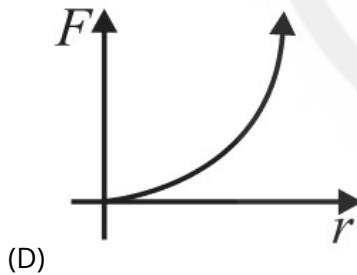
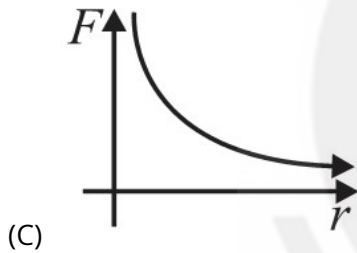
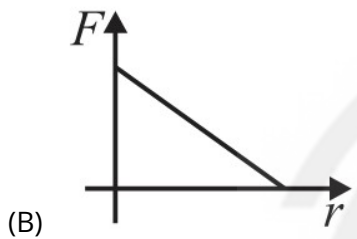
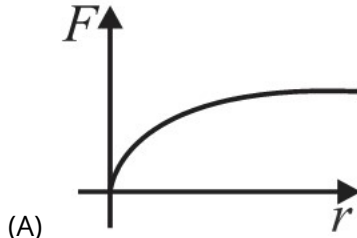


TEST - 01

ULTIMATE KCET CRASH COURSE 2026

PHYSICS

Q1 Force between two charges varies with distance between them as



Q2 If two bodies are rubbed and one of them acquires q_1 charge and another acquires q_2 charge, then ratio $q_1 : q_2$ is

- (A) 1 : 2
- (B) 2 : 1
- (C) -1 : 1
- (D) 1 : 4

Q3 Two charges $9e$ and $3e$ are placed at a distance r . The distance of the point where the electric field intensity will be zero is

- (A) $\frac{r}{(\sqrt{3}+1)}$ from $9e$ charge
- (B) $\frac{r}{1+\sqrt{1/3}}$ from $9e$ charge
- (C) $\frac{r}{(1-\sqrt{3})}$ from $3e$ charge
- (D) $\frac{r}{1+\sqrt{1/3}}$ from $3e$ charge

Q4 A drop of 10^{-6} kg water carries 10^{-6} C charge. What electric field should be applied to balance its weight? (assume $g = 10 \text{ m/s}^2$)

- (A) 10 V/m, Upward
- (B) 10 V/m, Downward
- (C) 0.1 V/m, Downward
- (D) 0.1 V/m, Upward

Q5 The number of electrons to be put on a spherical conductor of radius 0.1m to produce an electric field of 0.036 N/C just above its surface is

- (A) 2.7×10^5
- (B) 2.6×10^5
- (C) 2.5×10^5
- (D) 2.4×10^5

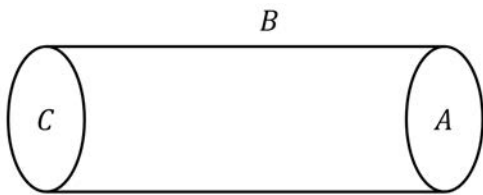
Q6 What is the magnitude of a point charge due to which the electric field 30 cm away has the magnitude 2 newton/coulomb?

$$\left[\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2\text{C}^{-2} \right]$$

- (A) 2×10^{-11} coulomb
- (B) 3×10^{-11} coulomb
- (C) 5×10^{-11} coulomb
- (D) 9×10^{-11} coulomb



- Q7** A hollow cylinder has a charge q coulomb within it. If ϕ is the electric flux in units of volt meter associated with the curved surface B, the flux linked with the plane surface A in units of $V\cdot m$ will be



- (A) $\frac{q}{2\epsilon_0}$
 (B) $\frac{\phi}{3}$
 (C) $\frac{q}{\epsilon_0} - \phi$
 (D) $\frac{1}{2} \left(\frac{q}{\epsilon_0} - \phi \right)$
- Q8** The electric flux through a closed surface area S enclosing charge Q is ϕ . If the surface area is doubled, then the flux is
 (A) 2ϕ (B) $\phi/2$
 (C) $\phi/4$ (D) ϕ
- Q9** An infinite line charge produces a field of $18 \times 10^5 \text{ N/C}$ at a distance of 4 cm. What is the linear charge density?
 (A) $18 \mu\text{C/m}$
 (B) $5 \mu\text{C/m}$
 (C) $4 \mu\text{C/m}$
 (D) $10 \mu\text{C/m}$
- Q10** An electric dipole is placed at an angle of 30° with an electric field intensity $2 \times 10^5 \text{ N C}^{-1}$. It experiences a torque equal to 4 N m. The charge on the dipole, if the dipole length is 2 cm, is
 (A) 8 mC (B) 2 mC
 (C) 5 mC (D) 7 mC

