May '18 Paper 2A

1a. very close, vibrate, move, solid, far away

b.i when copper rod is heated, it expands, ∴ the support will experience a force on them.

ii. molecules vibrate further since they gain K.E, ∴ they take up more space.

iii. the rod bends.

c. $m = 750\,g = 0.75\,kg$. $Q = mc(\Delta\theta)$

$\Delta\theta = 50^\circ C$ $Q = E = 0.75 \times 385 \times 50$

$c = 385\,J/kg^\circ C$ $Q =$ J

d.

conduction	solids	by direct contact
convection	liquid/gases	by convection currents
Radiation	gases	Electromagnetic waves

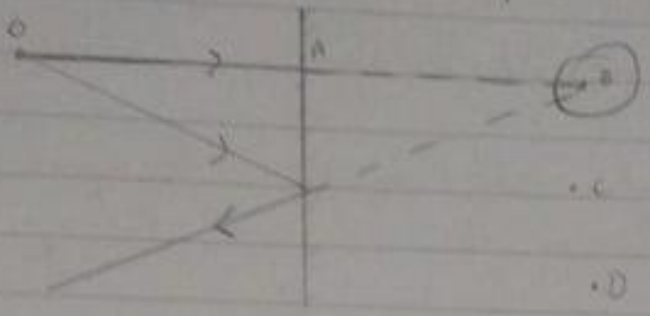
e. flutter their wings, creates air spaces in between the feathers. but air is a bad conductor, ∴ the bird will not lose its body heat.

f. double walls, thick curtains + carpets, insulated roofs.

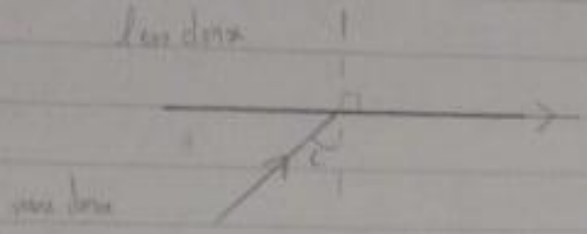
Paper 2B.

2\. a The angle of incidence equals the angle of reflection and normal, incident ray + reflected ray all lie in the same plane

b



c i.

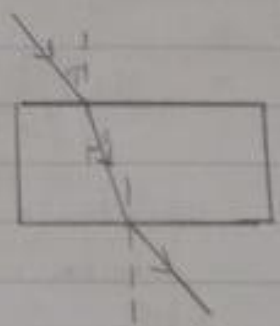


(c ii) it will be totally internally reflected

(c iii) fibre optics

~~d i. 5, 3, 1, 4, 2~~

(d iii)



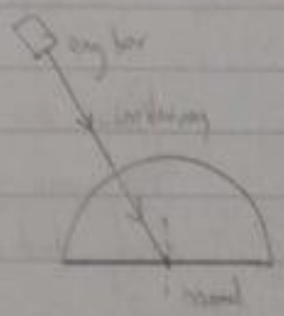
d iv. slow down, decrease

d v $n = \frac{\text{speed of light air}}{\text{speed of light in medium}}$

$1.495 = \frac{3 \times 10^8}{\text{speed}_{block}}$

$\text{speed}_{block} = \frac{3 \times 10^8}{1.495} = 2.01 \times 10^8$ m/s

(d i)

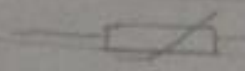


d vi $\text{mag.} = \frac{h_i}{h_o} = \frac{d_i}{d_o}$

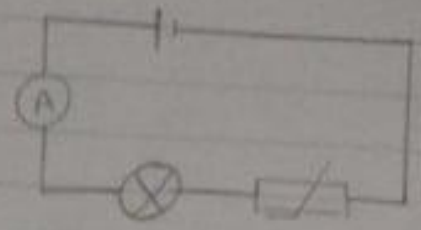
$3 = \frac{d_i}{d_o} = \frac{12}{d_o}$

$d_o = \frac{12}{3} = 4$ cm $= 0.04$ m

(d ii) trace outline of block on plain paper with pencil. use ray box to pass a light ray through block. Mark the ray of light with crosses as it enters + emerges from block. Remove block, join crosses to form ...

