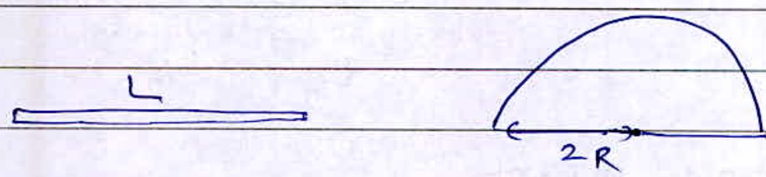
Level - 01

(1)



$\pi R = L$

$M_{new} = m(2R)$

$M = mL$

$= m\left(\frac{2L}{\pi}\right) = \frac{m(2L)}{\pi}$

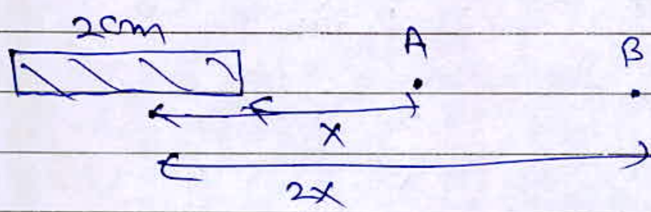
$= \frac{2M}{\pi}$

(2) Magnetic Intensity for an axial Point

$$= \frac{\mu_0}{4\pi} \frac{2m}{d^3} = \frac{\mu_0}{2\pi} \frac{M}{d^3}$$

(3) if A magnet is placed in iron powder and then taken out, then maximum iron powder is at "The end of the magnet".

(4)

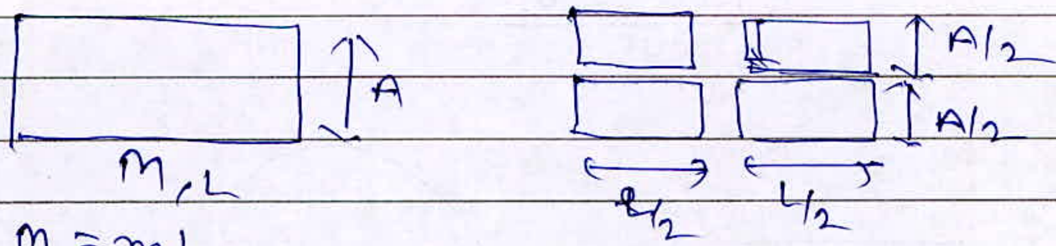


$d_B = 2d_A$

$\therefore B = \frac{\mu_0}{4\pi} \frac{2M}{d^3} \Rightarrow \therefore B \propto \frac{1}{d^3}$

$B_A / B_B = 8 : 1$

(5)



$M = mL$

for each part

$m' = m/2$

(6) $B_{axis} = \frac{\mu_0}{4\pi} \frac{2M}{r^3}$

$B_{eq} = \frac{\mu_0}{4\pi} \frac{M}{r^3}$ $\Rightarrow \frac{B_{axis}}{B_{eq}} = 2/1$

(7) The magnetism of magnet is due to the spin motion of electron.

(8) $m = 48$ A-m

$L = 25$ cm

Torque

$\tau = MB\sin\theta$

$\tau = (48 \times .25)(0.15) \times \sin 30^\circ$

$\tau = 0.9$ N-m

(9) $B_{axis} = \frac{\mu_0}{4\pi} \frac{2M}{x^3}$

$B_{eq} = \frac{\mu_0}{4\pi} \frac{M}{y^3}$

$\because B_{axis} = B_{eq}$

$\frac{2}{x^3} = \frac{1}{y^3}$

$\therefore (x/y) = 2^{1/3}$

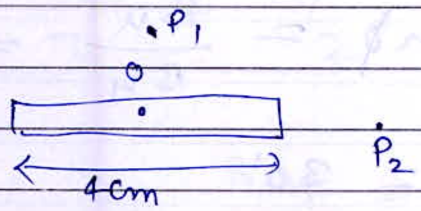
(10)

$W = MB(\cos\theta_0 - \cos\theta)$

$\because (\theta_0 = 0)$ and $\theta = 30°$

$\therefore W = (20)(0.3)\left(1 - \frac{\sqrt{3}}{2}\right) = 3(2-\sqrt{3})$ C.G.S.

(11)



P_1 on eq position
P_2 on axis position

$B_{axis} / B_{eq} = 2/1$

$\therefore \boxed{B = \mu_0 H}$ $\qquad \frac{B_{P_1}}{B_{P_2}} = \frac{1}{2} = \frac{H_{P_1}}{H_{P_2}}$

(12) $\frac{B_{axis}}{B_{eq}} = 2/1$ $\qquad \because B_{axis} = 200$ gauss

$\therefore B_{eq} = \frac{B_{axis}}{2} = 100$ gauss

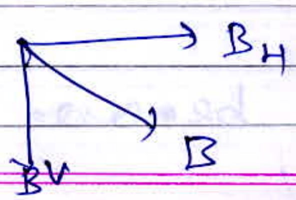
(13) at magnetic Poles, the angle of dip is 90°. Hence the horizontal component

$B_H = B\cos 90° = 0$

(14) angle of dip at magnetic poles = 90°

(15)

$|B| = \sqrt{B_H^2 + B_V^2}$



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(16) at a certain point

$$B_H = \sqrt{3}\, B_V$$

$$|B| = \sqrt{B_H^2 + B_V^2}$$

$$\frac{B_H}{B_V} = \frac{1}{\tan\theta} \Rightarrow \tan\phi = \frac{B_V}{B_H} = \frac{1}{\sqrt{3}}$$

$$\phi = 30^\circ$$

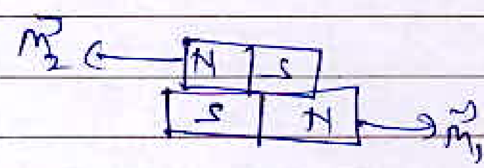
(17) Parallel straight lines.

