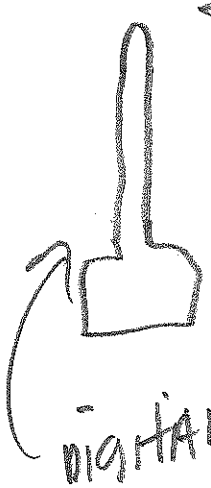
P11 11-7-13

Lab on cooling Lab

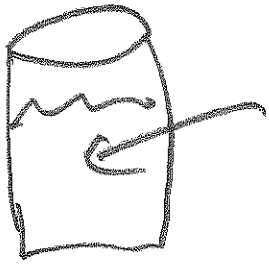
temperature probe:

wave in air and measure room temp. ≈ 24.6°C



DIGITAL

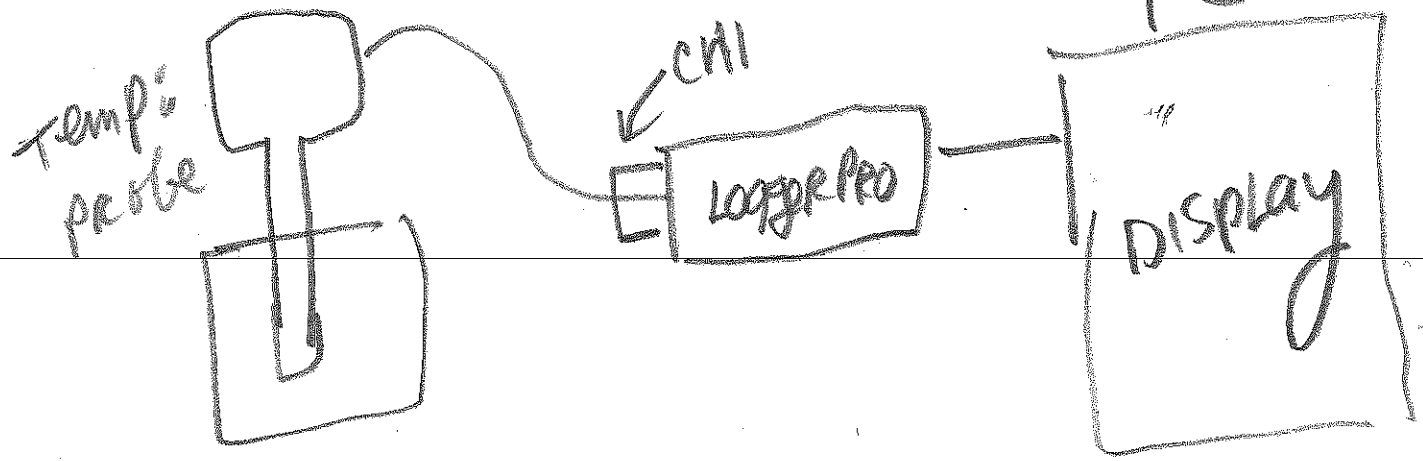
+30°C

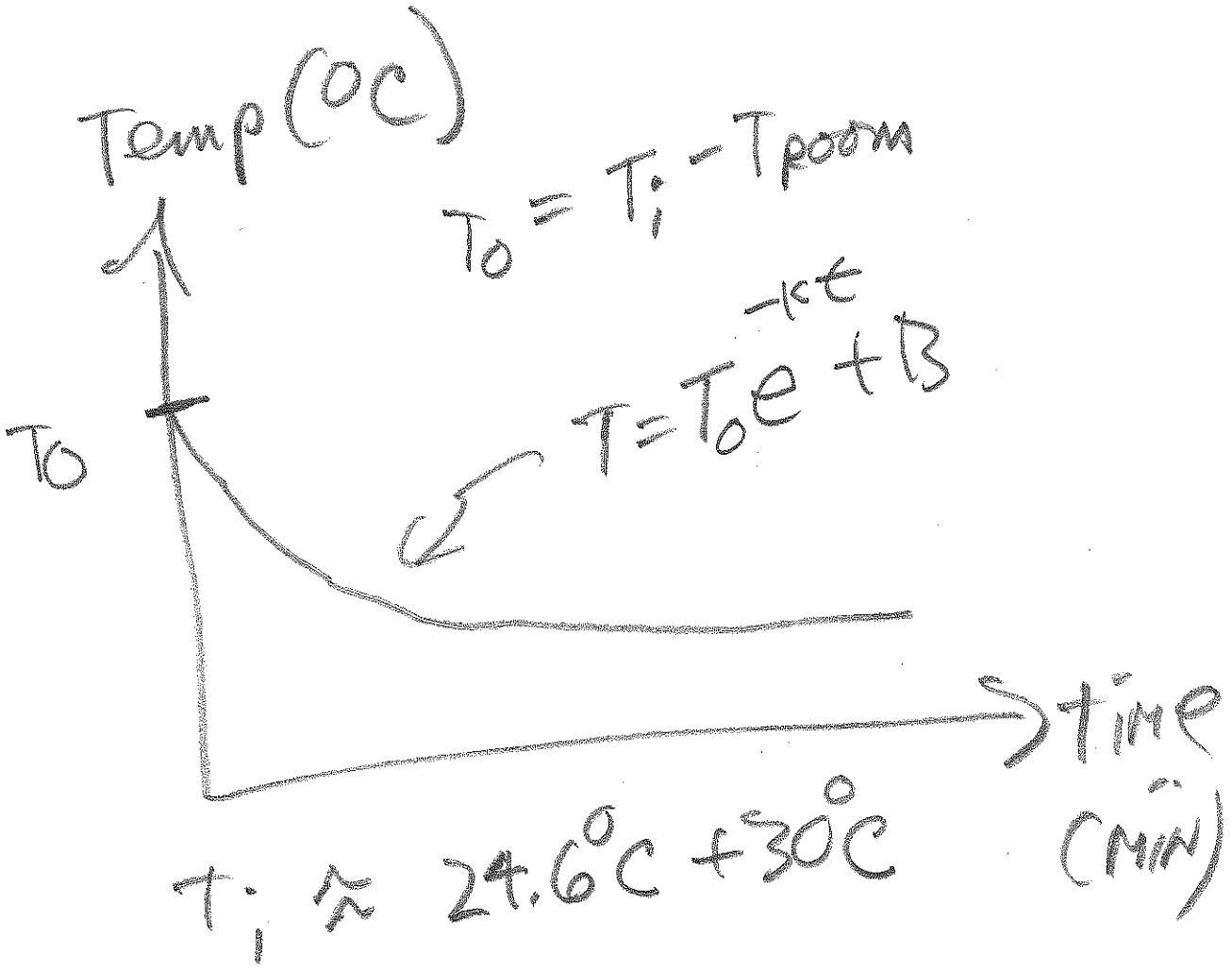


$H_2O$ @ $T \simeq T_{room}$

use not water TAP

(use regular thermometer)






writing project

other writing topics

(1) Hydraulic Fracking "

get a current news article

a recent demonstration

(2) nuclear power issue

SFChronicle science section

" "

