DPP – 07

Solution

Link to View Video Solution: Click Here

1. For P

$m' = \frac{m}{2}$

$L' = L$

$\Rightarrow M' = \frac{M}{2}$

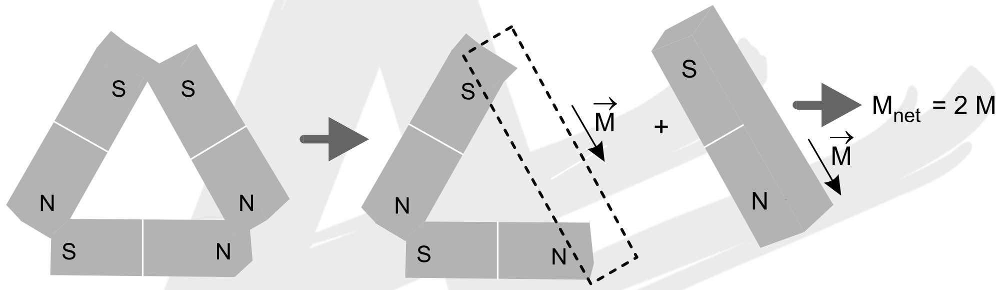
For Q

$m' = m$

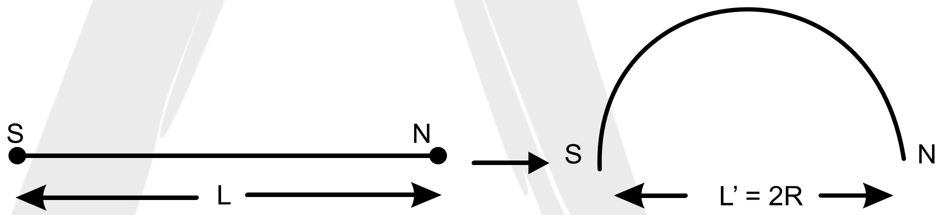
$L' = \frac{L}{2}$

$\Rightarrow M' = \frac{M}{2}$

2. The resultant magnetic moment can be calculated as follows.



3. On bending a rod its pole strength remains unchanged where as its magnetic moment changes.



New magnetic moment $M' = m(2R) = m\left(\frac{2L}{\pi}\right) = \frac{2M}{\pi}$

4. $B_1 = \frac{2M}{x^3}$ and $B_2 = \frac{M}{y^3}$

As $B_1 = B_2$

Hence $\frac{2M}{x^3} = \frac{M}{y^3}$ or $\frac{x^3}{y^3} = 2$ or $\frac{x}{y} = 2^{1/3}$

5. $B \propto \frac{1}{x^3} \Rightarrow \frac{B_1}{B_2} = \left(\frac{x_2}{x_1}\right)^3 = \left(\frac{3x}{x}\right)^3 = \frac{27}{1}$

6. $F = \frac{\mu_0}{4\pi}\left(\frac{6MM'}{d^4}\right)$ in end-on position.

Link to View Video Solution: Click Here

7. Magnetic potential at a distance d from the bar magnet on its axial line is given by

$$V=\frac{\mu_0}{4\pi}\cdot\frac{M}{d^2}\Rightarrow V\propto M\Rightarrow\frac{V_1}{V_2}=\frac{M_1}{M_2}\Rightarrow\frac{V}{V_2}=\frac{M}{M/4}\Rightarrow V_2=\frac{V}{4}$$

8. Work done $MB(\cos\theta_1-\cos\theta_2)$

$\theta_1=0^\circ$ and $\theta_2=180^\circ\Rightarrow W=MB(\cos 0-\cos 180)=2MB$

9. $\tau=MH\sin\theta=MH\sin 30^\circ=\frac{MH}{2}$