(18) $$T = 2\pi\sqrt{\frac{I}{MB_H}}$$

(19) $$T_s = 2\pi\sqrt{\frac{I_1 + I_2}{(M_1+M_2)B_H}}$$

$$T_d = 2\pi\sqrt{\frac{I_1 + I_2}{(M_1-M_2)B_H}}$$

$$\boxed{T_d > T_s}$$



(20) Time period (T) $= \left(\frac{30}{60}\right)^{-1} = \left(\frac{1}{2}\right)^{-1}$ sec. $= 2$ sec.

$$T' = 2\pi\sqrt{\frac{I}{MB_H}}$$

$$T' = \frac{T}{\sqrt{2}} = \frac{2}{\sqrt{2}} = \sqrt{2} \text{ sec}$$

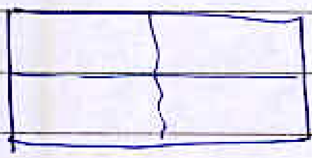
because $B_H' = 2B_H$

(21) $f_1 = 10/60 = 1/6\ sec^{-1}$ $\therefore T_1 = 6\ sec.$

$f_2 = 15/60 = 1/4\ sec^{-1}$ $\therefore T_2 = 4\ sec.$

$$\frac{T_1}{T_2} = 3/2 = \sqrt{\frac{M B_{2H}}{M B_{1H}}} = \sqrt{\frac{B_{2H}}{B_{1H}}}$$

$$\therefore \frac{B_{1H}}{B_{2H}} = 4/9$$

(22) 

$$T = 2\pi\sqrt{\frac{I}{M B_H}}$$

new magnetic moment $= M/2$

$I' = I/8$ $\left(I = \frac{wL^2}{12}\right)$

$$\therefore T' = 2\pi\sqrt{\frac{I/8}{M/2\, B_H}} = T/2$$

(23) $$T_d = 2\pi\sqrt{\frac{I_1 + I_2}{(M_1 - M_2) B_H}}$$

$\because$ $\boxed{M_1 = M_2}$ $\therefore T_d = \infty$ (infinite)

(24) $$T = 2\pi\sqrt{\frac{I}{M B_H}}$$

at magnetic poles

$\boxed{B_H = 0}$ $\therefore T = \infty$

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(25) for neon

unpaired e^- = 0

∴ $\mu = 0$ all are paired.

so cancel out each-other magnetic moment.

(26) at above curie Temp
ferromagnetic domain becomes random

(27) a diamagnetic Substance near poles it is repelled by the poles

(28) Permanent magnet has
High Retentivity and high coercivity

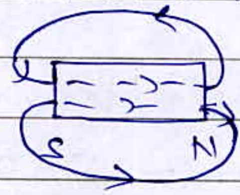
(29) above curie temp.
ferromagnetic becomes paramagnetic.

(30) when a magnetic substance is heated, then it losses its magnetism.

—— a ——

Level - 02

(1) in the case of Bar magnet, lines of magnetic induction

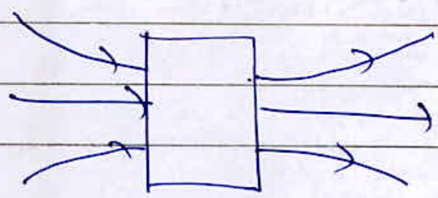


Run continuously through the bar and outside.

(2) $B = \frac{\mu_0 M}{4\pi R^3}\sqrt{1+3\cos^2\theta}$

$\therefore B \propto \frac{1}{R^3}$

(3)



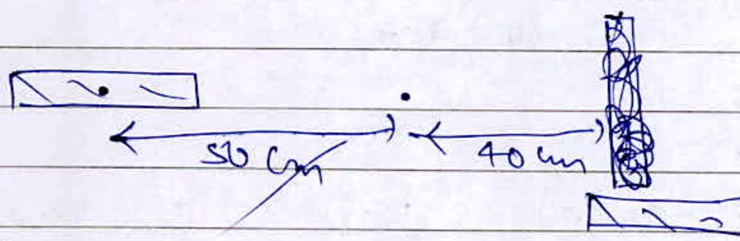
(B)

(4) $\vec{\tau} = \vec{m} \times \vec{B}$ $\therefore |\vec{m}| = niA$ for coil

angle b/w $\vec{m}$ and $\vec{B}$ is $(90-\theta)$

$\therefore \vec{\tau} = mB\cos\theta = niAB\cos\theta$

(5)



$B_{axis} = \frac{\mu_0}{4\pi}\frac{2M_1}{d_1^3}$

$B_{eq} = \frac{\mu_0}{4\pi}\frac{M_2}{d_2^3}$

$\frac{d_2}{d_1} = 4/5$

$\therefore \frac{M_1}{M_2} = \frac{d_2^3}{d_1^3} = (4/5)^3 = 64/125$

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(6) $W = MB(\cos\theta_0 - \cos\theta)$

$= MB(1 - \cos\theta)$ at $\theta_0 = 0'$

(11) ~~$W = MB(\cos\theta_0 - \cos\theta)$ Here~~

$B_H = B\cos\theta$ $\quad \frac{B_{H1}}{B_{H2}} = \frac{\cos\theta_1}{\cos\theta_2} = \frac{\sqrt{3}/2}{1/\sqrt{2}} = \frac{\sqrt{3}}{\sqrt{2}}$

(8) $\tau = (MB\sin\theta)$

$\because B = 4\pi \times 10^{-3}$ T

$M = \frac{10^{-3}}{.1} = 10^{-2}$

$\therefore \tau = (4\pi \times 10^{-3}) \times (10^{-2}) \times \sin 30'$

$= 2\pi \times 10^{-5}$ N-m

(9) Magnetic field intensity

= no. of lines of force crossing per unit area

(10) $B_H = B_V \quad \therefore \tan\theta = \frac{B_V}{B_H} = 1$

$\therefore \tan\theta = 1$

$\boxed{\theta = 45^\circ}$ Ans

(7) $W = MB(1 - \cos\theta)$ here $\theta = 180'$

$\cos\theta = -1$

$\therefore W = +\underline{2MB} = MB(1 - (-1))$

$= \underline{2MB}$

(12) $\tan\phi = \frac{B_V}{B_H}$

$\therefore B_V = B_H \tan\phi = (0.36\times10^{-4}) \tan 60^\circ = 0.62\times10^{-4}$

(13) $B_V = 6\times10^{-5}T$, $\phi = 40.6^\circ$

$B_V = B\sin\phi \Rightarrow B = \frac{B_V}{\sin\phi} = \frac{6\times10^{-5}}{\sin 40.6^\circ}$

$= 9.2\times10^{-5}T$

(14) $\phi = 30^\circ$, $B_H = 0.5$ Oersted.

