# Physics 201 — Day 18

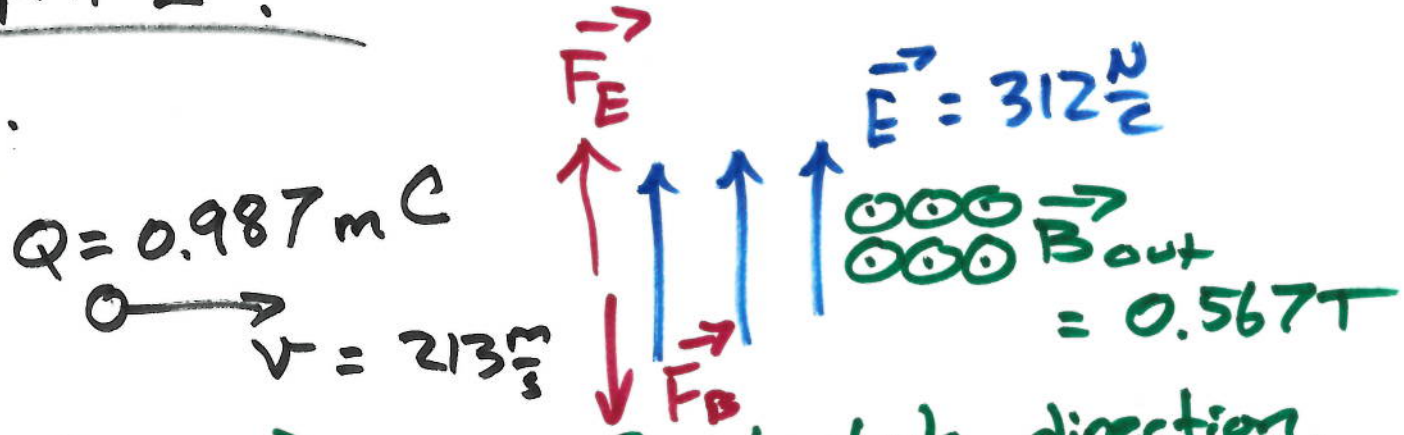
Exam 2 Reviews:
Today, next Monday in class and next Tuesday, April 3rd 5-6pm in SIE 2111. Come with Questions.

On Canvas, see: Sample MT3.pdf.

No Class Friday. Exam 2 Fri 6th. end of week 10.

Quiz 3.0 on Ampere's Law on Monday, April 2nd.

1. A.




Find net force on Q. Include direction.

$\vec{F}_E = q\vec{E}$ $\quad \vec{F}_B = Q\vec{v} \times \vec{B}$

$F_E = 0.987 \times 10^{-3}\,C \times 312 \frac{N}{C} = 0.308\,N$

$F_B = QvB\sin\theta = 0.987 \times 10^{-3}\,C\ 213 \frac{m}{s}\ (0.567T)$

$= 0.119\,N$

Bless You.

$F_{Net} = 0.308N - 0.119N$ up the page

$= 0.189N$ up the page ↑

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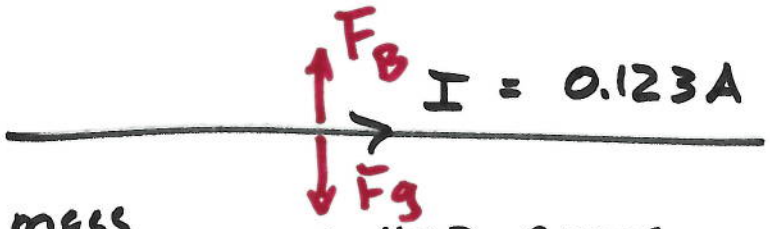
1B.




$\frac{mass}{length} = 0.0432 \frac{grams}{cm}$

Find $\vec{B}$ needed to generate $\vec{F_B}$ to counteract (cancel) gravity.