NYT

BG newspaper

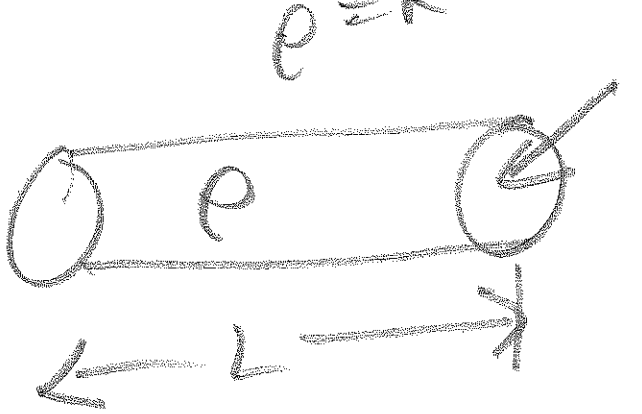
science (physics)

sections

Quiz a review

$$R = \frac{\rho \cdot L}{A}$$

$\rho$ = resistivity (intrinsic)




Ohm's Law $\Rightarrow I = \frac{\Delta V}{R}$ ← current

Example: $I = \frac{120(V)}{10\Omega} =$

$$\text{Power} = I \cdot \Delta V$$

example

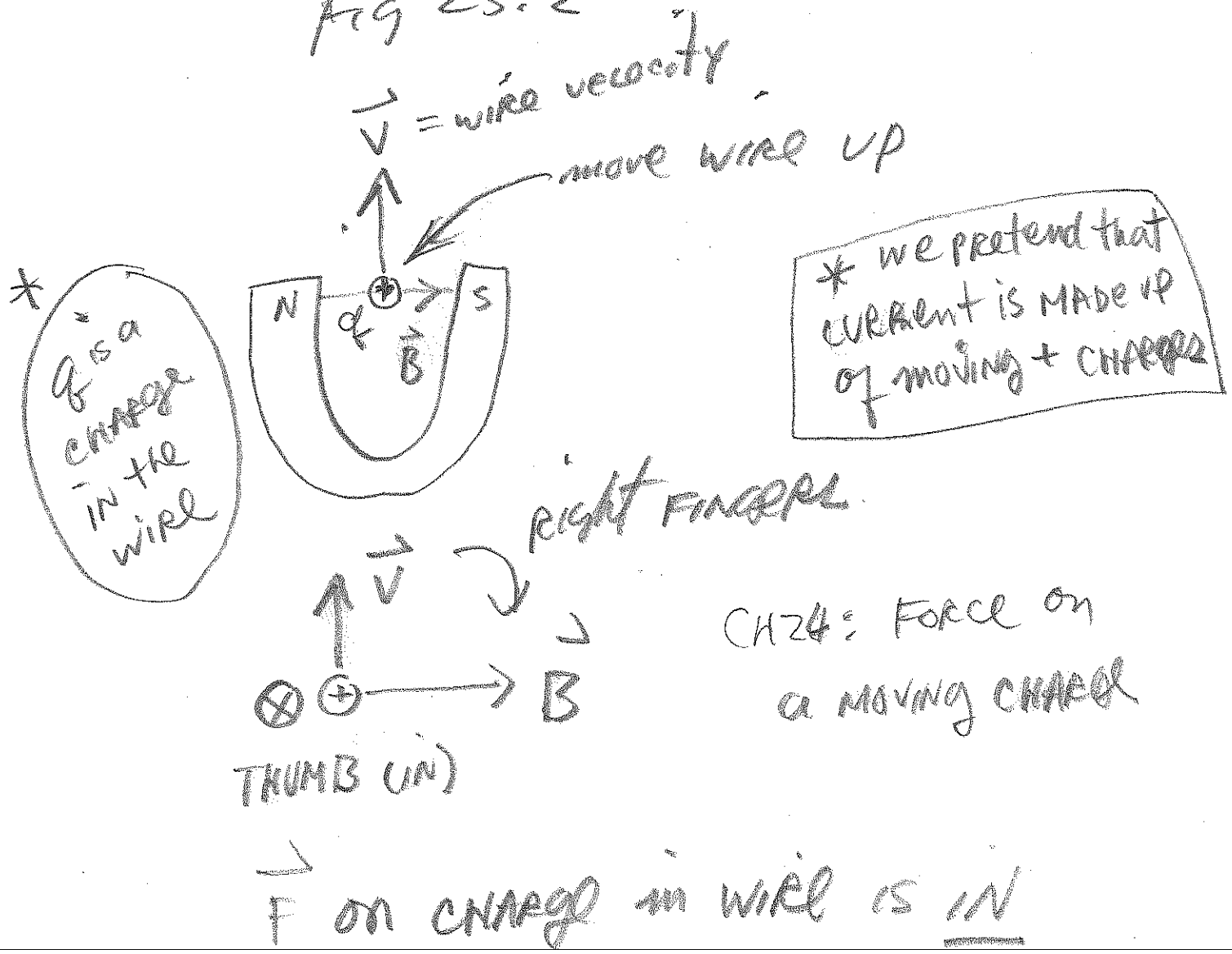
$P = (2A)(120V)$

$= 240$ WATTS

11-12-13

CH25

Fig 25.2

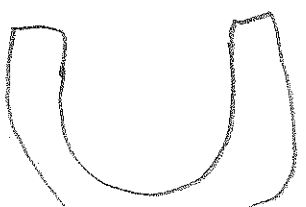


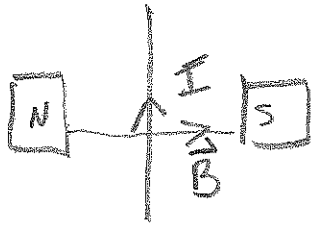

CH24: Force on a moving charge

eye ↓ look DOWN

current I moves IN.

