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27.14 No, I think it's not enough. Since the magnetic field is always perpendicular to it's motion. so it can only made a circular motion, it need a electrical field perpendicular to the magnetic field.

27.16 The earth has a magnetic field. The intensity varies with latitude. In high latitude areas, the ~~lines are do~~ magic field is strong. And Van Allen radiation belt is much ~~smaller the~~ thinner.

28.11 For toroidal: it's close on it self so the field lines can stay inside and close itself

For line, it must leave to close itself.

28.19 ~~Parag~~ Paramagnetism due to the partial alignment of electronics, so the motion can be easily effected by temperature. But the diamagnetic mainly depends on the initial orientation of atom, which is not related to temperature.

28.20 This kind of phenomena is based on conservation of angular momentum. When the cylinder is magnetized. At first atomic motion momentum make it still, but when the moment reversed atomic momentum will also reverse, so in order to make total angular momentum constant, the cylinder must rotate.

27.25 (a) $F = q(\vec{E} + \vec{v} \times \vec{B}) = (1.6\times10^{-19}C)(1.5\times10^{5}m/s)\times(0.55T) = 1.3\times10^{-14}N$

$= qv_zB$

b). Yes, The electric exert the ~~field~~ force on ~~the~~ positive proton, and there's a component of acceleration in this direction

c). the motion is a helix $\Rightarrow \begin{cases} yz: \text{circular} \\ x: \text{linear} \end{cases}$ the force did not have affect on yz so it did not affect circular motion, so the helix will not change.

d). $T = \frac{2\pi}{\omega} = \frac{2\pi}{qB/m} = \frac{2\pi m}{qB} = \frac{2\pi(1.67\times10^{-27}kg)}{(1.6\times10^{-19}C)(0.55T)} = \cancel{1.3}\ 1.2\times10^{-7}s \Rightarrow t = \frac{T}{2} = \cancel{6.5\times10^{-8}s}\ \cancel{6}\ 6\times10^{-8}s$

$v_{0x} = 1.8\times10^{5}m/s$

$a = \frac{F}{m} = \frac{(1.6\times10^{-19}C)\times(1.8\times10^{4}V/m)}{1.67\times10^{-27}kg} = \cancel{3.6\times10^{-11}m/s^2}\ 1.7\times10^{12}m/s^2$

$x - x_0 = v_0t + \frac{1}{2}at^2 = (1.8\times10^{5}m/s)\times(6\times10^{-8}s) + \frac{1}{2}\times(1.7\times10^{12}m/s^2)(6\times10^{-8}s)^2$

~~= 0.000~~ $= 0.014m$

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27.37

$F = mg \quad BIl = mg \quad I = \frac{mg}{Bl} = \frac{0.75\,kg \times 9.81\,m/s^2}{0.45\,T \times 0.5\,m} = 32.7\,A.$

$V = I \cdot R = 32.7\,A \times 25\,\Omega = 817.5\,V$

(b) $F' = BIl = \frac{BVl}{R} = \frac{0.45\,T \times 817.5\,V \times 0.5\,m}{25\,\Omega} = 92\,N.$

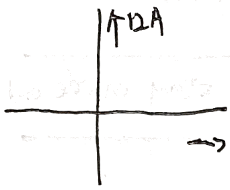
$a = \frac{F_{net}}{m} = \frac{F - mg}{m} = \frac{92 - 0.75 \times 9.81}{0.75} = 112.8\,m/s^2$

27.65 (a) $F = BIl$. to the right.

(b) $\cancel{V^2 - V_0^2 + 2a(x-x_0)}$ $\Rightarrow V^2 = 2ax \Rightarrow x = \frac{V^2}{2a} = \frac{V^2 \cdot m}{2BIl}.$

(c). $d = \frac{(1.12 \times 10^4)^2 \times 30}{2 \times 0.82 \times 2.4 \times 10^3 \times 0.51} = 1.87 \times 10^6\,m.$

28.27



Q: $B_1 = \frac{\mu_0 I_1}{2\pi r_1} = \frac{4\pi \times 10^{-7} \times 10}{2\pi \times 0.08} = 2.5 \times 10^{-5}\,T$

Similarly $B_2 = 1.6 \times 10^{-5}\,T$. $\Rightarrow B = B_1 + B_2 = 4.1 \times 10^{-5}\,T$ ⊙ ← direction.

P: similarly $B = 4.1 \times 10^{-5}\,T$ ⊗

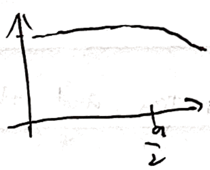
Q: $0.9 \times 10^{-5}\,T$ ⊗

P: $0.9 \times 10^{-5}\,T$ ⊙

28.67 (a) left: $B = \frac{\mu_0 N \cdot I a^2}{2[(x+\frac{a}{2})^2 + a^2]^{\frac{3}{2}}}$ right: $B = \frac{\mu_0 N \cdot I a^2}{2[(x-\frac{a}{2})^2 + a^2]^{\frac{3}{2}}}$

$\Rightarrow B = \text{left} + \text{right} = \frac{\mu_0 N I a^2}{2}\left(\frac{1}{[(x+\frac{a}{2})^2 + a^2]^{\frac{3}{2}}} + \frac{1}{[(x-\frac{a}{2})^2 + a^2]^{\frac{3}{2}}}\right)$

(b)



(c) At P, $x = 0 \Rightarrow B = \left(\frac{4}{5}\right)^{\frac{3}{2}} \frac{\mu_0 N I}{a}.$

(d) $B = \left(\frac{4}{5}\right)^{\frac{3}{2}} \times \frac{(4\pi \times 10^{-7}) \times 300 \times 6}{0.08} = 0.02\,T.$

(e). $B' = \frac{\mu_0 N I a^2}{2}\left(\frac{-3(x+\frac{a}{2})}{[(x+\frac{a}{2})^2 + a^2]^{\frac{5}{2}}} + \frac{-3(x-\frac{a}{2})}{[(x-\frac{a}{2})^2 + a^2]^{\frac{5}{2}}}\right)$ when $x = 0$

$B' = 0 \quad \frac{d^2B}{dx^2}$ At $x = 0$ $\frac{d^2B}{dx^2} = 0$

$\Rightarrow$ the rate of change = 0, it's very uniform.

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28.83 ① parallel: $150 + 50 = 200\ \mu T$.
anti (opposite) $150 - 50 = 100\ \mu T$.
> choose C.

Essay Question.

The magnetic strength of electromagnet is required to change obviously with the change of the current. Soft magnet's ability of magnetic is easy to disappear after magnetization, however. hard magnet. will be magnetized into permanent magnet after being electrified. For an electromagnet, ~~does~~ which will not fit the requirement.