$B_H = B\cos\phi$

$\Rightarrow B = \frac{B_H}{\cos\phi} = \frac{0.50}{\sqrt{3}/2} = \frac{1}{\sqrt{3}}$

(15) The angle b/w the earth's magnetic and the earth's geographical axes is zero.

(16) $T = 2\pi\sqrt{\frac{I}{MB_H}}$ $\therefore T \propto \sqrt{1/M}$

$T' = T/2 = 2/2 = 1 sec$

(17) $T = 2\pi\sqrt{\frac{I}{MB_H}} \Rightarrow T^2 = 4\pi^2\left(I/MB\right)$

$\Rightarrow M = \frac{4\pi^2 I}{T^2 B_H} = \frac{4\pi^2(40\times10^{-7})}{9\times3.6\times10^{-5}} = 0.5\ A\text{-}m^2$

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(18) $B = \mu_0 H$

$$T = 2\pi\sqrt{\frac{I}{mB_H}} = 2\pi\sqrt{\frac{I}{m\mu_0 H}}$$

$$T \propto \frac{1}{\sqrt{H}} \quad \therefore \quad T' = T/2$$

(19) $$T_s = 2\pi\sqrt{\frac{I_1 + I_2}{(m_1 + m_2) B_H}} \quad \because \quad I_1 = I_2 \ \& \ m_1 = m$$

$m_2 = 2m$

$$T_s = 3\,sec = 2\pi\sqrt{\frac{2I}{3m(B_H)}}$$

$$T' = 2\pi\sqrt{\frac{2I}{(2m - m) B_H}}$$

$$\frac{T'}{3} = \sqrt{3} \Rightarrow T' = 3\sqrt{3}\,sec.$$

(20) $$T_1 = \frac{60}{20} = 3\,sec \quad ; \quad T_2 = 4\,sec = \frac{60}{15}$$

$$\frac{T_1}{T_2} = \sqrt{\frac{B_2 \cos\theta_2}{B_1 \cos\theta_1}} \Rightarrow \frac{B_2}{B_1} = \frac{T_1^2}{T_2^2} \times \frac{\cos\theta_1}{\cos\theta_2} = \frac{9\sqrt{3}}{16}.$$

(21) $$T_1 = 1.5\,sec. \quad T_2 = 2\pi\sqrt{\frac{I}{m_2 B_H}}$$

$$m_2 = m/4 \quad \therefore T_2 = 2T_1 = 3\,sec.$$

(22)

(23) magnetic moment of a single atom is not zero → paramagnetism

(24) Diamagnetic sustance are feebly attracted by magnets.

(25) χ_m does not depend on the temp. of the sample for paramagnetic substance.

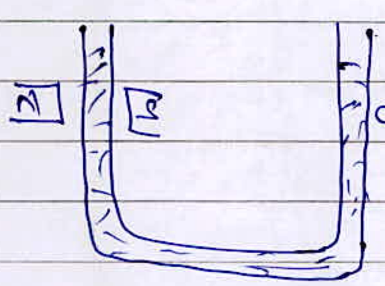
(26) $\mu_r = (1+\chi_m)$

$5500 = 1 + \chi_m \Rightarrow \chi_m = \underline{5499}$

(27)

(28) The use of study of hysteresis curve for a given material is to estimate the hysteresis loss.

(29)



→ level will fall.

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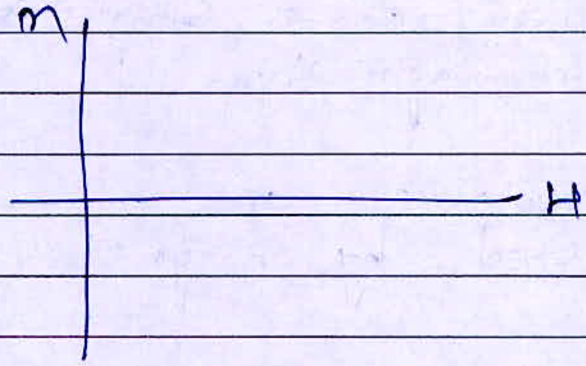
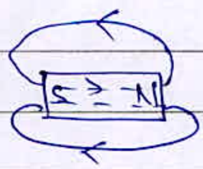
(30)

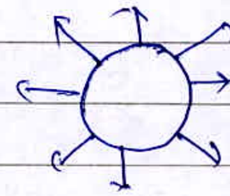


Assertion & Reasoning Questions

(1) Assertion :- false
Reason → : false

(2) The poles of magnet cannot be separated by breaking into two pieces. — True
Reason – True $m' = m/2$

(3) 

magnetic lines  electric field

(4) Assertion – true
Reason – A moving charged particle produces a magnetic field

(5) magnetic moment = niA
$A = \pi r^2$ $A' = 4A$ $\therefore m' = 4m$

(6) $B_H = 0$ at north Poles.
$B_V \neq 0$

(7) $\frac{\mu_0 N i}{2r} = B_H \tan\theta$ | $i = K \tan\theta = \frac{2r B_H}{\mu_0 N} \tan\theta$

(8) at curie point ferromagnetic substance start behaving as a paramagnetic substance.

(9) Soft iron has narrow hysteresis loop.
low coercivity.

(10) magnetic field is depend on motion of particle.

