 μC and a separation 20 cm is placed close to an infinitely charge non-conducting sheet with surface charge density 100 C/m$^2$. Find the torque acting on the dipole if the dipole makes an angle 30° with the normal to the sheet.

1) $\frac{12}{\varepsilon_0} \times 10^{-5}\,N-m$ 2) $\frac{2}{\varepsilon_0} \times 10^{-5}\,N-m$ 3) $\frac{4}{\varepsilon_0} \times 10^{-5}\,N-m$ 4) $\frac{1}{\varepsilon_0} \times 10^{-5}\,N-m$

12. The current in a AC circuit is given as $i = 100\sqrt{2}\sin\left(\frac{100\pi}{t}\right)A$. Find rms current and frequency is Hertz.

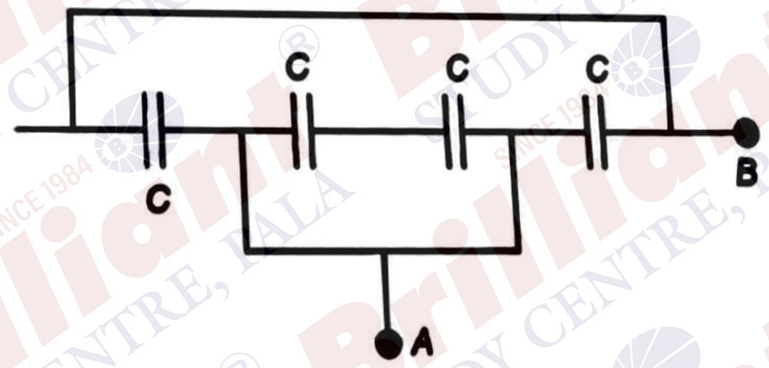
1) 100 A, 100 Hz 2) 50 A, 100 Hz 3) 200 A, 50 Hz 4) 100A, 50 Hz

13. 4 rods of equal length are joined as shown in the figure. Combined system is moving with speed 10 m/s in a perpendicular magnetic field of $\frac{1}{\sqrt{2}}$ tesla. Find emf induced between point P and Q (l= 10 cm)




1) 1 volt 2) 0.1 volt 3) 2 volts 4) $\sqrt{2}$ volts

14. Find the equivalent capacitance between A and B, where C = 16μF




1) 48 μF 2) 8 μF 3) 32 μF 4) 16 μF

15. Mean free path for an ideal gas is to be observed 20 μm while average speed of molecules of gas is observed to be 600 m/s, then frequency of collision is near by

1) $4 \times 10^{7}$ 2) $1.2 \times 10^{7}$ 3) $3 \times 10^{7}$ 4) $2 \times 10^{-7}$

16. A ring and a solid sphere released from rest from same height on enough rough inclined surface. Ratio of their speed when they reach at bottom is $\sqrt{\frac{7}{x}}\,m/s$, then x is _____

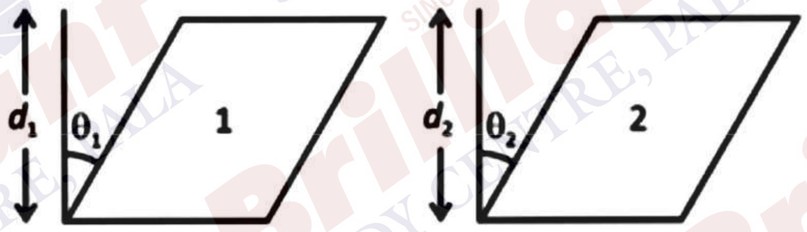
17. Find the dimension of $\frac{E}{B}$ where, E represents electric field and B represents magnetic field

1) $ML^2T^{-1}$ 2) $LT^{-1}$ 3) $L^2T^{-1}$ 4) $LT^{-2}$

18. A real object placed in front of a spherical mirror forms an image whose magnification is $-\frac{1}{3}$. If the distance between the image and object is 30 cm. The focal length of the mirror is ____ cm.

1) –11.25 cm 2) –22.5 cm 3) –45 cm 4) –60 cm

19. The figure shows two boxes with identical square cross-sections and heights $h_1$ and $h_2$ ($h_1 = 2h_2$) are made of different materials. An equal force is applied on the square cross-sections such that the deformations $\theta_1$ and $\theta_2$ are realized ($\theta_1 = 2\theta_2$). If shear modulus of box -1 is $4\times10^9$ N/m$^2$ and that of box -2 is $x\times10^9$ N/m$^2$, then x is _____.




20. $\vec{L}$ and $\vec{p}$ are angular momentum about origin and linear momentum of a particle. If position vector of particle is given as $\vec{r} = a(\sin\omega t\hat{i} + \cos\omega t)$ then direction of force is

1) Opposite to $\vec{L}\times\vec{r}$
2) Opposite to $\vec{p}\times\vec{r}$
3) Opposite to $\vec{L}\cdot\vec{r}$
4) Opposite to $\vec{p}\times\vec{L}$

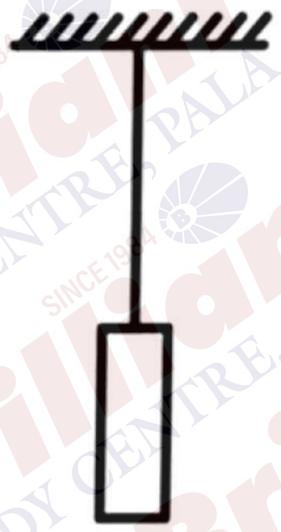
21. $V = 100\sqrt{2}\cos\omega t$ then $V_{rms}$ is

1) $100\sqrt{2}$
2) $200\sqrt{2}$
3) 200
4) 100

22. The Boolen expression $Y = A\bar{B}C + \bar{A}\bar{C}$ can be realised with which of the following gate configurations

1) One-3 inpu 2t AND gate, 3 NOT gate and one-2 input OR gate, one-2 input AND gate
2) One- 3 input AND gate, 1 NOT gate, one-2 input NOR gate and one-2 input OR gates
3) 3- input OR gate, 3 NOT gates and one 2- input AND gate
4) 3 - input AND gate, 3 NOT gates and one 2-input OR gate

23. A small mirror of mass m is suspended to a fix point with an ideal string of length *l*. A photon of energy E incident normally on the mirror. Find maximum angular deviation ($\theta$) of the mirror.



1) $\frac{3E}{mc\sqrt{gl}}$
2) $\frac{E}{2mc\sqrt{gl}}$
3) $\frac{E}{mc\sqrt{2gl}}$
4) $\frac{2E}{mc\sqrt{gl}}$

24. Regarding the rotational motion of rigid bodies, following two statements are given where symbols is are having usual meaning.

**SI :** Torque $\tau$ is given as $\vec{\tau} = \frac{d\vec{L}}{dt}$ and angular momentum about inertial point is given as $\vec{L} = \sum(\vec{r}_t \times \vec{p}_t)$.

**S2:** Torque $\tau$ is given as $\vec{\tau} = I\vec{r}$ and angular momentum about inertial point is given as $\vec{L} = I\vec{\omega}$.

1) S1 is correct and S2 is incorrect

2) S1 is incorrect and S2 is correct

3) Both are incorrect

4) Both are correct