Phys 2426 2015-12-01 Lec 27

Last Class Today! Review.

Final Tue 12/8 11am - 1:30 pm

Important Situation: mass spectrometer
e/m Apparatus

Two Stages: I: make particles move w/ v.
II: make them bend in B.

Particle Accelerator (Used in e/m)

$$\text{Energy} = q\Delta V = \frac{1}{2}mv^2$$

ΔV: Voltage; v: velocity

$$\text{Force} = qE = ma$$

$E = \Delta V / \ell$

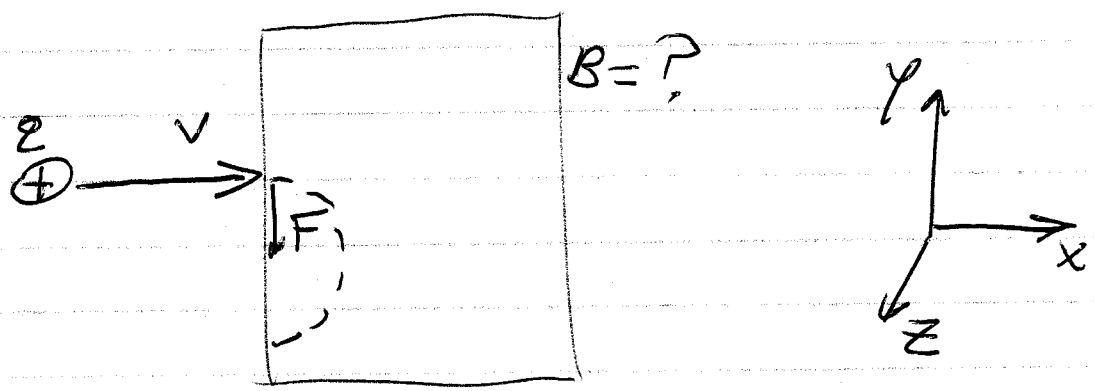
Velocity Selector

$$F_E = F_B$$
$$qE = qvB$$
$$\frac{E}{B} = v$$

Circular Motion in B

$$r = \frac{mv}{qB}$$

$$\text{Force} = qvB = ma = \frac{mv^2}{r}$$



What dir is B?

not $\pm x$ → Force would be 0.

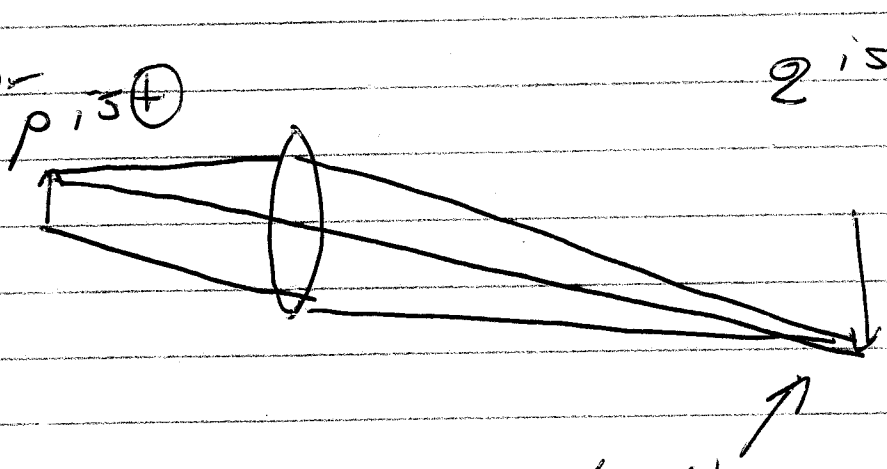
not $\pm y$ → Force would be $\pm z$.