- Q11** Two point charges $+4q$ and $+q$ are placed at a distance L apart. A third charge Q is placed along the line such that all the three charges are in equilibrium. Then location and magnitude of third charge will be
 (A) At a distance $\frac{L}{3}$ from $+4q$ charge, $\frac{4q}{9}$
 (B) At a distance $\frac{L}{3}$ from $+4q$ charge, $-\frac{4q}{9}$
 (C) At a distance $\frac{2L}{3}$ from $+4q$ charge, $-\frac{4q}{9}$
 (D) At a distance $\frac{2L}{3}$ from $+4q$ charge, $+\frac{4q}{9}$
- Q12** A particle of mass m and charge q is placed at rest in uniform electric field E and then released. The kinetic energy attained by the particle after moving a distance y is
 (A) qEy^2 (B) qE^2y
 (C) qEy (D) q^2Ey
- Q13** A hollow metal sphere of radius 5 cm is charged such that the potential on its surface is 10 volts. The potential at the centre of the sphere is
 (A) Zero
 (B) 10 V
 (C) Same as at a point 5 cm away from the surface
 (D) Same as at a point 25 cm away from the surface
- Q14** If potential (in volts) in a region is expressed as $V(x,y,z) = 6xy - y + 2yz$, the electric field (in N/C) at point $(1, 1, 0)$ is :
 (A) $-(2\hat{i} + 3\hat{j} + \hat{k})$
 (B) $-(6\hat{i} + 9\hat{j} + \hat{k})$
 (C) $-(3\hat{i} + 5\hat{j} + 3\hat{k})$
 (D) $-(6\hat{i} + 5\hat{j} + 2\hat{k})$



- Q15** Identify the wrong statement.
 (A) Equipotential surface due to a single point charge is spherical.
 (B) Equipotential surface can be constructed for dipoles too.
 (C) The electric field is normal to the equipotential surface through the point.
 (D) The work done to move a test charge on the equipotential surface is positive.
- Q16** A current I flows along the length of an infinitely long, straight, thin walled pipe. Then
 (A) the magnetic field at all points inside the pipe is the same, but not zero
 (B) the magnetic field is zero only on the axis of the pipe
 (C) the magnetic field is different at different points inside the pipe
 (D) the magnetic field at any point inside the pipe is zero
- Q17** A circular coil of wire consisting of 100 turns each of radius 9 cm carries a current of 0.4 A. The magnitude of magnetic field at the centre of the coil is
 (A) 2.4×10^{-4} T
 (B) 3.5×10^{-4} T
 (C) 2.79×10^{-4} T
 (D) 3×10^{-4} T
- Q18** An electron (mass = 9×10^{-31} kg, charge = 1.6×10^{-19} C) moving with a velocity of 10^6 m/s enters a magnetic field. If it describes a circle of radius 0.1m, then strength of magnetic field must be
 (A) 4.5×10^{-5} T
 (B) 1.4×10^{-5} T
 (C) 5.6×10^{-5} T
 (D) 2.6×10^{-5} T
- Q19** Two particles X and Y having equal charges, after being accelerated through the same potential difference, enter a region of uniform magnetic field and describe circular paths of radii R_1 and R_2 respectively. The ratio of masses of X and Y is
 (A) $\left(\frac{R_1}{R_2}\right)^{\frac{1}{2}}$ (B) $\frac{R_2}{R_1}$
 (C) $\left(\frac{R_1}{R_2}\right)^2$ (D) $\frac{R_1}{R_2}$
- Q20** The sensitivity of a moving coil galvanometer depends on
 (A) The angle of deflection
 (B) Earth's magnetic field
 (C) Torsional constant of the spring
 (D) The moment of inertia of the coil
- Q21** A solenoid of 2 m long and 3 cm diameter has 5 layers of winding of 500 turns per metre length in each layer and carries a current of 5A. Intensity of magnetic field at the centre of the solenoid is (in Am^{-1})
 (A) 5×10^4
 (B) 1.25×10^4
 (C) 4×10^4
 (D) 3×10^4
- Q22** The ratio of the shunt resistance and the resistance of a galvanometer is 1 : 499. If the full scale deflection current of the galvanometer is 2 mA, find the range of the ammeter.
 (A) 4A (B) 3A
 (C) 2A (D) 1A
- Q23** r is the radius of the circular path of a charged particle in uniform magnetic field. If the energy of the particle is doubled, then radius of the circular path will be
 (A) $\sqrt{2}r$ (B) $\frac{r}{\sqrt{2}}$
 (C) r (D) $\frac{r}{2}$



Q24 A proton, a deuteron and an α - particle whose kinetic energies are same, enter at right angles to a uniform magnetic field. Compare radii of their circular paths.