(11) Earth's magnetic ~~filed~~ field is very weak. so. it does not effect the working of a moving coil ~~gta~~ galvanometer.

(12) Soft iron has low coercivity.

(13) Iron is a magnetic substance.

(14) magnetic field due to magnet is not uniform

$B \propto \frac{1}{d^3}$

(15) reduction factor $K = \frac{2rB_H}{\mu_0 N}$

K is independent of i,

(16) χ for diamagnetic ~~is~~ always negative. It is constant.

(17) μ also varies at very high magnetic field

(18) mono magnetic poles does not exist.

(19) magnetic moment of Helium atom is zero because all $e^{\ominus}$ are paired.

(20) Retentively is greater for soft materia

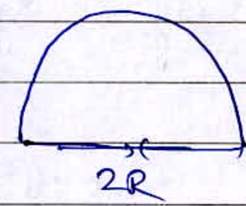
Previous Year's Questions

Magnet and its Properties

(1)

$m = mL = 4\pi \; A\text{-}m^2$

$\longleftrightarrow$ L



$\pi R = L$

$R = \frac{L}{\pi}$

$M' = m\,2R = \frac{2mL}{\pi} = \frac{2M}{\pi} = 8 \; Am^2$

(2) $B_{axis} = \frac{\mu_0}{4\pi} \frac{2M}{z^3}$

(3) $W = MB(\cos\theta_0 - \cos\theta)$

$W = MB(1 - \cos\theta)$ Put $\theta = 180°$

$W = 2MB$

(4) $\tau = MB\sin\theta$

$0.032 = M(0.16)\sin 30°$

$M = 0.40 \; J/T$

(5) $\frac{B_A}{B_B} = \left(\frac{d_B}{d_A}\right)^3 = \left(\frac{48}{24}\right)^3 = 8$

(6) Inside bar magnet

from South to north pole.

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(7) $I = M/V = \frac{M}{\text{mass}/\text{density}}$

mass $= 1\times10^{-3}$ kg ;

density $= 5\,g/cm^3 = \frac{5\times10^{-3}}{10^{-6}} = 5\times10^{3}\,kg/m^3$

$I = \frac{6\times10^{-7}\times5\times10^{3}}{10^{-3}} = 3\,A/m$

(8) 

$m' = m/2$

(9) $W_d = MB(\cos\theta_0 - \cos\theta)$

$W_1 = MB$ and $W_2 = MB(1-1/2) = \frac{MB}{2}$

$W_1 = 2W_2$.

(10) $F = \frac{\mu_0}{4\pi}\frac{m_1 m_2}{r^2}$

$= 10^{-7}\times\frac{10\times10}{0.1\times10}$

(11) $\tau = MB\sin\theta$ $\therefore$ $\boxed{\theta = 90^\circ}$

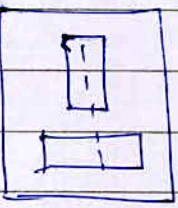
$\frac{\tau_1}{\tau_2} = \frac{B_1}{B_2}$

(12)

(13) $T_1 = 2\pi\sqrt{\frac{2I}{m+2mB_H}}$ $T_2 = 2\pi\sqrt{\frac{2I}{(2m-m)B_H}}$

$T_1 < T_2$

(14) net force on the cork is zero



(15) $U = -\vec{m}\cdot\vec{B}$ for lowest P.E.

$U = -m.B\cos\theta$ $\cos\theta = 1$

$\theta = 0$

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(16) for magnetic field lines of force

$\Rightarrow \nabla \cdot B = 0$

(17) net torque $\neq 0$ But force $= 0$

(18) lines of force due to earth's horizontal magnetic field are parallel and straight.

(19) μ of neon $= 0$
because all e^- are paired.

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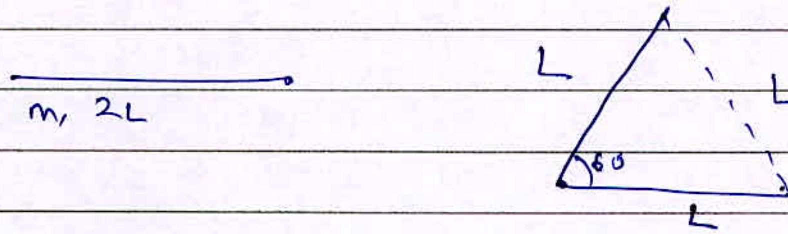
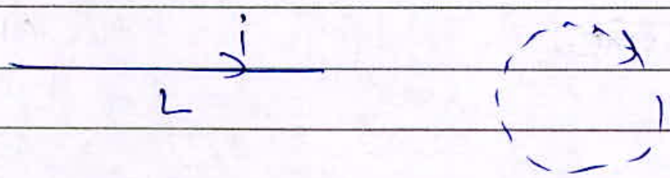
(20)



L = new Length of magnet

(21)



$2\pi R = L$

$M = (iA)$

$= I(\pi R^2)$

$= IL^2/4\pi$

(22) at a point on the right bisector of a magnetic diple the magnetic potential

$V = -\int B.dr \quad \propto \frac{1}{r^2}$

(23) $\tau = \vec{m} \times \vec{B} = MB\sin\theta$

(24) $\phi = \oint \vec{B}.d\vec{s}$ for closed loop $d\vec{s} = 0$

$\therefore \phi = 0$

(25) $\tau = mB\sin\theta$

$\tau = 10 \times 10^{-2} \times 125 \times 2 \times 10^{-5} \times \sin 30'$

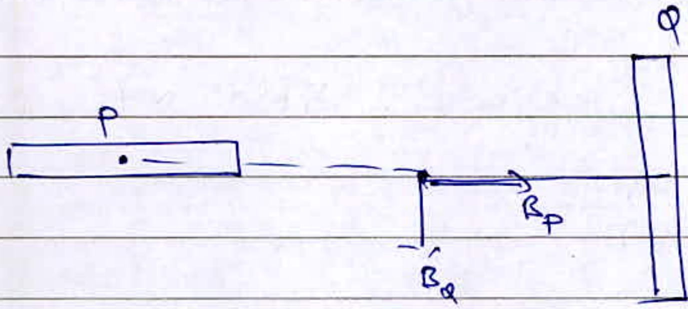
$= 12.5 \times 10^{-5}$ N-m

(26) $M = iA$ $\quad \because i = \frac{q}{T} = \frac{\omega q}{2\pi}$

$A.M. = mr^2\omega$

$\therefore \frac{\text{Magnetic moment}}{\text{angular moment}} = \frac{q\omega/_{2\pi}\,\pi r^2}{mr^2\omega} = \frac{q}{2m}$