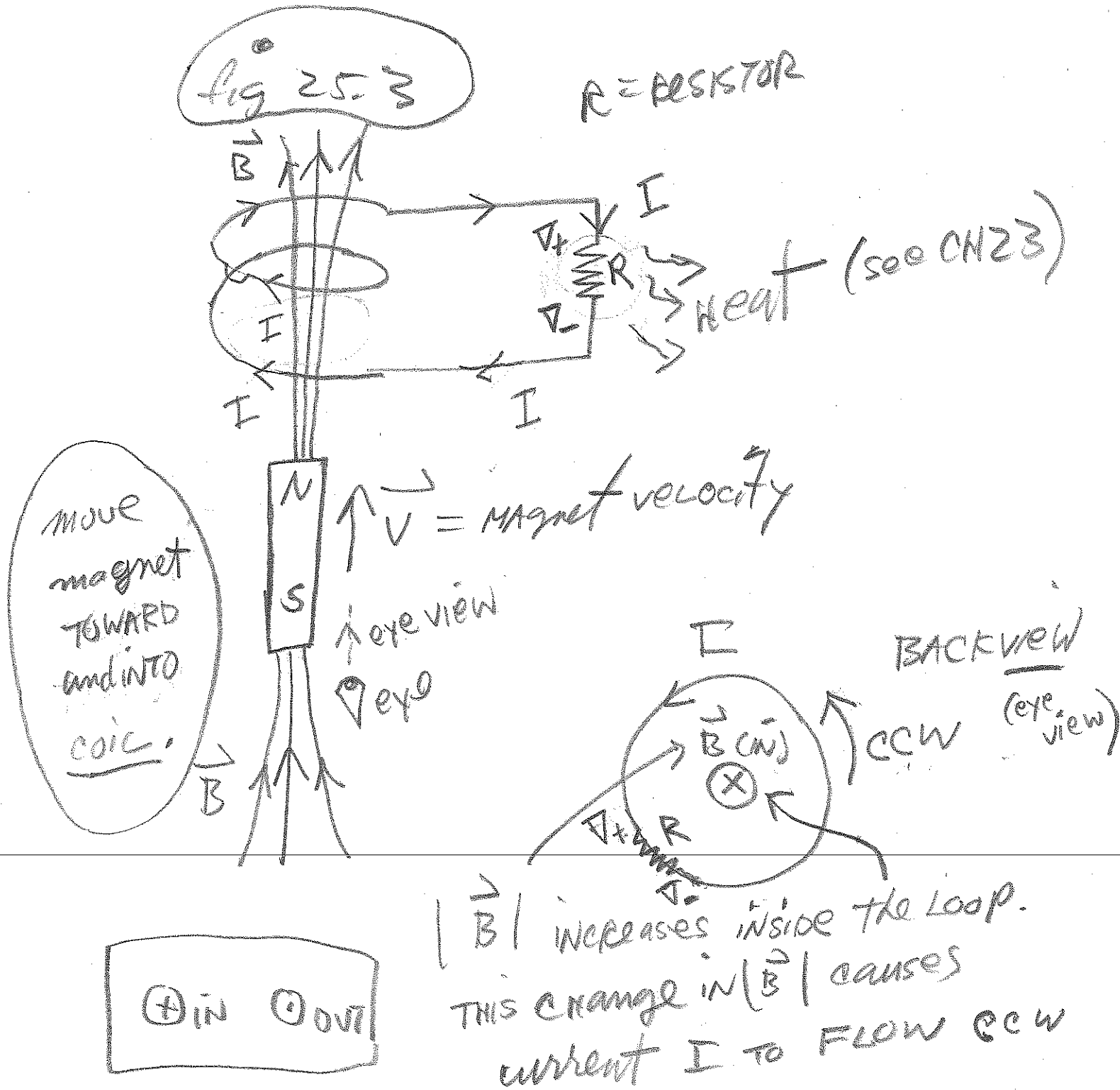
top view






motion causes current

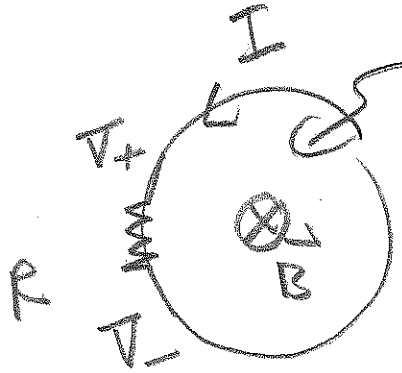
another way of seeing THIS




$|\vec{B}|$ increases INSIDE the loop.
THIS change IN $|\vec{B}|$ causes current I TO FLOW CCW

⊕ IN ⊙ OUT

# Faraday's LAW




$$V_+ - V_- = N \cdot \text{area} \cdot \left|\frac{\Delta \vec{B}}{\Delta t}\right|$$

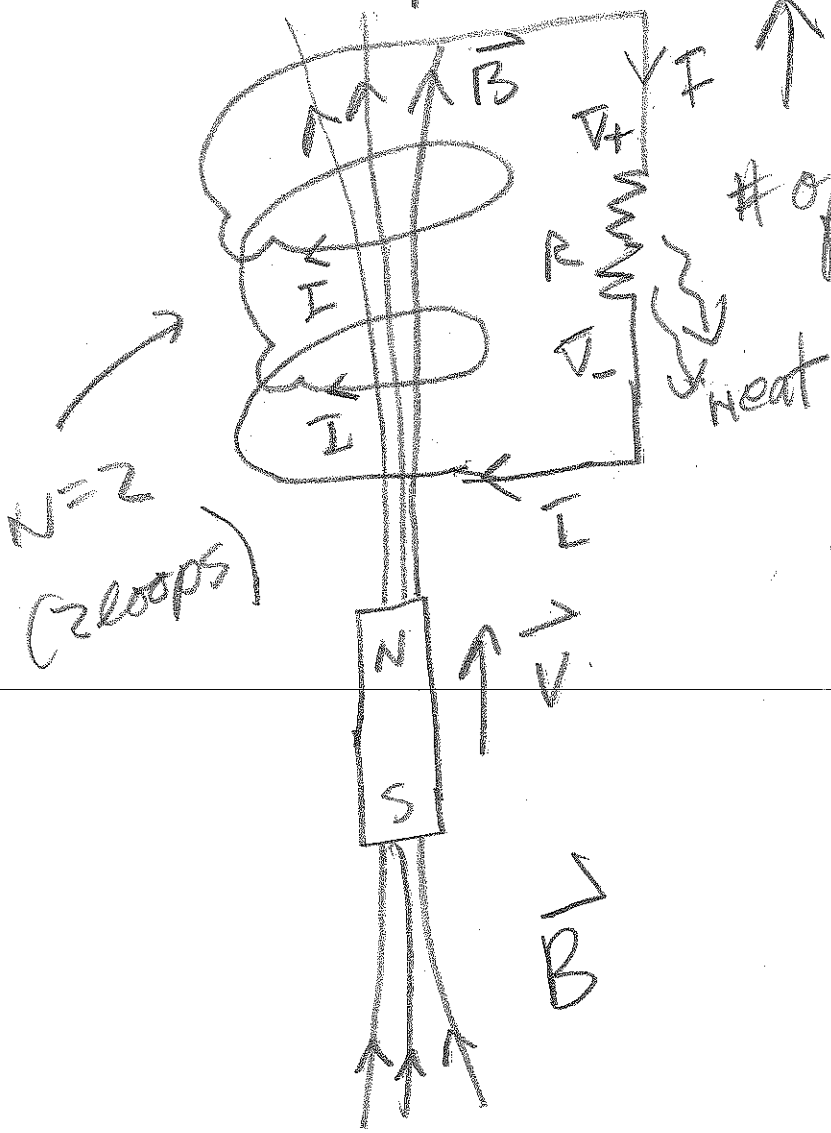
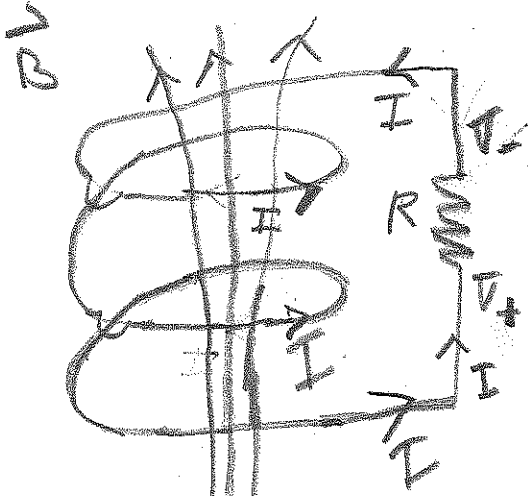
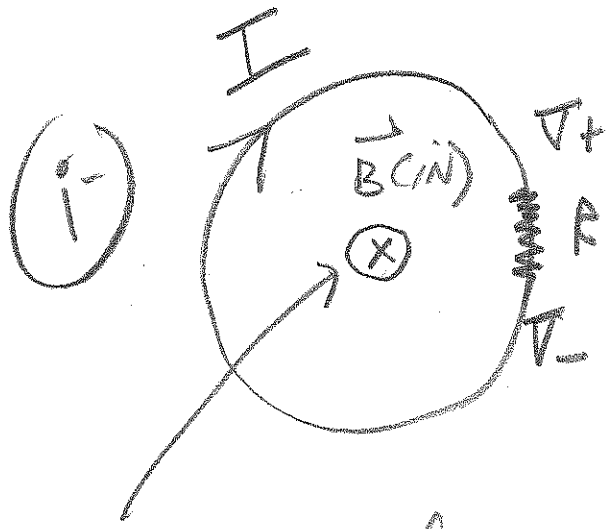