- (A) $1 : \sqrt{2} : 1$ (B) $1 : 1 : \sqrt{2}$
 (C) $\sqrt{2} : 1 : 1$ (D) None of these

Q25 Calculate the force experienced by a wire of length 10 cm kept at an angle 30° to a field of $0.5 T$ and carrying a current of 6 A.

- (A) 0.5 N
 (B) 1 N
 (C) 0.15 N
 (D) 0.2 N

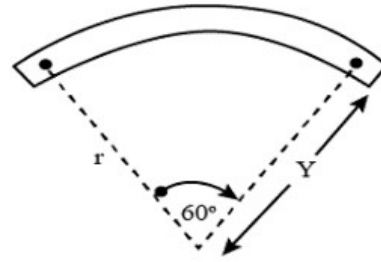
Q26 A metal wire of length 1m is bent in the form of a circle and a current of 2A is made to pass through it. At the centre of the circle the magnetic induction is

- (A) $8\pi^2 \times 10^{-7} T$
 (B) $2\pi^2 \times 10^{-7} T$
 (C) $4\pi \times 10^{-7} T$
 (D) $8\pi \times 10^{-7} T$

Q27 An ammeter has a resistance of G ohm and range of i ampere. The value of the resistance used in parallel to convert it into an ammeter of range ni ampere is

- (A) nG
 (B) $(n - 1) G$
 (C) $\frac{G}{n}$
 (D) $\frac{G}{n-1}$

Q28 A bar magnet of length ' l ' and magnetic dipole moment ' M ' is bent in the form of an arc as shown in figure. The new magnetic dipole moment will be



- (A) $\frac{2}{\pi} M$ (B) $\frac{M}{2}$
 (C) M (D) $\frac{3}{\pi} M$

Q29 A bar magnet of pole strength 10 A m is cut into two equal parts breadthwise. The pole strength of each magnet is

- (A) 5 A m
 (B) 10 A m
 (C) 15 A m
 (D) 20 A m

Q30 A magnet of magnetic moment M is rotated through 360° in a magnetic field B . The work done will be

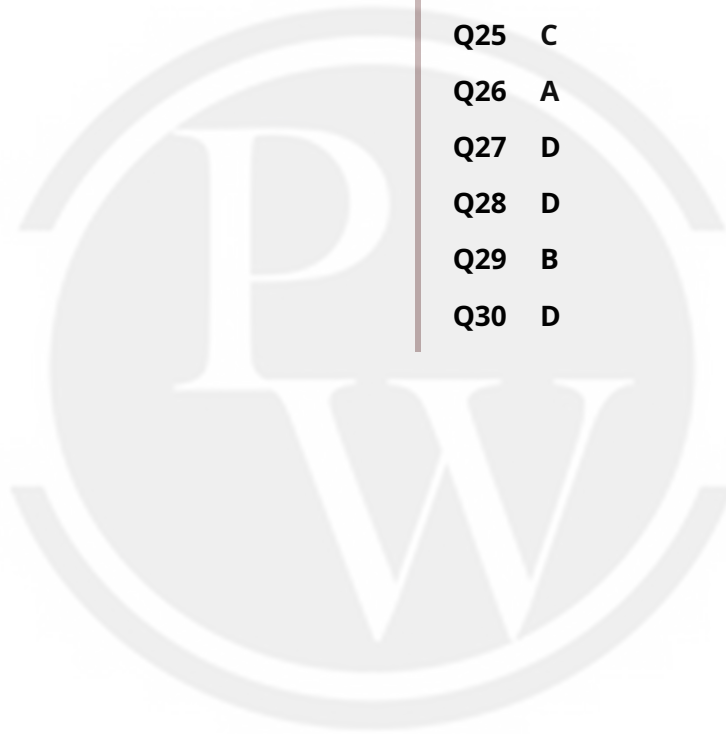
- (A) MB
 (B) $2 MB$
 (C) $2\pi MB$
 (D) Zero