(27)



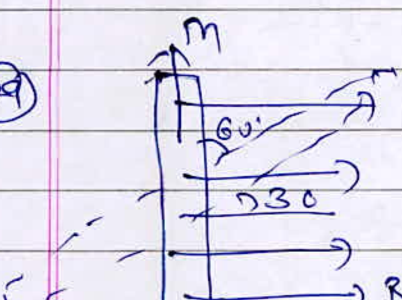
$B_{net} = \sqrt{B_p^2 + B_Q^2}$

$\because \boxed{B_P = 2B_Q}$

$B_{net} = \sqrt{5}B$

(28) $W = MB(\cos 0° - \cos\theta)$
$= MB(1 - \cos\theta) = MH(1 - \cos\theta)$

(29)



$\tau = MB\sin\theta$

θ is angle b/w B & M.

$\tau' = \tau/_2 \quad \therefore \theta = 30°$

(30) for protecting a sensitive from external magnetic field, it should be placed inside an iron can. because
inside iron magnetic field = 0

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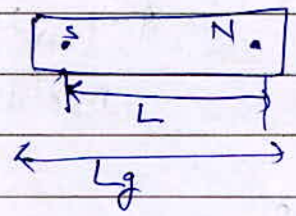
(31) direction of magnetic field at equatorial point is parallel to M.

(32)



$L < L_g$

(33) Intensity of magnetic field at r distant $\propto \frac{m}{r^2}$

(34) magnetic moment $= \frac{M}{2\pi r}$

$= \frac{n i A}{2\pi r} = \frac{(r)(I)\pi r^2}{2\pi r} = \frac{I r^2}{2}$

(35) $W = MB(1 - \cos 60°) = \frac{MB}{2}$

$\tau = MB \sin 60° = \frac{\sqrt{3}}{2} MB = \sqrt{3}\, W$

---

(36) dip angle in 1st case $= \delta_1$
in 2nd case $= \delta_2$

declination angle θ

$\tan\theta = \frac{\tan\delta_1}{\tan\delta_2}$

$\theta = \tan^{-1}\left(\frac{\tan\delta_1}{\tan\delta_2}\right)$

(37) declination angle θ = angle b/w geographic and the magnetic meridian planes.

(38) The angle of dip at a place on the earth gives the direction of the earth's magnetic field.

(39) $\tau_1 = MB\sin 90^\circ = MB$

$\tau_2 = MB\sin 30^\circ = \frac{MB}{2} = \frac{1}{2}\times 10^{-5}$

$= \underline{5\times 10^{-6}\,Nm}$

(40) $B_H = B_{eq} = \frac{\mu_0}{4\pi}\frac{m}{d^3}$

$m = \frac{4\times 10^{-5}\times 0.2\times .2\times .2}{10^{-7}} = 3.2\ Am^2$

(41) $\frac{B_v}{B_H} = \tan\phi$

$B_v = B_H\tan 30^\circ = 0.34\times 10^{-4}\times \frac{1}{\sqrt{3}} = 1.96\times 10^{-5}\,T$

(42) isogonic lines are those for which declination is the same at all places on the line.

(43) $m = 2\times 10^{4}\,J/T$ $\qquad B_H = 6\times 10^{-4}\,T$

$W = mB(1-\cos 60^\circ) = mB(\frac{1}{2}) = 6J$

(44) $\tau = \vec{m} \times \vec{B} = mB\sin 30'$

$\tau = (0.1)(2) \times 0.32 \times 10^{-4} \times \frac{1}{2} = 32 \times 10^{-7}$ N-m

(45)

$\tan\phi = \frac{B_v}{B_H}$

(46) at north pole of the earth, Dip needle will stay vertical. ~~at the north~~

(47) $\tan\phi = \frac{B_v}{B_H}$

(48) dips angle - θ
vertical plane rotated by angle α.
then the needle will dip by an angle more than θ.

(49)

(50) earth's magnetic field is
$= 10^{-5}$ T

(51) angle b/w magnetic meridian and the geographic meridian is called - magnetic declination.

(52) In the northern hemisphere the needle together with the cork move towards the north of the lake. Yes.

(53) $\tan\phi = \frac{B_V}{B_H} = \sqrt{3}$

$\therefore \phi = 60'$

(54) $T = 2\pi\sqrt{\frac{I}{MB_H}} = 2\pi\sqrt{\frac{I}{MB\cos\phi}}$

$T_1 = 3$ sec at $\phi = 0$

and $T_2 = 3\sqrt{2}$ at angle ϕ

$\frac{3}{3\sqrt{2}} = \sqrt{\frac{\cos\phi}{1}} \Rightarrow \cos\phi = \frac{1}{2} \therefore \phi = 60'$

(55) isogonic lines on magnetic map represent lines of equal declination.

(56)

(57) at magnetic equator, earth's magnetic field become horizontal.

(58) $T_1 = \frac{60}{20} = 3$ sec. $T_2 = \frac{60}{15} = 4$ sec.

$\frac{B_1\cos\phi_1}{B_2\cos\phi_2} = \frac{T_2^2}{T_1^2} \Rightarrow \frac{B_1}{B_2} = 16/9\sqrt{3}$

(59) $\hat{i} = k \tan\theta$

$i_1 = k \tan\theta_1$ | $i_2 = k \tan\theta_2$

$i_2 = i_1/\sqrt{3}$ $\Rightarrow$ $k \tan\theta_2 = \frac{1}{\sqrt{3}} \tan 45'$

$\tan\theta_2 = 1/\sqrt{3} \Rightarrow \theta_2 = 30'$

15° decrease.

