NAME ..... MARKING SCHEME ..... INDEX NO.....

SCHOOL.....SIGN.....

232/2
PHYSICS PAPER 2
TIME 2HRS

ANGLICAN SPONSORED SCHOOLS
FORM 4 JOINT EVALUATIONS
PHYSICS PAPER 2
TIME: 2HRS

INSTRUCTION TO CANDIDATES

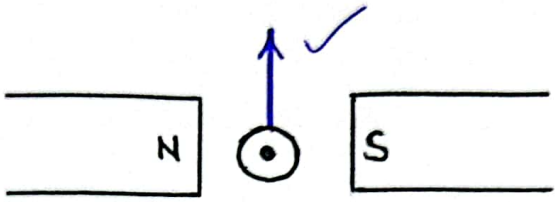
a) Write your name, the name of your school, stream and index number in the spaces provided above.
b) This paper consists of two sections: A and B
c) Answer **ALL** the questions in the section A and B in the spaces provided.
d) Silent electronic calculators and **KNEC** mathematical tables may be used.
e) **ALL** working **MUST** be clearly shown.
f) Non – programmable silent electronic calculators and KNEC mathematical tables may be used.
g) This paper consists of **13 printed pages.** Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

Form examiner's use only

Section	Questions	Maximum score	Candidate's
A	1 - 15	25	
B	16	14	
	17	12	
	18	13	
	19	09	
	20	07	
		80	

SECTION A (25MARKS)

1. The diagram below shows a cross – section of a conductor carrying current and held between 2 poles of a magnet.

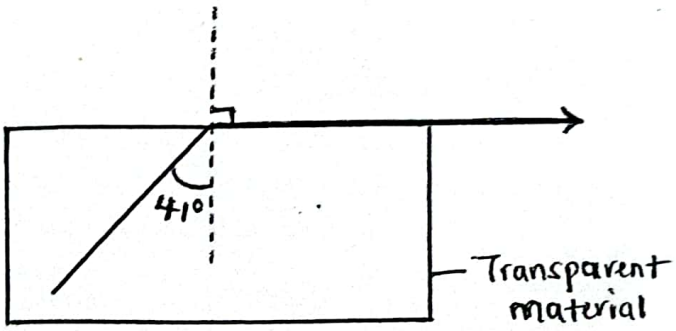


Using an arrow, indicate the direction in which the conductor will move when it is released (1mk)

2. a) Briefly explain what is meant by critical angle (1mk)

It is the angle of incidence in the optically denser medium for which the angle of refraction in the less dence medium is 90°

b) The figure drawn shows a path of ray of light through a transparent material placed in air



Determine the refractive index of the transparent material. (3mks)

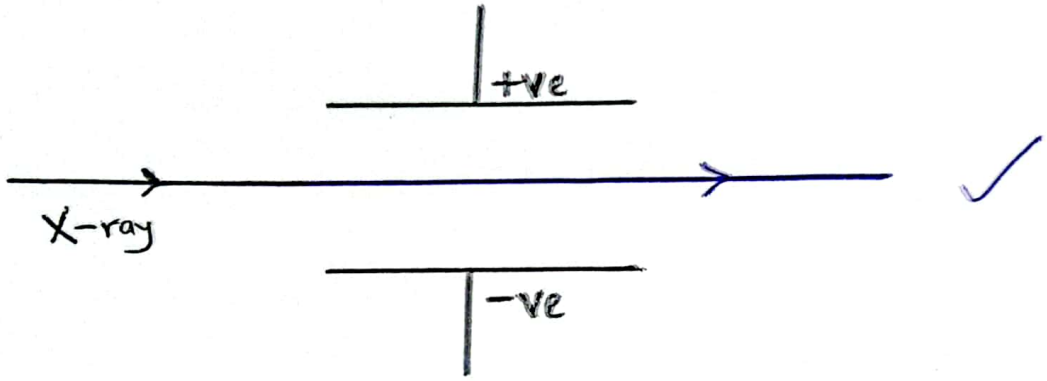
$n = \frac{1}{\sin c} = \frac{1}{\sin 41°}$

$= 1.524$

3. Secondary cells are often preferred to primary cells in most electrical gadgets. Justify this statement (1mk)

This is because they can be recharged unlike primary cells ✓

4. Drawn is an x – ray radiation made to pass through two electrodes as shown.



Complete the path of the radiation and explain why it is so. (2mks)

X-rays have no charge hence cannot be deflected in an electric field. ✓

5. An electric heater with a resistance of 100Ω is connected to a 240V main supply. Determine the heat energy dissipated in 2 minutes. (3mks)

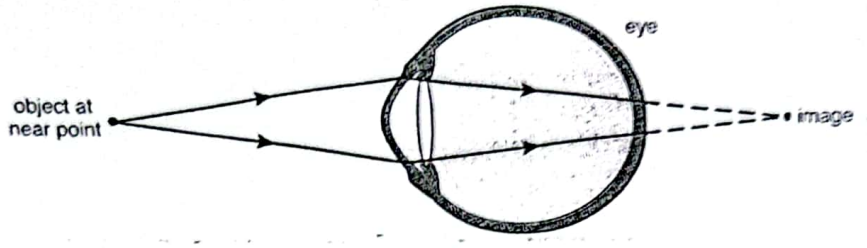
$E = \frac{V^2 t}{R} = \frac{240 \times 240 \times 2 \times 60}{100}$ ✓ ✓

$= 69,120\ J$ ✓

6. State any one use of a gold leaf electroscope.(1mk)

✓ To detect presence of charge ✓
✓ To test nature of charge
✓ To determine quantity of charge
✓ To determine the insulating properties of a material.