Answer Key

Q1 C
Q2 C
Q3 B
Q4 A
Q5 C
Q6 A
Q7 D
Q8 D
Q9 C
Q10 B
Q11 C
Q12 C
Q13 B
Q14 D
Q15 D

Q16 D
Q17 C
Q18 C
Q19 C
Q20 C
Q21 B
Q22 D
Q23 A
Q24 A
Q25 C
Q26 A
Q27 D
Q28 D
Q29 B
Q30 D



Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

$$F \propto \frac{1}{r^2}$$

Video Solution:



Q2 Text Solution:

$$-1 : 1$$

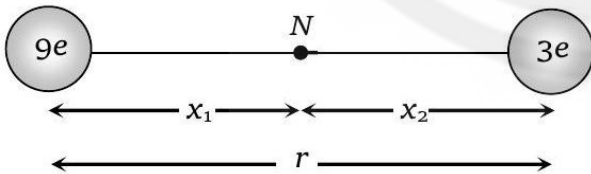
Video Solution:



Q3 Text Solution:

Suppose neutral point is obtained at a distance x_1 from charge $9e$ and x_2 from charge $3e$

$$\text{By using } x_1 = \frac{x}{1 + \sqrt{\frac{Q_2}{Q_1}}} = \frac{r}{1 + \sqrt{\frac{3e}{9e}}} = \frac{r}{\left(1 + \frac{1}{\sqrt{3}}\right)}$$



Video Solution:



Q4 Text Solution:

In equilibrium $QE = mg$

$$E = \frac{mg}{Q} = \frac{10^{-6} \times 10}{10^{-6}} = 10V/m;$$

Since charge is positive so electric field will be upward.

Video Solution:



Q5 Text Solution:

By using $E = k \frac{Q}{R^2}$, Where R = Radius of sphere
so

$$0.036 = 9 \times 10^9 \times \frac{ne}{(0.1)^2} \Rightarrow n = 2.5 \times 10^5$$

Video Solution:



Q6 Text Solution:

By using

$$E = \frac{1}{4\pi\epsilon_0} \cdot \frac{Q}{r^2}; 2 = 9 \times 10^9 \times \frac{Q}{(30 \times 10^{-2})^2}$$

$$\Rightarrow Q = 2 \times 10^{-11} C$$

Video Solution:



Q7 Text Solution:

Let ϕ_A , ϕ_B and ϕ_C are the electric flux linked with A, B and C.

According to Gauss theorem,

$$\phi_A + \phi_B + \phi_C = \frac{q}{\epsilon_0}$$

Since $\phi_A = \phi_C$,

$$\therefore 2\phi_A + \phi_B = \frac{q}{\epsilon_0} \text{ or } 2\phi_A = \frac{q}{\epsilon_0} - \phi_B$$

or, $2\phi_A = \frac{q}{\epsilon_0} - \phi$ (Given $\phi_B = \phi$).

$$\phi_A = \frac{1}{2} \left(\frac{q}{\epsilon_0} - \phi \right)$$

Video Solution:**Q8 Text Solution:**

The flux passing through any closed area = $\frac{Q}{\epsilon_0}$

If area is doubled, the field will be half but the flux remains the same.

Video Solution:**Q9 Text Solution:**

Here,

$$E = 18 \times 10^5 \text{ N/C}, r = 4 \text{ cm} = 4 \times 10^{-2} \text{ m}$$

$$\text{As } E = \frac{\lambda}{2\pi\epsilon_0 r}$$

$$\therefore \lambda = 2\pi\epsilon_0 E r = \frac{Er}{2\left(\frac{1}{4\pi\epsilon_0}\right)}$$

$$= \frac{(15 \times 10^5 \text{ N/C})(4 \times 10^{-2} \text{ m})}{2 \times 9 \times 10^9 \text{ Nm}^2/\text{C}^2}$$

$$= 4 \times 10^{-6} \text{ C/m} = 4 \mu\text{C/m}$$

Video Solution:**Q10 Text Solution:**

Here, $\theta = 30^\circ$, $E = 2 \times 10^5 \text{ N C}^{-1}$

$$\tau = 4 \text{ Nm}, l = 2 \text{ cm} = 0.02 \text{ m}$$

$q = ?$

$$\tau = pE \sin\theta = (ql)E \sin\theta$$

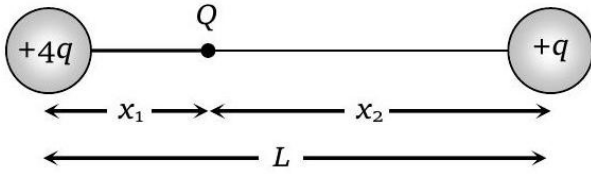
$$\therefore q = \frac{\tau}{El \sin\theta} = \frac{4}{2 \times 10^5 \times 0.02 \times \frac{1}{2}} = 2 \text{ mC}$$