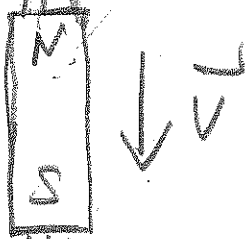

fig 25.1
fig 25.3

NOTE:
IF $\vec{V}$ is large
(move magnet very FAST) $\left|\frac{\Delta \vec{B}}{\Delta t}\right|$ is large since $\Delta t$ is small.

counter-example:

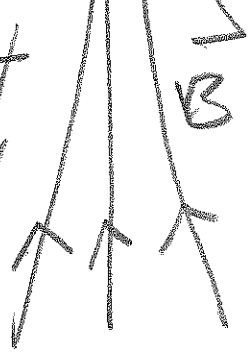


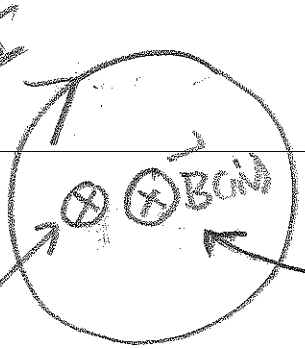




$|\vec{B}|$ get smaller (decreases)

move magnet AWAY




rule: I flows to oppose change in external $\vec{B}$




EXTERNAL $\vec{B}$ GETS WEAKER

$\vec{B}_{IND}$ = induced $\vec{B}$ TO KEEP $\vec{B}_{EXT}$ STRONG BY ALSO POINTING IN.

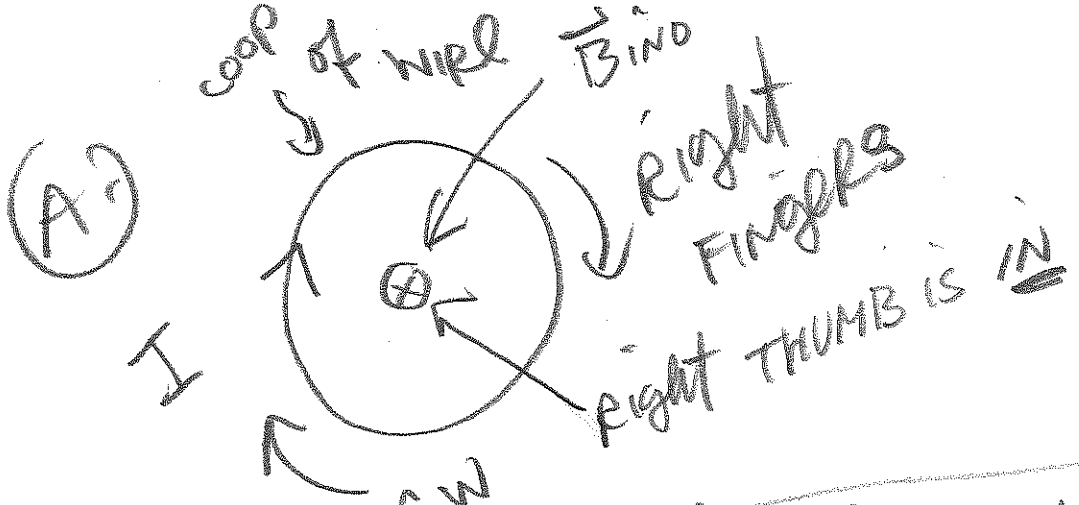
CH24

I induced

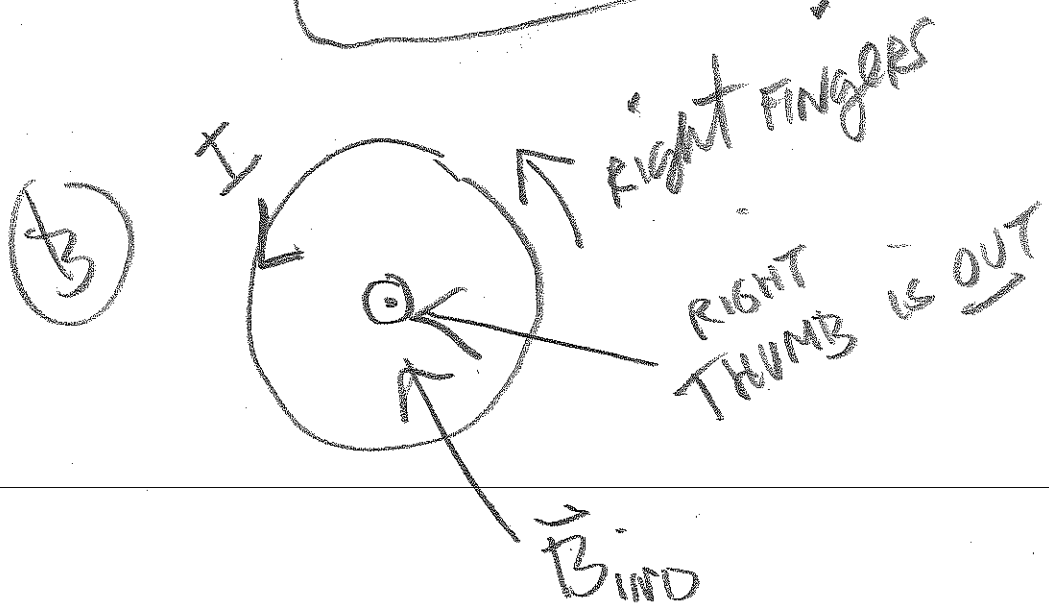
$\vec{B}_{IND}$ USING RIGHT HAND RULE.