(60) $f = \frac{1}{2\pi}\sqrt{\frac{MB_H}{I}}$

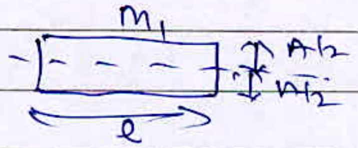
(61) In non-uniform magnetic field
it experience a force and torque both.

(62) In uniform magnetic field
Torque is present but no net force.

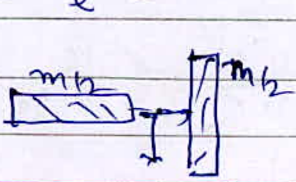
(63) $T = 2\pi\sqrt{\frac{I}{MB_H}}$ $m' = 4m$

$\therefore T' = T/2 = 3/2 = 1.5$ sec

(64)



$m' = m/2$



Resultant magnetic moment $= \sqrt{2}\, m/2$

$\therefore \frac{m_1}{m_2} = \sqrt{2}$

(65) $\frac{\mu_0 N i}{2r} = B_H \tan\theta$

$\frac{N_1}{N_2} = \frac{\tan\theta_1}{\tan\theta_2} = \frac{\sqrt{3}}{1/\sqrt{3}} = 3/1$

(66)

$B = B_H \tan\theta$ | $B = \frac{\mu_0}{4\pi}\frac{2m}{d^3}$

$B_1 = \frac{\mu_0}{4\pi}\frac{2m_1}{d^3}$ | $B_2 = \frac{\mu_0}{4\pi}\frac{2m_2}{d^3}$

$\frac{B_1}{B_2} = \frac{\tan\theta_1}{\tan\theta_2} = \frac{m_1}{m_2} \Rightarrow \tan\theta_2 = \sqrt{3}\times\frac{m}{3} = \frac{1}{\sqrt{3}}$

$\theta_2 = 30^\circ$

(67) $T = 2\pi\sqrt{\frac{I}{MB_H}}$

new moment of inertia of system $I_s = \frac{I}{27}\times 3 = I/9$

$m_s = \frac{m}{3}\times 3 = m$

$T' = 2\pi\sqrt{\frac{I/9}{MB_H}} = \frac{1}{3}\left(2\pi\sqrt{\frac{I}{MB_H}}\right) = \frac{2}{3}\text{sec}$

(68) $T = 2\pi\sqrt{\frac{I}{MB_H}}$

$I' = \frac{m/2\,(l/2)^2}{12} = \frac{I_0}{8}$

$m' = m/2$

$\therefore \frac{T'}{T} = \sqrt{\frac{I_1}{I_2}\times\frac{m_2}{m_1}} = 2$

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(69) $m' = m/4$ then $T' = 2T$

$$T = 2\pi\sqrt{\frac{I}{MB_H}} \Rightarrow T \propto \frac{1}{\sqrt{m}}$$

(70) $i_1 = i_2$;

$$\frac{\mu_0 N i}{2r} = B_H \tan\theta$$

$$\frac{\left(\frac{N_1 i_1}{r_1}\right)}{\left(\frac{N_2 i_2}{r_2}\right)} = \frac{\tan\theta_1}{\tan\theta_2}$$

$$\Rightarrow (N_1/N_2) = \left(\frac{r_1}{r_2}\right)\left(\frac{\tan\theta_1}{\tan\theta_2}\right) = \left(\frac{8}{16}\times\left(\frac{1}{\sqrt{3}\times\sqrt{3}}\right)\right)$$

$$N_2 = (N_1)(2)(3) = 2\times 2\times 3 = 12 \text{ turns}$$

(71) ~~$i = B_H \tan$~~ $i = K\tan\theta$

$$\frac{i_1}{i_2} = \frac{\tan\theta_1}{\tan\theta_2} \Rightarrow i_2 = (i_1)\frac{\tan\theta_2}{\tan\theta_1}$$

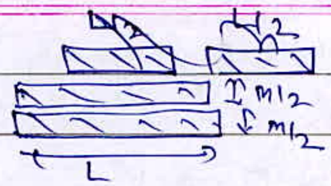
$$= (500\,mA)\,3$$

$$= 1.5A$$

(72) Tangent galvanometer measures - current

(73) $\tau = MB\sin\theta$ for small θ - ($\sin\theta = \theta$)

$$MB\theta = I\alpha \Rightarrow \alpha = \frac{MB\theta}{I}$$

(74)  along axis 

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

$T = 2\pi\sqrt{\frac{I}{MB_H}}$

~~$I = I_0/8$~~

$I' = I_0/2$

$\boxed{T' = T}$

(75) Cut along its axis
then $I' = I_0/2$ and $M' = M/2$

$\therefore T' = T$

(76) $m_1 = m_2$ and $L_2 = 2L_1$
$\therefore M_2 = 2M_1 \rightarrow$ magnetic moment

$B_{1axis} = \frac{\mu_0}{4\pi}\frac{2M_1}{d_1^3}$ and $B_{2axis} = \frac{\mu_0}{4\pi}\frac{2M_2}{d_2^3}$

$B_{1axis} = B_{2axis}$

$\therefore \frac{2M_1}{d_1^3} = \frac{2M_2}{d_2^3}$

$\therefore d_2 = (20) \times (2)^{1/3}$ cm

(77) $i = K\tan\theta$ $\because K = 940$ mA
and $\theta = 45°$

$\therefore i = K = 940$ mA

(78) $\frac{i_1}{i_2} = \frac{\tan\theta_1}{\tan\theta_2} \Rightarrow \theta_2 = 30'$

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(79) $i = K \tan\theta$ $\because K_1 = 1A$

$i = 1A$

then $\tan\theta = 1$

$\boxed{\theta = 45}$

(80) A B C D

$\because$ B is feebly attracted

So B is of a paramagnetic material.