Video Solution:

Q11 Text Solution:

Let third charge be placed at a distance x_1 from $+4q$ charge as shown.

$$\text{Now } x_1 = \frac{L}{1 + \sqrt{\frac{q}{4q}}} = \frac{2L}{3} \Rightarrow x_2 = \frac{L}{3}$$



For equilibrium of q

$$Q = +4q\left(\frac{L/3}{L}\right)^2 = \frac{4q}{9} \Rightarrow Q = -\frac{4q}{9}$$

Video Solution:



Q12 Text Solution:

When a charge particle of mass m and charge q is released in the uniform electric field, then it is accelerated in the direction of electric field,

Acceleration of the charge particle,

$$a = \frac{F}{m} = \frac{qE}{m}$$

Final velocity of electron at a distance y is given by

$$v^2 = u^2 + 2ay$$

$$v^2 = \frac{2qEy}{m}$$

$$\text{Kinetic energy} = \frac{1}{2}mv^2 = qEy$$

Video Solution:



Q13 Text Solution:

Inside the conductor potential remains same and it is equal to the potential on surface. So here potential at the centre of sphere will be 10V.

Video Solution:



Q14 Text Solution:

The electric field \vec{E} and potential V in a region are related as,

$$\vec{E} = -\left[\frac{\partial V}{\partial x}\hat{i} + \frac{\partial V}{\partial y}\hat{j} + \frac{\partial V}{\partial z}\hat{k}\right]$$

Here, $V(x, y, z) = 6xy - y + 2yz$

$$\vec{E} =$$

$$-\left[\frac{\partial}{\partial x}(6xy - y + 2yz)\hat{i} + \frac{\partial}{\partial y}(6xy - y + 2yz)\hat{j} + \frac{\partial}{\partial z}(6xy - y + 2yz)\hat{k}\right]$$

$$= -[(6y)\hat{i} + (6x - 1 + 2z)\hat{k} + (2y)\hat{k}]$$

$$= -[(6(1))\hat{i} + (6(1) - 1 + 2(0))\hat{j} + (2(1))\hat{k}]$$

At point $(1, 1, 0)$,

$$= -[(6(1))\hat{i} + (6(1) - 1 + 2(0))\hat{j} + (2(1))\hat{k}]$$

$$= -(6\hat{i} + 5\hat{j} + 2\hat{k})$$

$$= -(6\hat{i} + 5\hat{j} + 2\hat{k})$$

Video Solution:



Q15 Text Solution:

The work done to move a test charge on the equipotential surface is zero.

Video Solution:**Q16 Text Solution:**

There is no current inside the pipe.

By Ampere's law $\oint \vec{B} \cdot d\vec{l} = \mu_0 I$

Here $I = 0$

$\therefore B = 0$

Video Solution:**Q17 Text Solution:**

Here, $N = 100$

$R = 9 \text{ cm} = 9 \times 10^{-2} \text{ m}$, and $I = 0.4 \text{ A}$

Now, $B = \frac{\mu_0 NI}{2R} = \frac{2\pi \times 10^{-7} \times 100 \times 0.4}{9 \times 10^{-2}}$

$= \frac{2 \times 3.14 \times 0.4}{9} \times 10^{-3}$

$= 0.279 \times 10^{-3} \text{ T} = 2.79 \times 10^{-4} \text{ T}$

Video Solution:**Q18 Text Solution:**

$$Bqv = \frac{mv^2}{r} \text{ or } B = \frac{mv}{rq} = \frac{(9 \times 10^{-31}) \times 10^6}{0.1 \times (1.6 \times 10^{-19})}$$

$$= 5.6 \times 10^{-5} \text{ T.}$$

Video Solution:**Q19 Text Solution:**

We know that, kinetic energy gained $E = qV$

$$\text{and radius } r = \frac{mv}{Bq} = \frac{p}{Bq} = \frac{\sqrt{2mE}}{Bq}$$

If charge and energy of the particles are same, then we get,

$$r \propto \sqrt{m} \text{ or } m \propto r^2$$

Video Solution:**Q20 Text Solution:**

Sensitivity of a moving coil galvanometer depends on torsional constant of the spring.