# Review of Ch 29

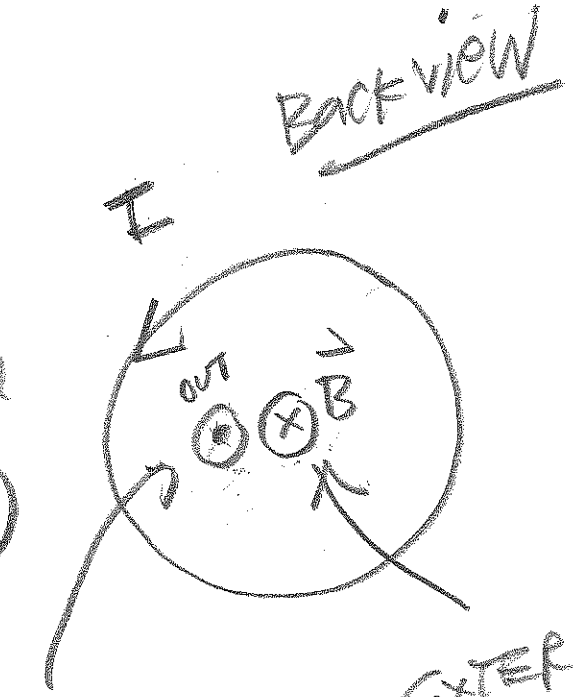
## Right Hand Rule #1

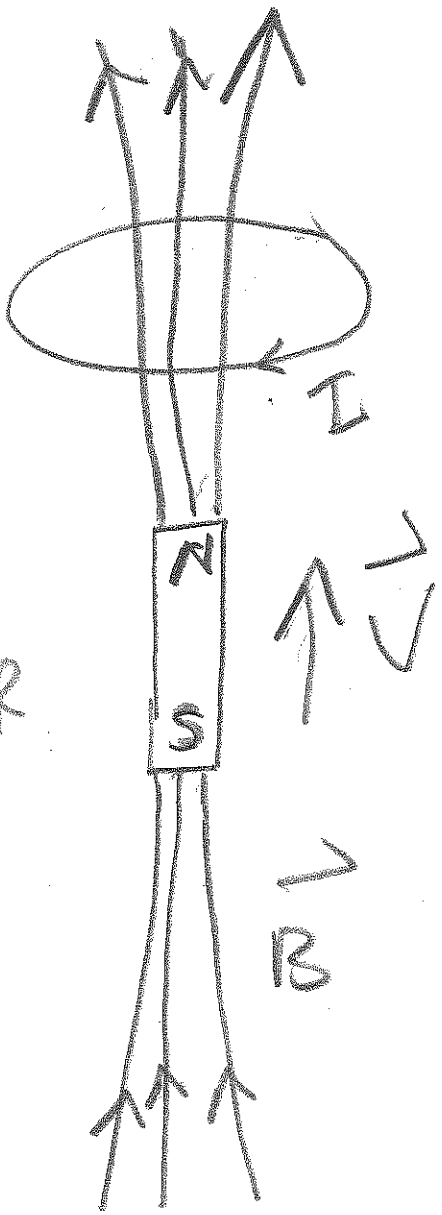



$\vec{B}_{IND}$ = FIELD induced by I



Example (ii)

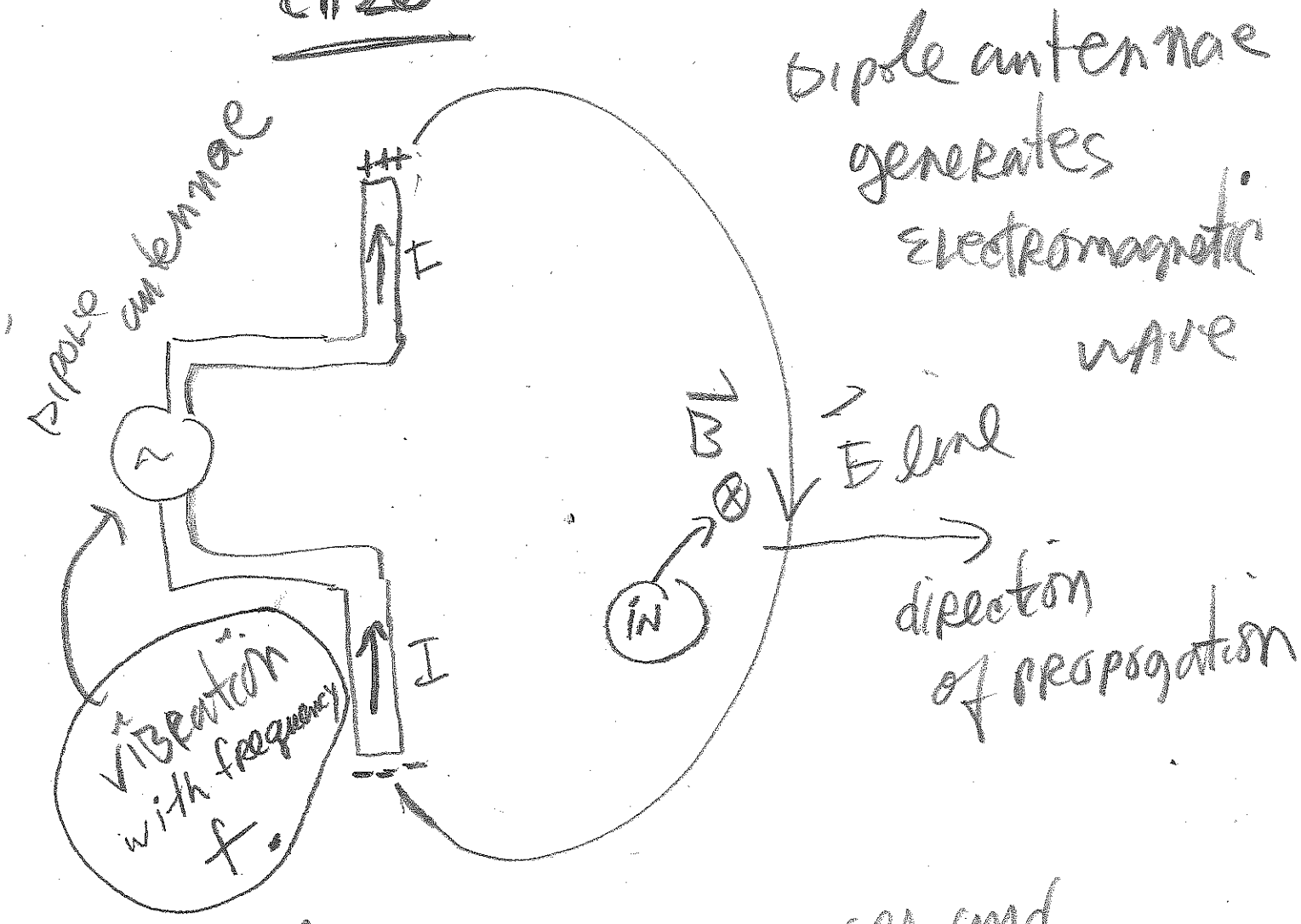



$\vec{B}_{IND}$ tries to cancel external $\vec{B}$ to make $\vec{B}_{EXT}$ weaker by pointing OUTWARD to cancel out $\vec{B}$ from magnet.

⊗ IN ⊙ OUT NOTATION

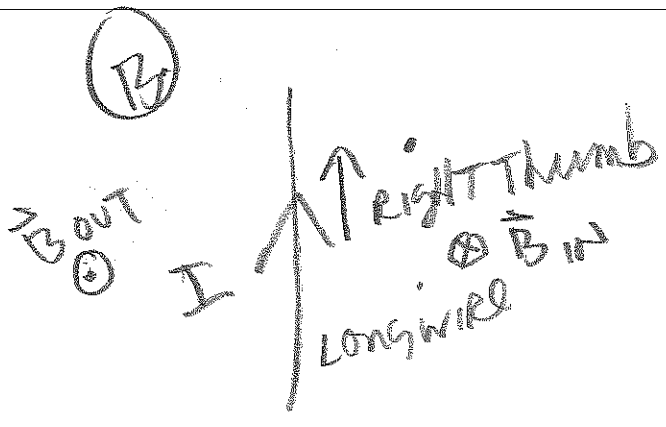
# CH26:




dipole antennae generates electromagnetic wave

(A) $\vec{E}$ - lines leave + charges and enter - charges: see Fig 26.22 (b)

(B)