(81) Resultant force acting on a magnetic materia in a magnetic field is in direction from stronger to the weaker part of the magnetic field

(82) ferromagnetic.

(83) $\chi = \frac{C}{T}$ for paramagnetic

$\chi_1 = \frac{C}{200} = 0.0060$

$\chi_2 = \frac{C}{100}$

$\frac{\chi_1}{\chi_2} = \frac{0.0060}{\chi_2} = \frac{100}{200}$

$\chi_2 = 2\chi_1 = 0.0120$

(84) $N = 8 \times 10^{10}$ atoms

$m_{ax} = N \times m = 8 \times 10^{10} \times 9 \times 10^{-24}$ Am^2

$M_{max} = \frac{m_{max}}{volume} = \frac{8 \times 10^{10} \times 10^{-24} \times 9}{10^{-18}} = 7.2 \times 10^{5}$ A/m

(85) $Area = 0.2\ cm^2$; $\chi = 599$

$\mu_r = (1 + \chi_m) = 600$

8.

(86) unit of intensity of magnetisation = A/m

(87)

$I = \frac{m}{A} = M/_V = \frac{\text{Pole strength}}{\text{Area}}$

(88) $I = \frac{M}{V} = \frac{M}{mass/density}$

$mass = 1 \times 10^{-3}$ kg

$density = 5\ gm/cm^3 = 5 \times 10^{3}\ kg/m^3$

$I = \frac{6 \times 10^{-7} \times 5 \times 10^{3}}{10^{-3}} = 3$

(89) if a diamagnetic substance is brought near the north or the south pole of a bar it is repelled by both the poles.

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(90) $\mu_r = (1 + \chi_m) = 5500$

$\chi_m = \underline{5499}$

(91) $\mu_r = (1 + \chi_m) = 6000$

$\chi_m = (6000 - 1) = 5999$

(92) A Superconducting material is diamagnetic

(93) for paramagnetic magnetisation

(94) ferromagnetic materials used in a transformer must have
→ high permeability and low hysteresis loss

(95) on applying an external magnetic field a ferromagnetic substance domains
→ align in the direction of magnetic field

(96) for above Curie temperature
→ ferro magnetic material becomes paramagnetic material.

(97) for $\boxed{T > T_c}$ iron becomes paramagnetic

T_c for iron $= 770°C$

$\therefore T > 770°C$

(98) lead is diamagnetic.

(99) Nickel shows ferromagnetic at room Temp.
If $T > T_c$
then Nickel becomes paramagnetic.

(101) χ_m for Paramagnetic materials
Positive, but small

(100) $2 \times 10^{24} \times 1.5 \times 10^{-23}$
$= 30\ Am^2$ = magnetization

(102) X_m of diamagnetic does not depend on temp.

(103) A diamagnetic material in a magnetic field moves from stronger to the weaker parts.

(104) Curie-Weiss-law is obeyed by iron above Curie temp.

(105)
$$\chi = \frac{1}{T}$$

$$\frac{\chi_1}{\chi_2} = \frac{T_2}{T_1} \Rightarrow X_2 = 2\chi_1 = 0.020$$

(106) diamagnetic substances is thrown out in magnetic field.

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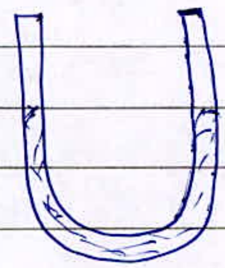
(107) A hydrogen atom is paramagnetic but hydrogen molecule is diamagnetic.

(108) Domain formation is the necessary feature of ferromagnetism,

(109) permanent magnet have high retentivity and coercitivity,

(110)



liquid level rises up,

(111) Diamagnetic materials can exhibit magnetism, but don't have permanent dipole moment,

(112) $B = niA = (60)(i) \times \pi(6)^2 \times 10^{-4}$

$H = 10^3 \; A/m$

$B = \mu_0 H$

$60 \times (i) \times \pi(6)^2 \times 10^{-4} = 4\pi \times 10^{-7} \times 4 \times 10^{3}$

(113) $\mu_d = 0$ and $\mu_p \neq 0$

(114) Diamagnetic materials have a small positive susceptibility.

(115) at curie point a ferromagnetic material become non-magnetic.

(116) copper - diamagnetic
aluminium - paramagnetic
iron - ferromagnetic

(117) bismuth. freely in a magnetic field.
angle $\theta = 90'$

(118) Superconductors repel a magnet.

(119) $B = \mu_0 (H + M)$

(120) X_m for ferromagnetic > 0 Positive
for paramagnetic > 0

(121) Hysteresis property is shown by ferromagnetic substances.

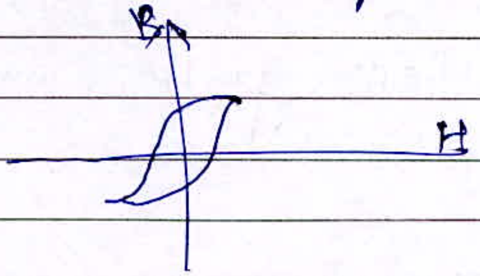
(122) $\mu_r = (1 + \chi_m)$
$5500 = (1 + \chi_m) \Rightarrow X_m = 5499$

(123) Curie temp.

(124) According to Curie's law $\chi \propto \frac{1}{T}$

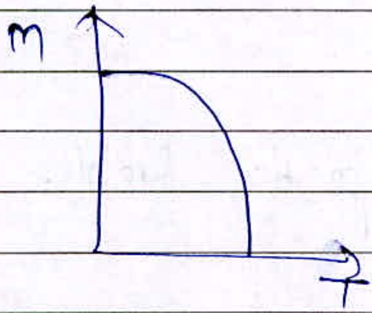
(125) diamagnetic subetance is repelled by magnet in magnetic field.