Video Solution:

Q21 Text Solution:

For long solenoid at the centre, magnetic induction, $B = \mu_0 ni$

Intensity of magnetic field $\frac{B}{\mu_0} = ni$

$$H = ni = 500 \times 5 \times 5 = 1.25 \times 10^4 \text{ A/m}$$

Video Solution:



Q22 Text Solution:

$$\frac{S}{G} = \frac{i_g}{i - i_g} \Rightarrow \frac{1}{499} = \frac{2 \times 10^{-3}}{i - 2 \times 10^{-3}}$$

$$i - 2 \times 10^{-3} = 499 \times 2 \times 10^{-3}$$

$$i = 499 \times 2 \times 10^{-3} + 2 \times 10^{-3}$$

$$i = [499 + 1] \times 2 \times 10^{-3} = 1 \text{ A}$$

Video Solution:



Q23 Text Solution:

We know that $E = \frac{q^2 B^2 r^2}{2m}$

i.e., $r \propto \sqrt{E}$

$$\frac{r_1}{r_2} = \sqrt{\frac{E_1}{E_2}} \text{ or } \frac{r_1}{r_2} = \sqrt{\frac{E}{2E}} \text{ or } r_2 = \sqrt{2} r$$

Video Solution:



Q24 Text Solution:

Given that, $K_p = K_D = K_\alpha = E$

We know that $r = \frac{mv}{Bq} = \frac{p}{Bq} = \frac{\sqrt{2mE}}{Bq}$

$$\Rightarrow r \propto \frac{\sqrt{m}}{q}$$

$$r_1 : r_2 : r_3 = \frac{\sqrt{m_p}}{q_p} : \frac{\sqrt{m_D}}{q_D} : \frac{\sqrt{m_\alpha}}{q_\alpha}$$

$$= \frac{\sqrt{m}}{q} : \frac{\sqrt{2m}}{q} : \frac{\sqrt{4m}}{2q} = 1 : \sqrt{2} : 1$$

Video Solution:



Q25 Text Solution:

$$F = Bil \sin \theta = 0.5 \times 6 \times 0.1 \times \sin 30^\circ$$

$$F = 0.15 \text{ N}$$

Video Solution:



Q26 Text Solution:

Here, $2\pi r = 1$

$$\Rightarrow r = \frac{1}{2\pi} \text{ m}$$

Magnetic induction at the centre of circle,

$$B = \frac{\mu_0 i}{2r} = \frac{4\pi \times 10^{-7} \times 2}{2 \times (\frac{1}{2\pi})} = 8\pi^2 \times 10^{-7} \text{ T}$$

Video Solution:



Q27 Text Solution:

$$S = \frac{G}{n-1}$$

Video Solution:

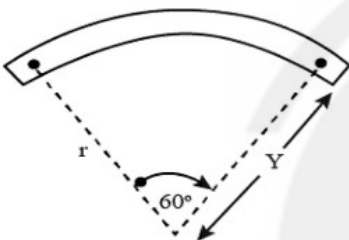


Q28 Text Solution:

Let m be strength of each pole of bar magnet of length l , Then

$$M = m \times l \quad \dots (i)$$

When the bar magnet is bent in the form of an arc as shown in figure



$$\text{Then, } l = \frac{\pi}{3} \times r = \frac{\pi r}{3}$$

$$\text{or } r = \frac{3l}{\pi}$$

New magnetic dipole moment

$$M = m \times 2r \sin 30^\circ \quad (\text{Using (i)})$$

$$= m \times 2 \times \frac{3l}{\pi} \times \frac{1}{2} = \frac{3ml}{\pi} = \frac{3M}{\pi}$$

Video Solution:



Q29 Text Solution:

The pole strength of bar magnet = 10 A m. If bar magnet is cut into equal parts breadthwise then the pole strength of each magnet will remain the same. i.e., 10 A m.

Video Solution:



Q30 Text Solution:

$$W = MB (\cos \theta_1 - \cos \theta_2)$$

$$\text{Here, } \theta_1 = 0^\circ, \theta_2 = 360^\circ$$

$$W = MB (\cos 0^\circ - \cos 360^\circ)$$

$$W = \text{zero}$$

Video Solution:



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