3a  , heat, convection

(bi) set up apparatus as shown (1)
set down to one power level
measure the current from ammeter
repeat with different power levels
draw a graph of power level against current



(bii) current ∴ power level (heat level)

(biii) ↑ power level, ↑ current

(3d) iron / oven / washing machine

(3ci) the fan should replace bulb. } the heat falls on the thermistor & when the heat is high enough, the resistance of thermistor falls, increasing the current in the circuit switching on the fan.
the device is no longer required }

(3cii) the thermistor, because the thermistor allows the fan to switch on only when needed.

(3e) $\theta = 20°C$, $\therefore R = 22k\Omega$

$\therefore$ In series, total resistance = $22k\Omega + 18k\Omega = 40k\Omega$

$V = 6V$

$R = 40,000\Omega$

$I = ?$

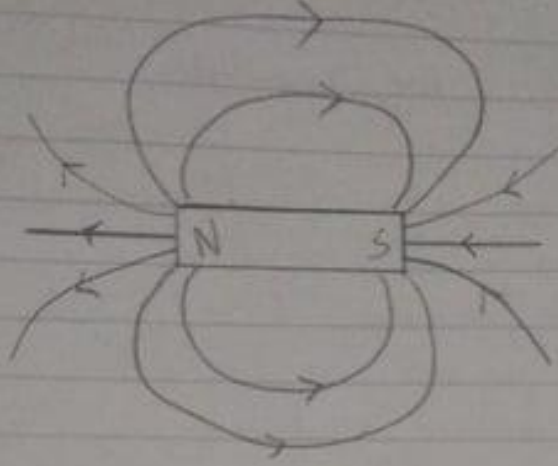
$t = 2hrs \times 60 \times 60 = 7200s$

$E = QV = ItV = \frac{V^2}{R}t = \frac{6^2 \times 7200}{40,000}$

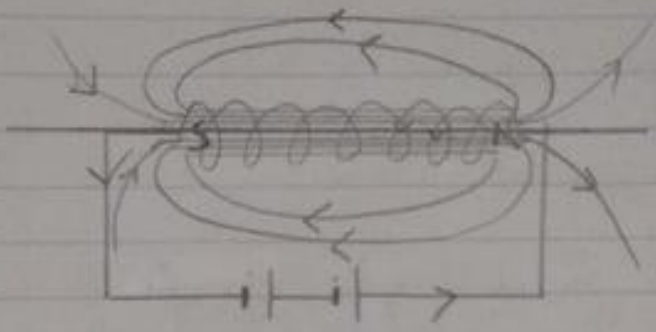
$E = 6.48\,J.$

but $V = IR$, $I = V/R$

4. a



bi.



ii. permanent magnet → always there permanent
coil → temporary. only there when current pass through wire

iii. → you can vary the strength of the electromagnet
→ temporary.

iv. → increasing the no. of turns in coil
→ increasing the current

ci. due to the magnet pushed in, cutting of magnetic flux, ∴ induced current in coil, ∴ galvo will flick.

ii. no induced current, no cutting of magnetic flux.

iii. galvo flicks to the opp. direction, since a change in direction of the force

iv. induced current depends on the direction of force + there needs to be a cutting of magnetic flux for current to be induced

v. Lenz's law, faraday's law

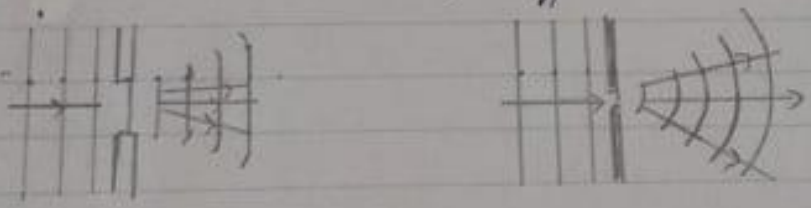
5ai. Longitudinal since particle vibrate parallel to the direction of travel of the wave in the form of compression + rarefaction

ii. 50 waves in one sec

iii. $f = 1/T \Rightarrow T = 1/f = 1/50 = 0.02$ sec (time of 1 wave)
next wavefront → 0.04 sec

(bi) transverse (bii) diffraction.

biii.



ci. frequency → same, (ii) λ → decrease (iii) speed → decrease

di. electromagnetic waves.

(ii) $v = f\lambda$
but $f = 1/T$
$\therefore v = \frac{1}{T} \times \lambda$

$v = 3 \times 10^8 = \frac{\lambda}{2.5 \times 10^{-15}}$

$\lambda = 75 \times 10^{-7}$ m

ii. all obey $v = f\lambda$
all can be reflected, diffracted, refracted

iii. Gamma