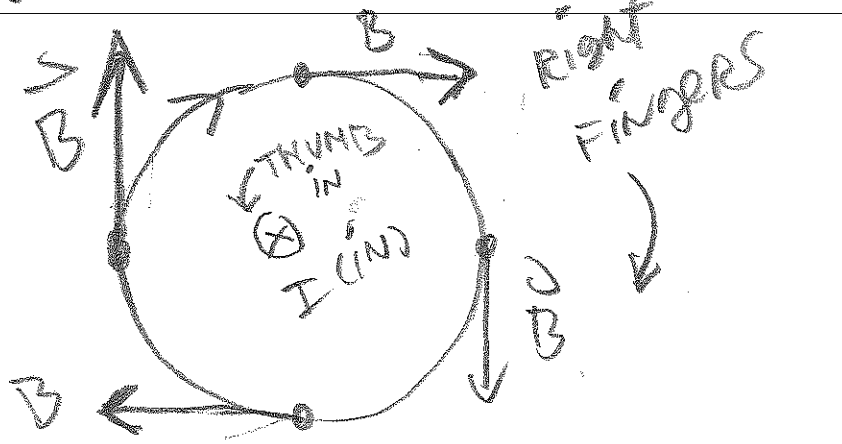
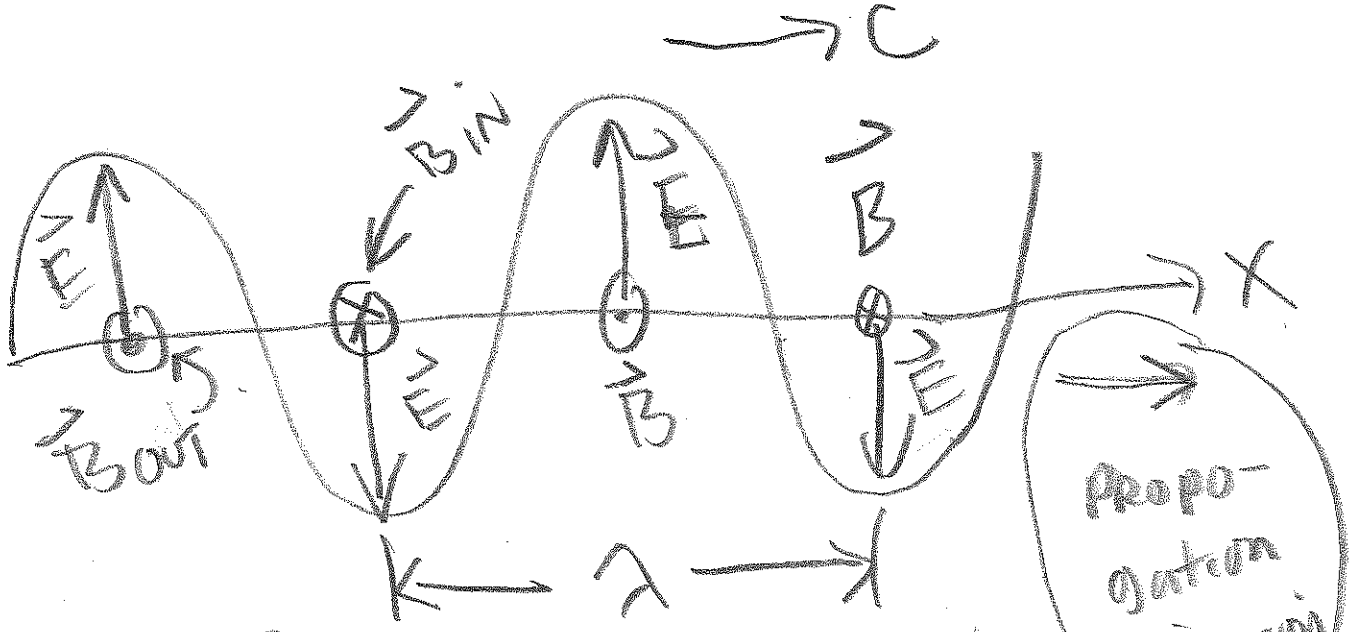



Fig 20.2 plane wave

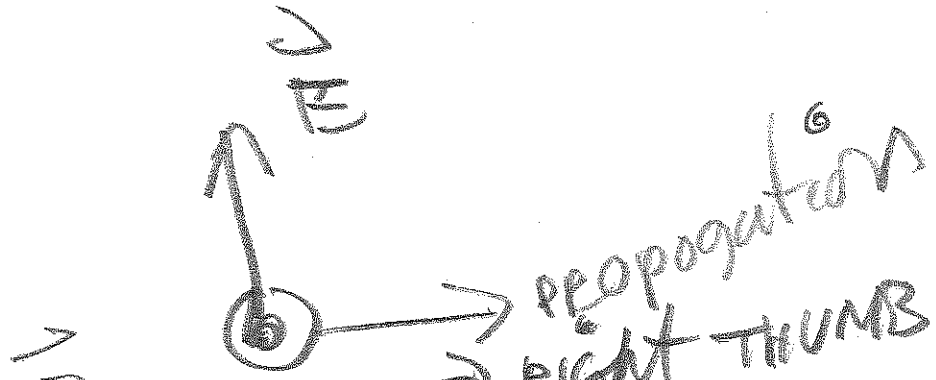



⊙ OUT ⊗ IN

wavelength

$$c = \frac{\lambda}{T} = \lambda \cdot f$$

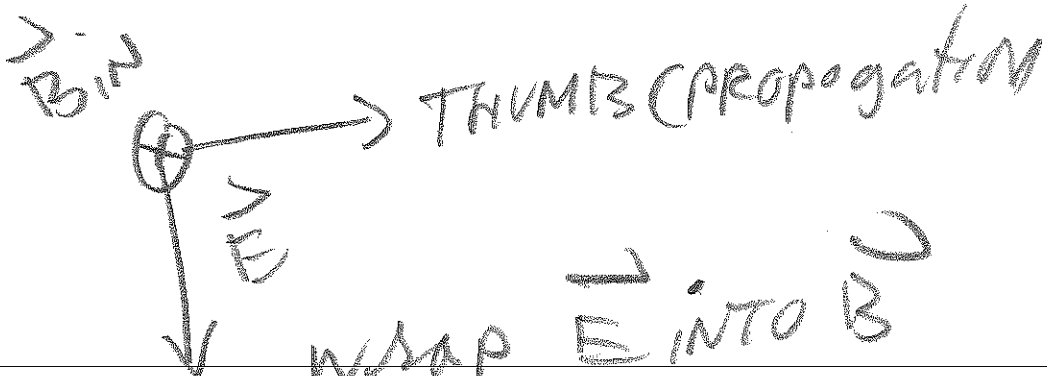
vibration ( f = frequency, T = period )