(126) for temporary magnet

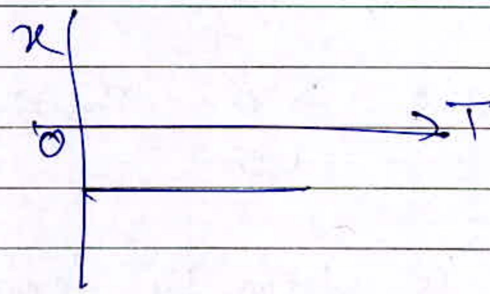


small area.

(127)

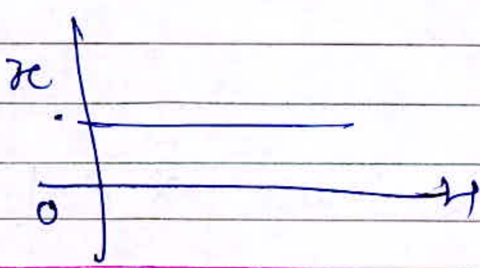


(128) χ is negative and Constant. for diamagnet



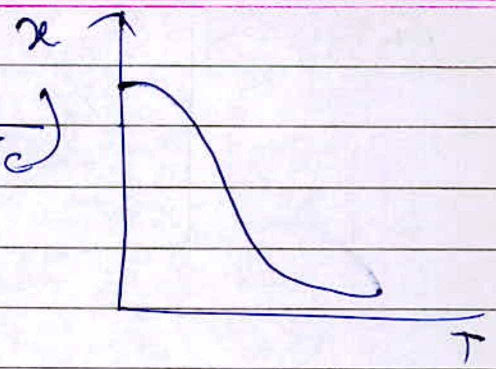
(129)

for paramagnetic
χ does not change with magnetising field.

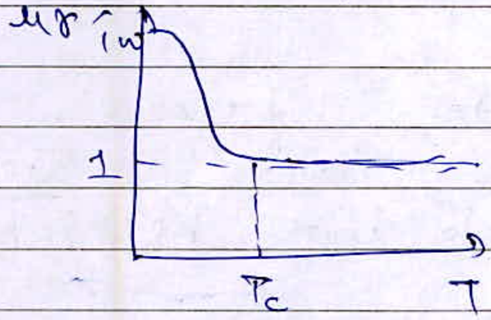


(130) for ferromagnetic

$$\chi = \left(\frac{C}{T - T_C}\right)$$



(131) for ferromagnetic substances



for $T > T_C$

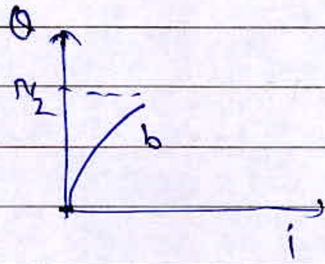
$\boxed{\mu_r = 1}$

(132)

$\mu_r = \frac{B}{H}$ μ_r = Slope of B-H graph

μ_r is highest at Point Q.

(133) $i = k \tan\theta$



(134) V - x graph

Δx = Perpendicular change

$B = \frac{\Delta V}{\Delta x} = \frac{0.1 \times 10^{-4}}{0.05} = 2 \times 10^{-4}$ T

$= 10 \sin 30°$

$= 5$

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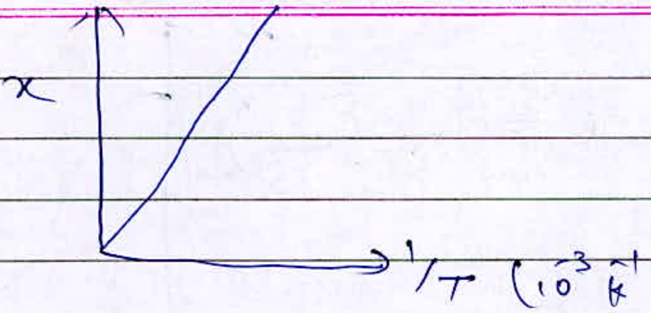
(135)



$\chi = \frac{C}{T}$

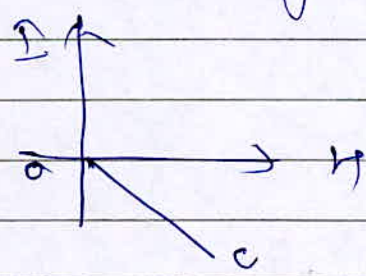
Slope of x vs 1/T graph = C (Curie constant)

$C = \frac{0.4}{7} \times 10^{3} \approx 57K$

(136) for permanent magnet – hysteresis loss should be high so OQ and OR should both be large.

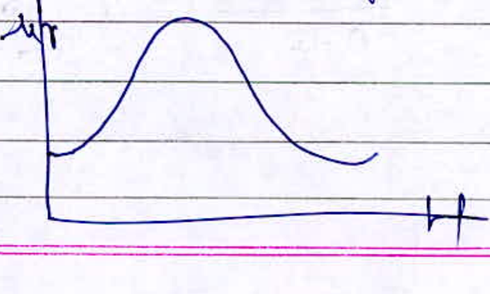
(137) $\chi_m = I/H \Rightarrow \boxed{I = \chi_m H}$

χ_m is always (–)ve for Diamagnetic.

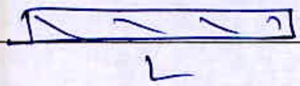


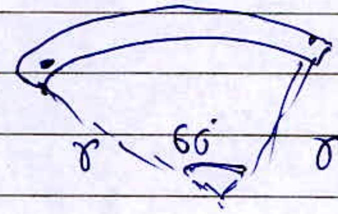
(138) $\mu_r = (1 + \chi_m)$ | χ_m is always positive and very large for ferro magnetic.

$\mu_r = \left(1 + \frac{I}{H}\right)$



(139) $M = mL$





$\left(\frac{\pi}{3} \times r\right) = L$

$\Rightarrow r = \left(\frac{3L}{\pi}\right)$

$m' = mr = \frac{3(mL)}{\pi} = 3M/\pi$

(140) for highest net magnetic dipole moment angle b/w them should be small.