$\vec{F_B} = I\vec{l} \times \vec{B}$ $\quad \vec{B}$ into page

$F = mg$ $\quad IlB\sin 90^\circ = mg$

$$B = \frac{mg}{Il} = \left(\frac{m}{l}\right)\frac{g}{I}$$

$g = 9.8 \frac{m}{s^2}$

$I = 0.123A$

need $\frac{m}{l}$ in $\frac{kg}{m}$

$$\frac{m}{l} = 0.0432 \frac{g}{cm} \times \frac{1\,kg}{1000g} \times \frac{100cm}{1m}$$

$$\frac{m}{l} = 0.00432 \frac{kg}{m}$$

$$B = 4.32 \times 10^{-3} \frac{kg}{m} \times 9.8 \frac{m}{s^2} / 0.123A =$$

$B = 0.3442\ T$

$$\frac{N}{A \cdot m} = T = \frac{N \cdot s}{C \cdot m} = \frac{kg}{C \cdot s}$$

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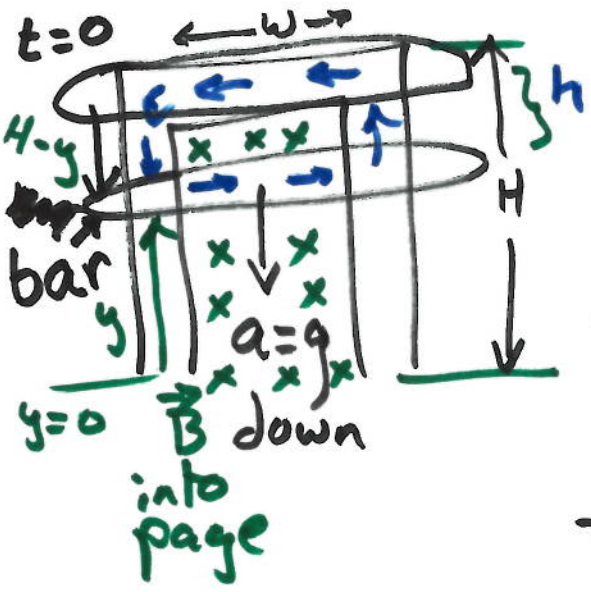
2. Slight variation: I want to solve the sample Faraday's problem posted pre-Spring break.




$y(t) = H - \frac{1}{2} g t^2$

Find $V(t)$ in loop.

$$V = -\frac{d}{dt} \int \vec{B} \cdot d\vec{a}$$

Lenz Law → Direction of I

$$V = \frac{d}{dt} \int B \, da$$

$h = H - y$

$= H - (H - \frac{1}{2} g t^2)$

$= H - H + \frac{1}{2} g t^2$

$h = \frac{1}{2} g t^2$

$h(t) = H - y(t)$

$= B \frac{d}{dt} \int da$

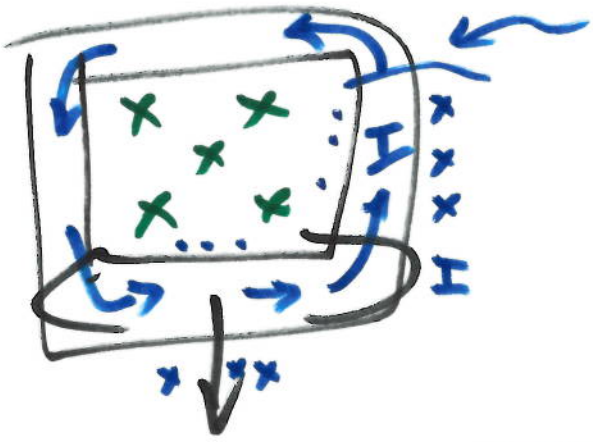
$= B \frac{d}{dt} \left[ w \left( \frac{1}{2} g t^2 \right) \right]$

area $= h \cdot w$

$= B w \frac{g}{2} \frac{d}{dt} t^2$

$V = Bwgt$

at $t=0$, $V=0$
later, $V$ increases




Since loop area increases blue field counters that.

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3.A. In Faraday's law 3 things can change. List. Give example.

answer:

B, area, angle between them.

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move magnet closer / farther from loop of wire.

area: you could make loop bigger, or see problem 2 above.

angle:  spin magnet near loop of wire.