Right - Hand-rule

Right FINGERS point along $\vec{E}$

WRAP Right FINGERS INTO $\vec{B}$

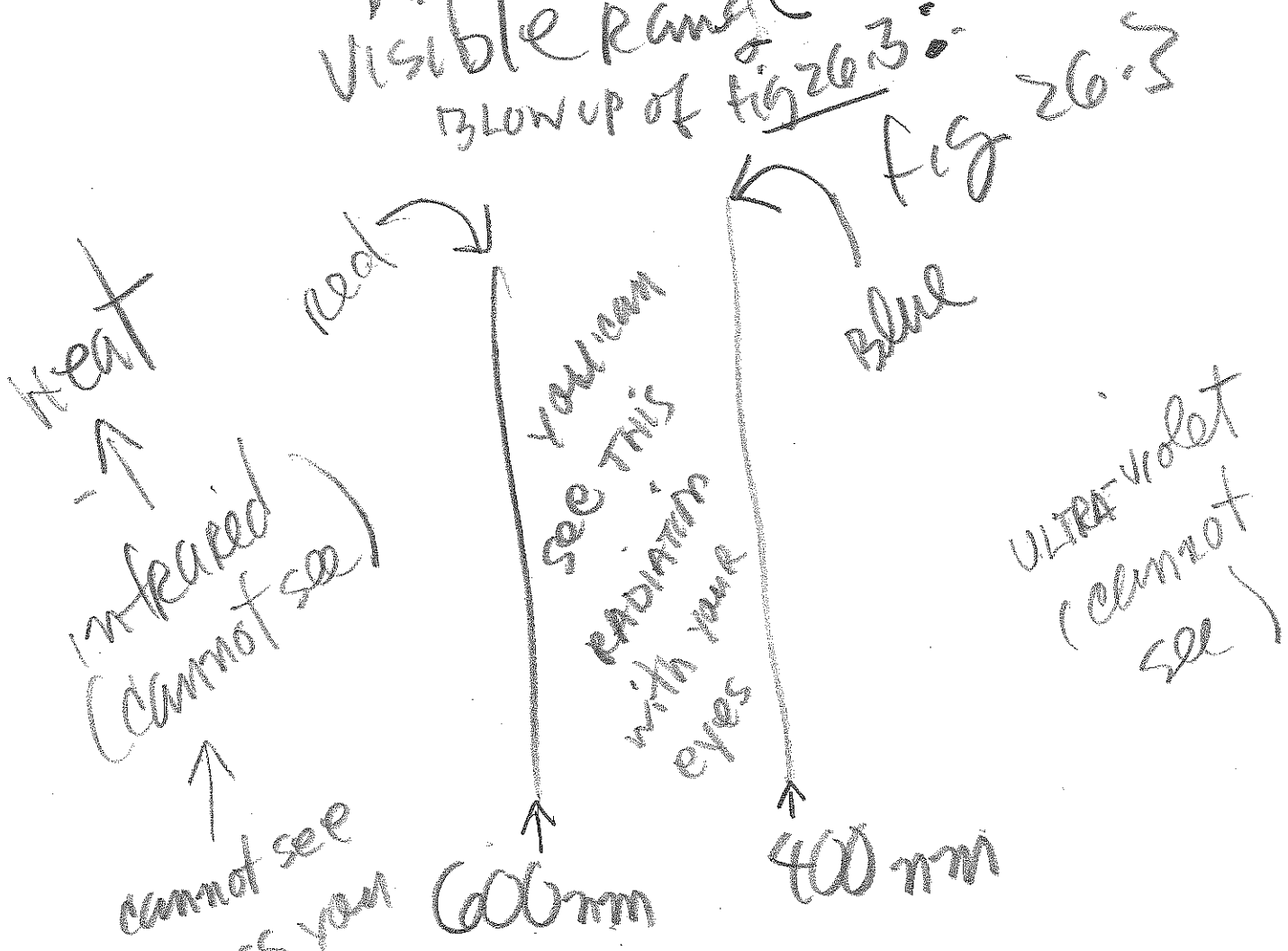



WRAP $\vec{E}$ INTO $\vec{B}$ with right FINGERS

see fig 26.3

Visible range

BLOW UP of fig 26.3:




$nm = 10^{-9}\ m$

(glasses) See fig 26.4 ALSO.

fig 26.9

Glass window

visible light passes through

visible f is different from electrons or atom natural frequencies

UV IS ABSORBED

ULTRA-VIOLET

UV DOES NOT PASS THROUGH: f = NATURAL frequency of electrons INSIDE ATOMS

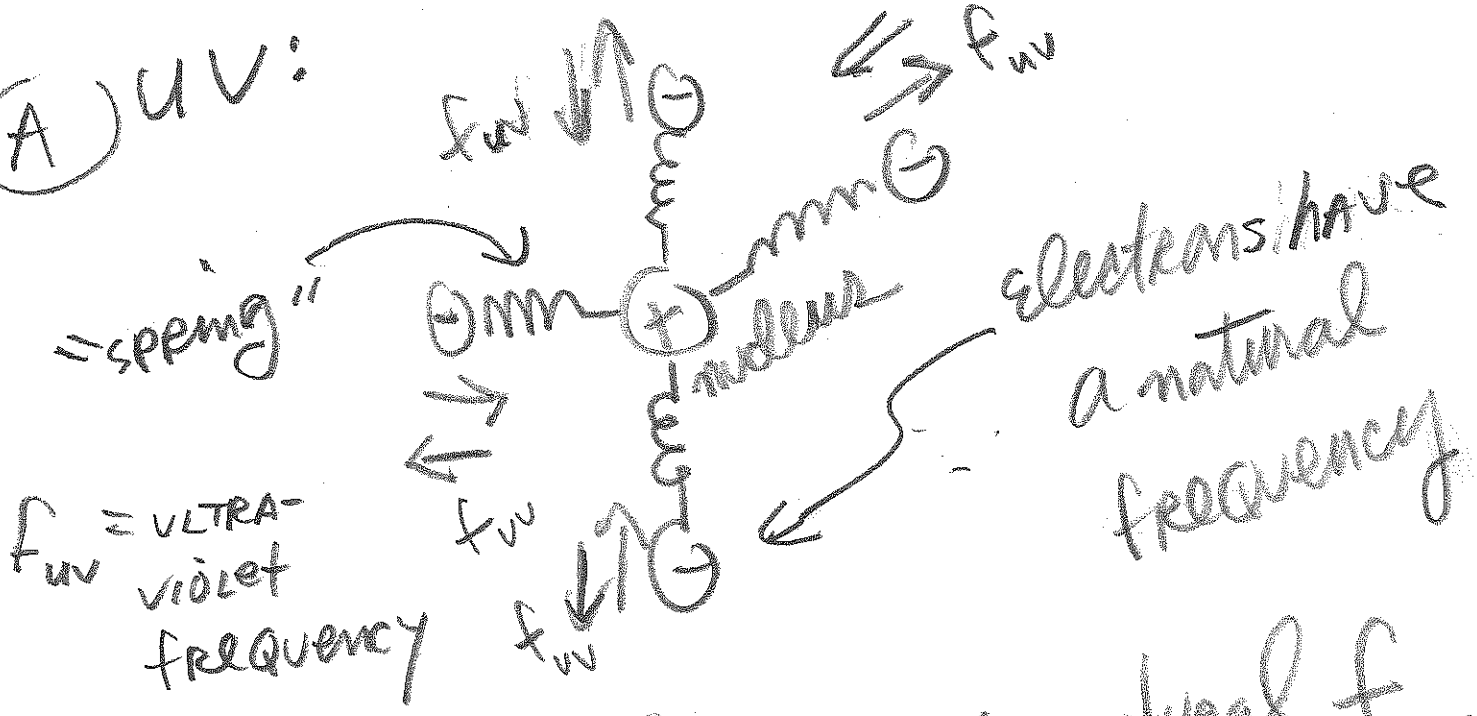
INFRARED IS ALSO ABSORBED

INFRARED f is = Natural of VIBRATING ATOMS.

INFRARED does NOT PASS through GLASS.

