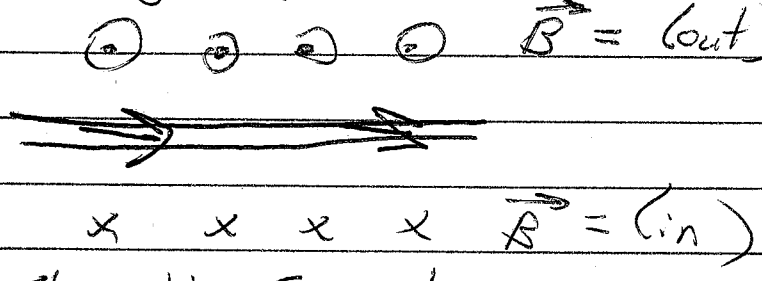
Phys 1402 2017-12-05 Lec 26

Last Class!!
Final Exam Thu 12/14 11 am - 1:30 pm

- Fields & Charges
- Circuits
- Waves & Optics

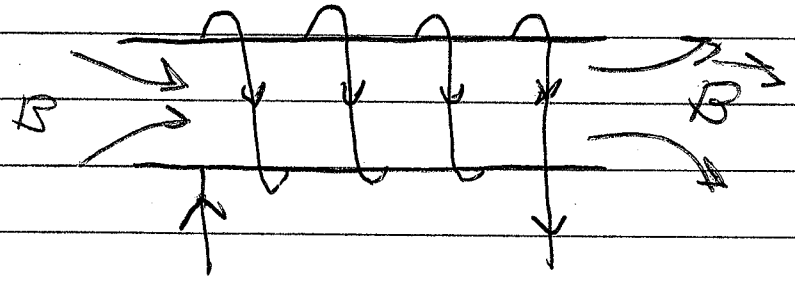
Right-Hand Rules

Generating Magnetic Fields ($\vec{B}$)



Straight Current
Thumb = current
Curled fingers = B Field

Solenoid



Curled fingers = Current
Thumb = B inside coil

Force Caused By magnetism (F_B)

$F_B = q v_\perp B$ — Thumb, Index, middle

$F_B = I \ell B$ — Thumb, Index, middle

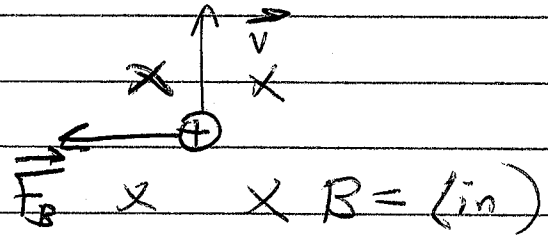
Ex: Want Force to Left
Velocity is to top of page
What B for ⊕ charge?

Middle finger = into page
Result: B = into page

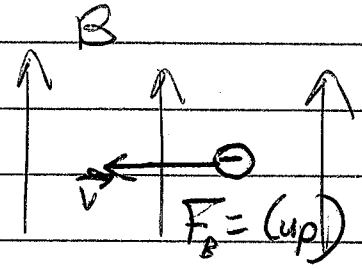
$F = ma$

$qvB = mv^2/R$

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



Ex: B = (North)
q = ⊖
Want to "Levitate"

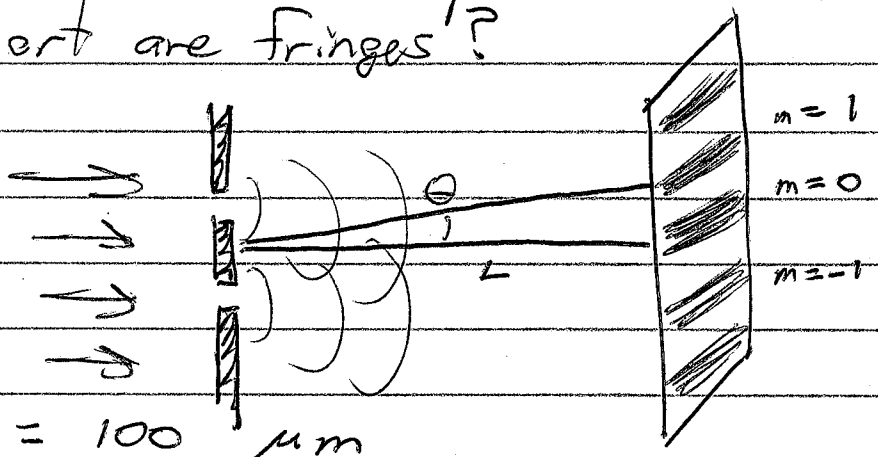


Index Finger = Right = East
⊖ charge, so $\vec{v}$ = (West)

Two-Slit Example

$m\lambda = d \sin\theta$

Red Light $\lambda = 650$ nm
Spacing of 0.1 mm
Project to screen 2.0 m away
How far apart are fringes?