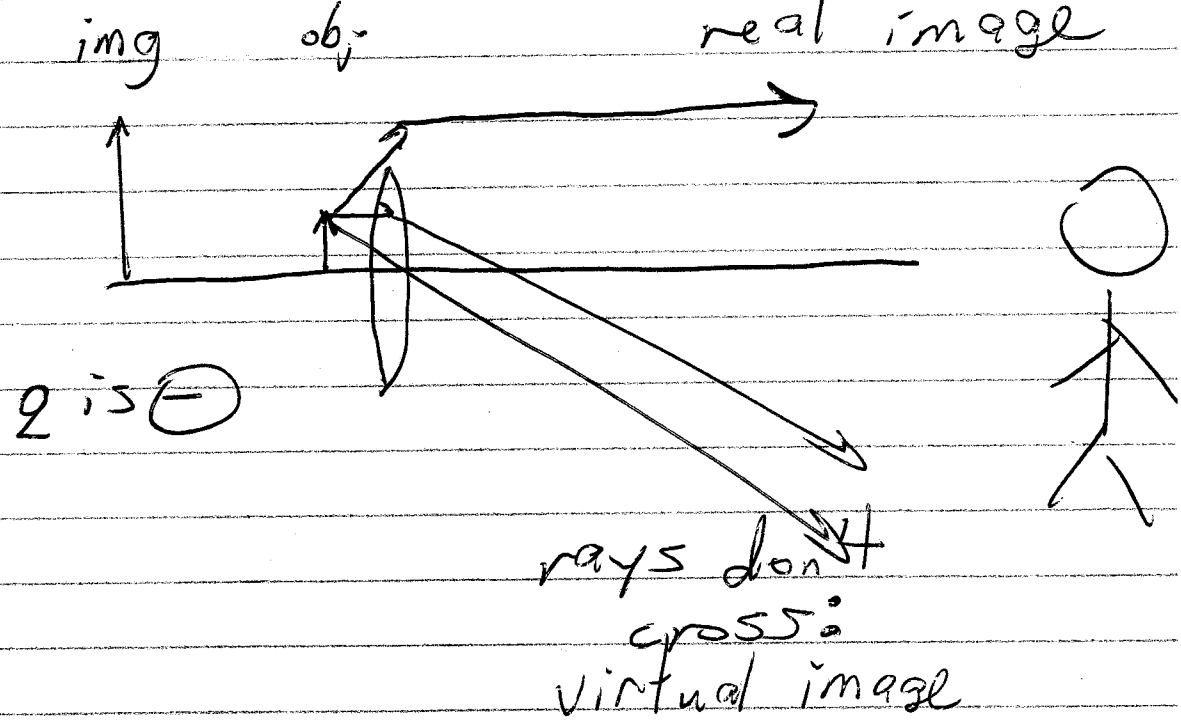
$\pm z$

v is $+x$, F is $-y$ → B is $+z$

③

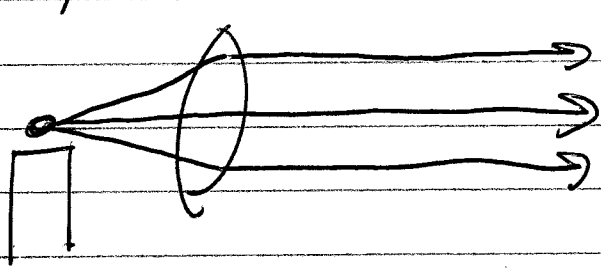
Projector





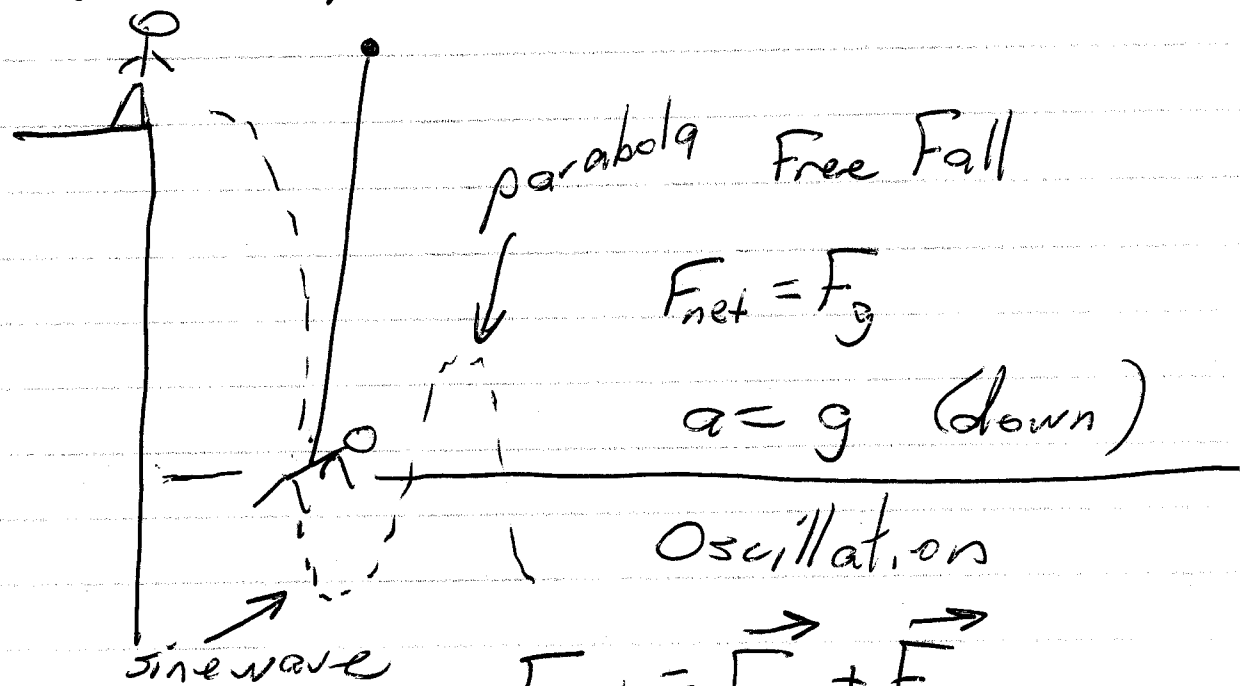
what if a candle is @ $p = f$?

