Seen

Tan Zhi Yong 03S6H Physics Magnetic field & Electromagnetism

Subject: Aen Date: 4/5/04

1a) Mass of slide $= \frac{35 \times 10^{-3}}{9.81}$

$= 3.57 \times 10^{-3}$ kg (3 s.f.)

1b) Current $= -3.5$ A

1c) Current flows from left to right of metal slide.

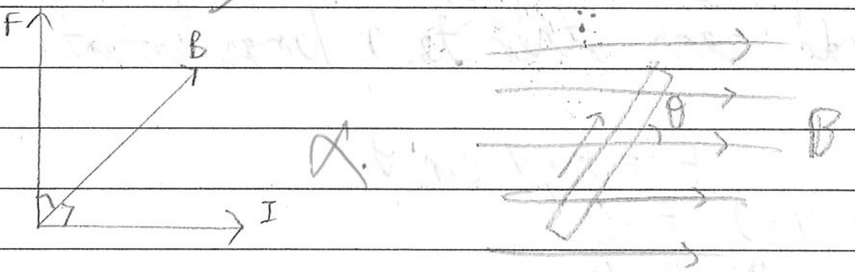
1d) $F = BIL \sin\theta + mg$

When $I = 1.0A$, $45 \times 10^{-3} = B(1.0)(0.04) + (3.568 \times 10^{-3})(9.81)$ } not mg.

$B = 0.25$ T

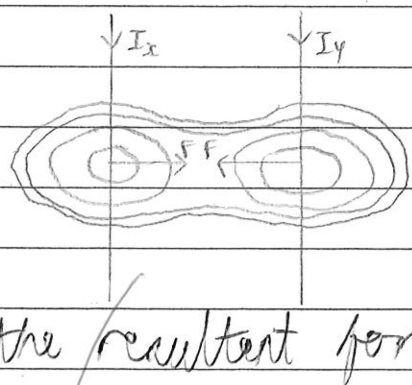
2ai) $B = \frac{F}{IL \sin\theta}$

2aii)



2aiii) A tesla is the magnetic flux density if a force of ~~1A~~ 1N acts on a wire of length 1m, carrying a current of 1A placed perpendicular to the magnetic field.

2bi)



When two straight conducting wires carrying a current I in the same direction are separated a distance d from each other, their magnetic fields converge and the resultant forces cause them to attract.

M

use F.L.HR.

Draw 3-D diagram.

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2b(ii) $B = \frac{\mu_0 I}{2\pi r}$ —— (1)

$F = BIL$ —— (2)

Subst (2) into (1) $F = \frac{\mu_0 I}{2\pi r}(IL)$

$\frac{F}{L} = \frac{\mu_0 I^2}{2\pi r}$

2c(i) Force per unit length $= \frac{(4\pi \times 10^{-7})(200)^2}{2\pi(6.0)}$

$= 1.33 \times 10^{-3}\ N$ (3s.f.)

~~Forces are in opposite direction towards each other.~~

?

0

2c(ii) The forces between them are too weak for them forces small to attract and stick to each other as the compared to weight weight of the wires prevent them from bending & tension of towards each other to a large extent. cable.

3a) $F = Bqv \sin\theta$

When $v = 0$, $F = 0$

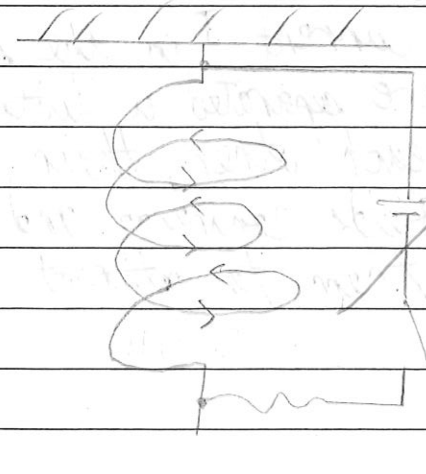
When $\theta = 0°$, $F = 0$

∴ two situations are:

1) particle is not moving stationary

2) particle is moving parallel to direction of magnetic field.

3b(i)



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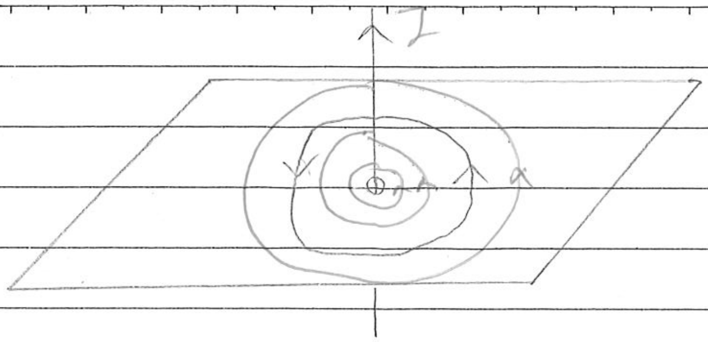
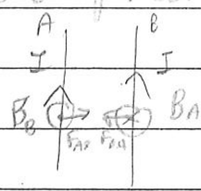
3bii)



3biii) The adjacent coils of the spring have the current flowing through them in ~~a parallel manner~~ the same direction. The currents generate magnetic fields ~~which are~~ whose directions are anticlockwise to ~~do~~ the plane of the paper. The magnetic fields converge and this results in forces of attraction between the adjacent coils, causing the spring to shorten.

3biv) The spring is compressed.

2bii) Consider two parallel wires A & B carrying current in the same direction. Each current-carrying wire produces its own magnetic field. The current-carrying wire A in presence of the field produced by the other wire B experiences a magnetic force due to the wire B. By Newton's third law wire B will experience an equal & opposite force acting on it due to wire A. By FLHR, direction of magnetic forces are pointing towards each other.



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