$m = 10^{-3}$
$\mu = 10^{-6}$
$n = 10^{-9}$

$d = 0.1$ mm $= 100$ μm
$\lambda = 650$ nm $= .650$ μm

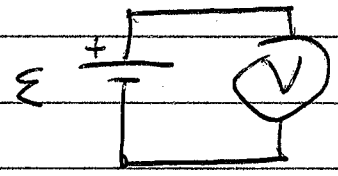
$$m\lambda = d \sin\theta$$
$$(1)(0.65\ \mu m) = (100\ \mu m) \sin\theta$$
$$0.0065 = \frac{0.65}{100} = \sin\theta$$
$$\theta = \sin^{-1}(0.0065) = 0.372^\circ$$

$$\tan\theta = \frac{y}{L}$$

$$y = L\tan\theta = (2.0\ m)\tan(0.372^\circ)$$
$$= 0.013\ m \approx 1.3\ cm$$

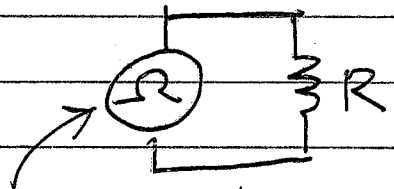
(4) Electrical Measurements

Battery - Measure Voltage



Open Circuit Voltage
No-Load Voltage

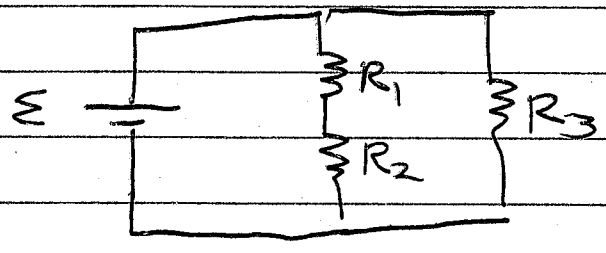
Resistor - Measure Resistance



Acts as battery

Must be just Ohmmeter and Resistance to measure

Circuit - Measure Voltages or Currents



Voltage - place meter across component.

Current - Break circuit and insert meter.

Internal Resistance - is in series w/ Load

$$\mathcal{E} = V_{int} + V_{ext}$$

$$\mathcal{E} = I R_{int} + V_{ext}$$

↳ Terminal Voltage

(5)

Ex: Measure Batt by itself

$$V = 9.0\,V = \mathcal{E}$$

Attach $9\,\Omega$ Resistor

$$V = 8.1\,V = V_{ext}$$

Calculate: $$I = \frac{V_{ext}}{R} = \frac{8.1\,V}{9\,\Omega} = 0.9\,A$$

Calculate: $$\mathcal{E} = V_{int} + V_{ext}$$
$$(9.0\,V) = V_{int} + (8.1\,V)$$
$$0.9\,V = V_{int}$$

Calculate $$V_{int} = I R_{int}$$
$$(0.9\,V) = (0.9\,A)\, R_{int}$$

$$\boxed{1.0\,\Omega = R_{int}}$$

(6)

Farsighted

Person's Value
Ex: 1.5 m

Desired Location
mimicks typical good vision.
(25 cm)

$d_i = -150$ cm $d_o = 25$ cm

$$\frac{1}{25} + \frac{1}{-150} = \frac{1}{f}$$

$$\frac{6}{150} - \frac{1}{150} = \frac{1}{f}$$

$$\frac{5}{150} = \frac{1}{f}$$

$$\frac{150}{5} = f = 30 \text{ cm}$$
$$= 0.3 \text{ m}$$

$$\text{Power} = \frac{1}{f} = \frac{1}{0.3} = 3.33 \text{ Diopters}$$