$$\frac{1}{p} + \frac{1}{q} = \frac{1}{f}$$



$q = \infty \rightarrow \frac{1}{q} = 0$

④ Bungee Jumper



$\vec{F}_{net} = \vec{F}_g + \vec{F}_{bungee}$

This is oscillation: ↑ variable force

$y = A \sin(2\pi f t)$

↑ amplitude

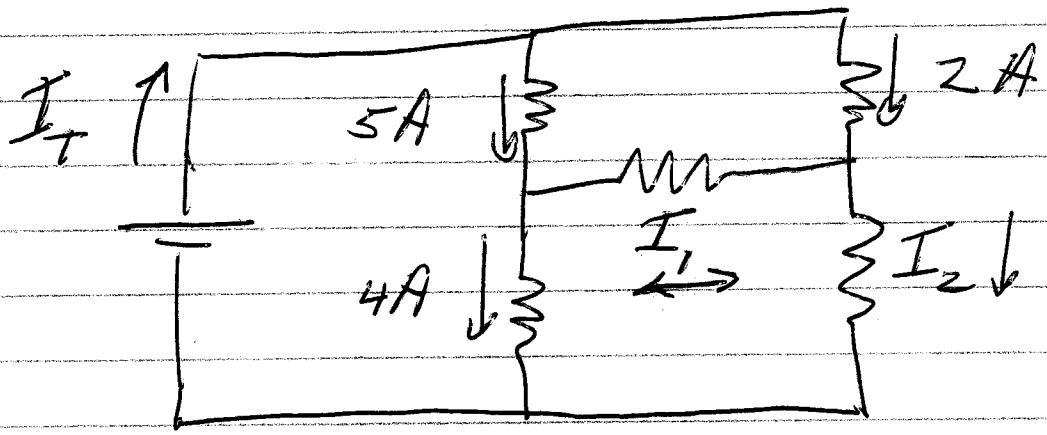
$v_{max} = 2\pi f A$

$v = v_{max} \cos(2\pi f t)$

$f = \frac{1}{2\pi} \sqrt{k/m}$

Circuits

- R in series
- R in parallel
- RC discharging
- RLC series AC
  - f = resonant frequency = f_R
  - f ≠ resonant frequency



Results: $I_T = 7A$

$I_2 = 3A$

$I_1 = 1A$ toward right

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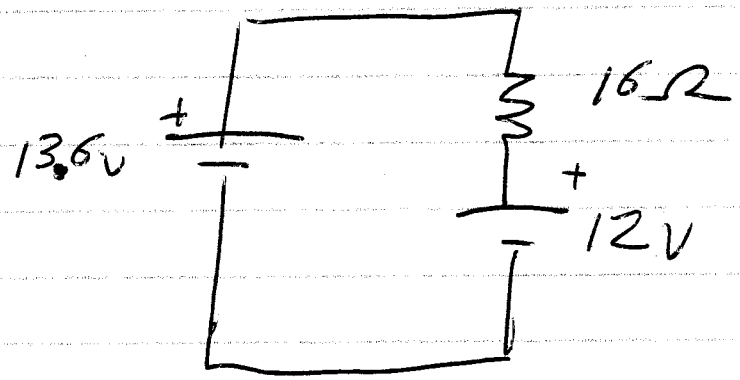
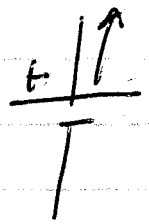


Effective voltage = 13.6 − 12 = 1.6 V

$$I = \frac{1.6\,V}{16\,\Omega} = 0.1\,A$$

Power Supply

13.6V



$P = (13.6\,V)(0.1\,A)$
$= 1.36\ W$
Generated

Resistor

$P = (1.6\,V)(0.1\,A)$
$= 0.16\ W$
Used

Battery Being Charged

$P = (12\,V)(0.1\,A)$
$= 1.2\ W$
Used

(7)

Cost of Electricity

$$\text{Cost} = \text{Amount} \cdot \text{Rate}$$

$$\text{Rate} = \$0.12 / \text{kWh}$$

$$\text{Energy} = P \Delta t$$

Ex: LED Bulb 9W vs 60W

$P = 0.009\ \text{kW}$ $0.060\ \text{kW}$

For a month $\Delta t = 720\ \text{hr}$

Energy	6.5 kWh	43 kWh
Cost	\$0.78	\$5.18

(3)

Diffraction Grating

$$m\lambda = d \sin\theta$$

Types of EM radiation

Gamma
X-Ray
UV
Visible Light
IR
Microwaves
Radio