# Details of WHY UV and infrared DO NOT pass through GLASS!

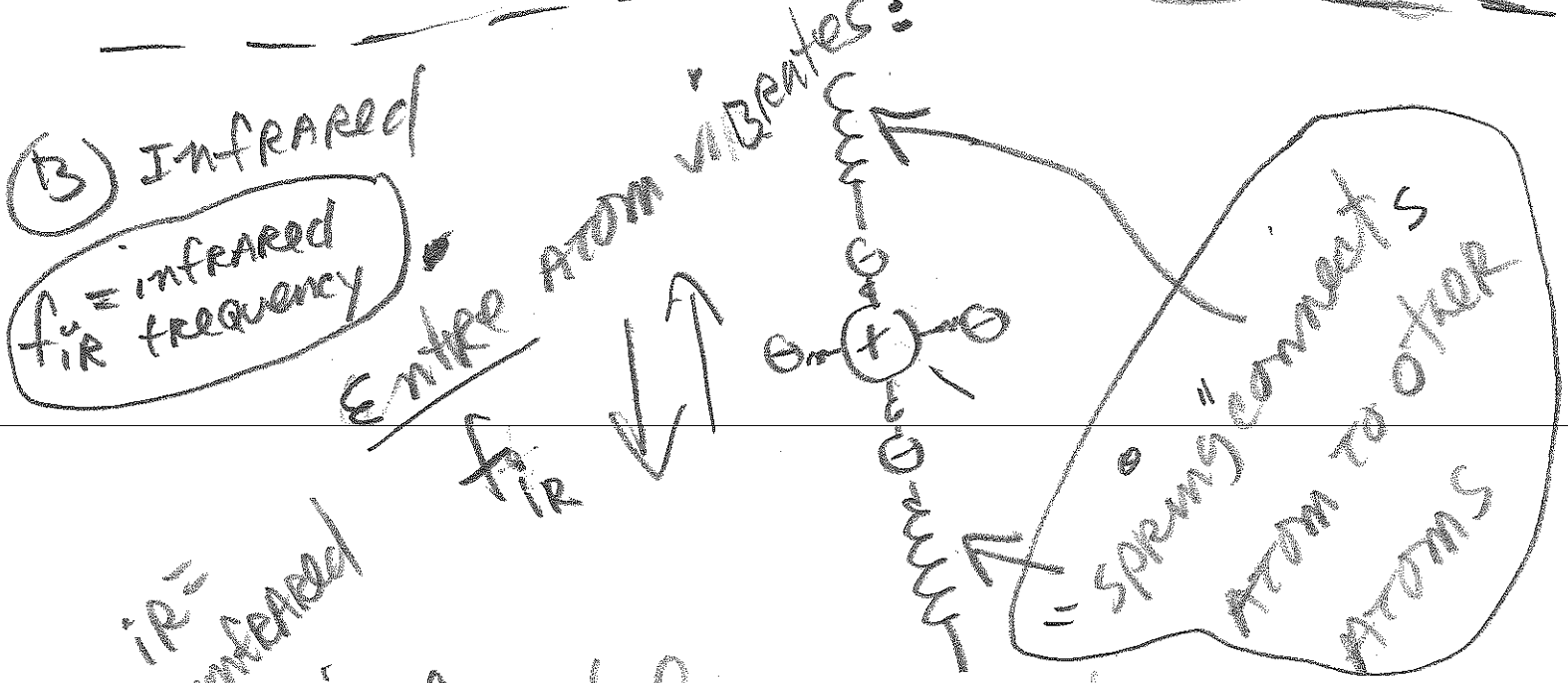
(A) UV:




UV f = this natural $f_{uv}$

(B) Infrared

$f_{IR}$ = infrared frequency




infrared f = this natural $f_{IR}$

SUMMARY: (ultraviolet)

infrared and UV does NOT pass through glass

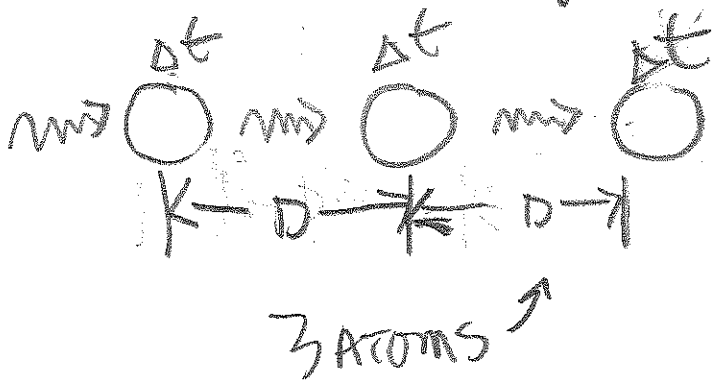
note: UV = ultraviolet

---

new: explanation of why light TRAVELS in glass slower than in a vaccuum:

In vaccuum $c = 3 \times 10^8 \frac{m}{s}$ (speed of light)

In glass: fig 26.7 : $\Delta t$ = "gulp" time = time light is delayed inside atom.




$$\text{speed} = \frac{2D}{\frac{2D}{c} + \Delta t} < c$$

## SUMMARY:

(A) NO ATOMS:

$$\frac{2D}{\frac{2D}{C}} = C$$

(B) WITH ATOMS:

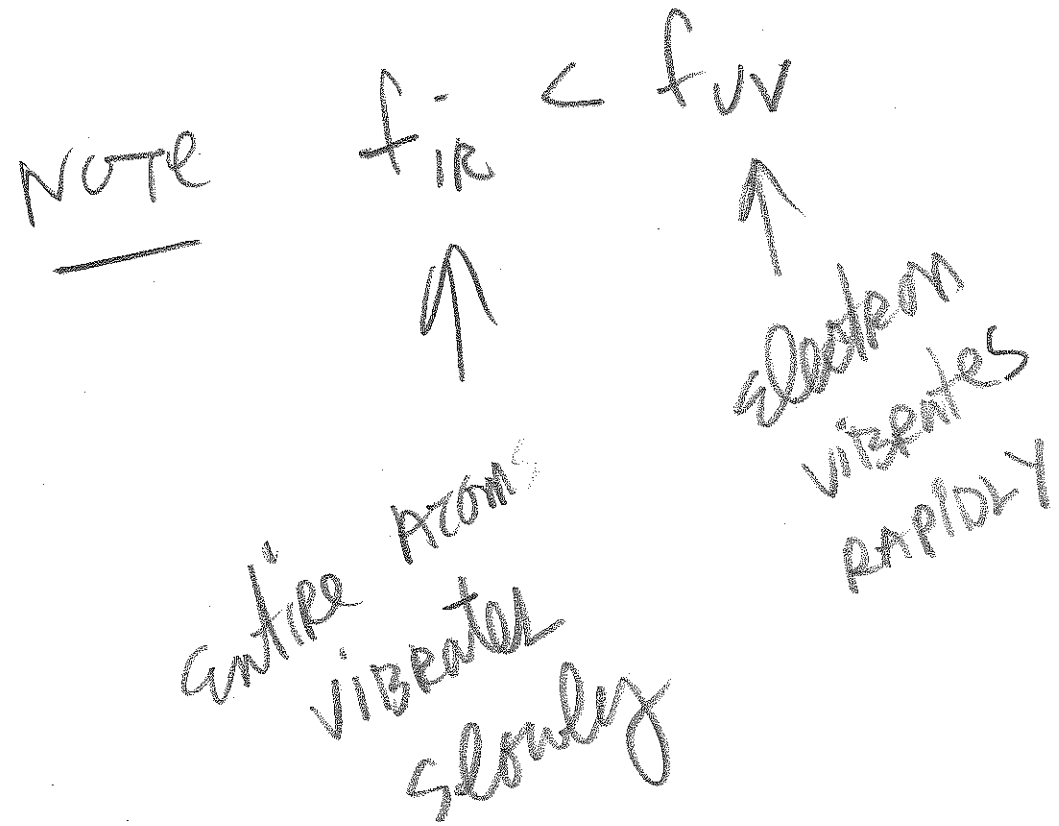
$$\frac{2D}{\frac{2D}{C} + \Delta t} < C$$

$$\text{speed in glass} = \frac{C}{n} < C$$

$n$ = index of refraction of glass = 1.53

note: $C = 3 \times 10^8 \frac{m}{s}$

→ CH 28, p 494


NOTE
$f_{IR} < f_{UV}$
electron vibrates rapidly
entire atom vibrates slowly

next ch 28