7. The figure drawn shows lights rays entering a human eye.



a) Identify the defect drawn (1mk)

Long Sightedness / Hypermetropia ✓

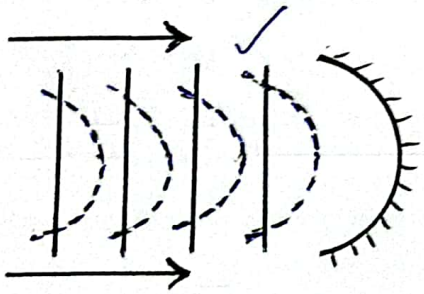
b) State any possible cause of the defect (1mk)

✓ Eye ball having a very long focal length ✓
✓ Eye ball being too short.

8. Apart from bulbs operating independently, state one other advantage of connecting bulbs in parallel in domestic wiring (1mk)

It allows bulbs to operate at the same ✓
voltage hence same brightness

9. The figure below shows straight wave fronts approaching a concave reflector.

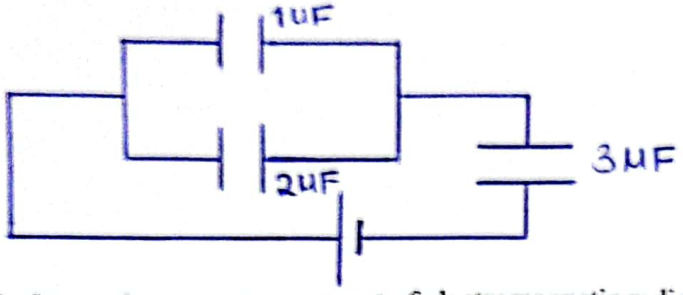


a) Complete the diagram using dotted lines to show waves formed after reflection (1mk)

b) Name the other wave characteristic apart from frequency which remains constant after reflection (1mk)

Wavelength of the wave ✓

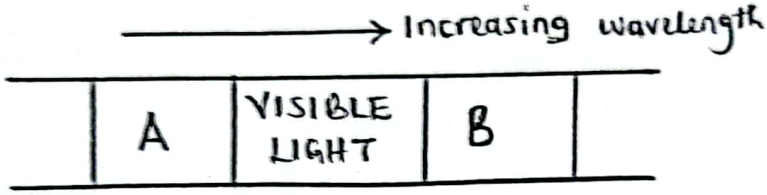
10. Sketch a circuit of 3 capacitors and a cell from a set of 1.0 uF, 2.0 uF and 3.0 uF such that the net capacitance in the circuit is 1.5uF(2mks).



✓ correct drawing of capacitor arrangement

✓ Correct cell arrangement

11. The table drawn shows an arrangement of electromagnetic radiations in order of increasing wavelength.



Identify the radiations A and B(2mks)

A= Ultraviolet ✓

B= Infra red ✓

12. Briefly describe one main structural difference between an AC generator and a d.c generator.(1mk)

An A.C generator operates with Slip rings while a D.C generator has split rings / Commutators ✓

13. Name one property of cathode rays which shows that they have a particulate nature. (1mk)

They are streams of negatively charged particles. ✓

14. Fleming's left hand rule is often used to predict the direction of motion of a conductor. Name the physical quantity predicted by the Dynamo Rule. (1mk)

Direction of induced current ✓

15. Briefly explain any property of magnetic field lines. (1mk)

✓ Never cross each other. ✓
✓ Originate from North pole and end at South pole.
✓ Are parallel where the field is uniform. (Any one)

SECTION B (55 MARKS)

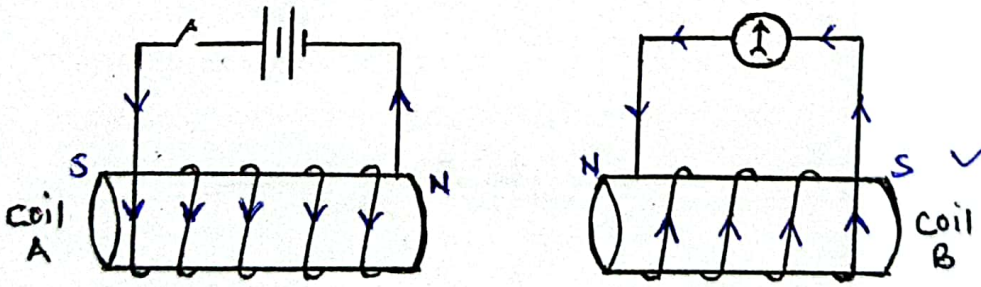
16. a) Differentiate between step – down and step – up transformer. (1mk)

Step-down transformers have fewer windings in the secondary coil than primary while for step-up, windings in the secondary are more than in primary ✓

b)Commercial transformers do not operate at 100% efficiency. Name two forms of energy losses in a transformer that justifies the statement.(2mks)

✓ Resistance in the coils ✓
✓ Hysteresis Loss ✓ (Any 2)
✓ Flux Leakage
✓ Eddy currents

c)The diagrams drawn shows 2 coils adjacent to each other used in inducing an Emf through mutual induction



✓

Show on coil B the direction of current when the switch is closed. Also state the direction of deflection on galvanometer (2mks)

Galvanometer deflects in an Anti-clockwise direction. ✓

d)A transformer that is 80% efficient has 4000 turns in the primary coil and 500 turns in the secondary coil. It is used to supply power to a 15Ω motor from a 240V mains.

i. Calculate the voltage in the secondary coil. (3mks)

$\frac{N_s}{N_p} = \frac{V_s}{V_p} = \frac{500}{4000} = \frac{V_s}{240}$ ✓

$V_s = \frac{240 \times 500}{4000} = 30V$ ✓

ii. Work out the power rating of the motor(3mks)

$\text{Power} = VI = \frac{V^2}{R} = \frac{30 \times 30}{15} = 60W$ ✓

Power rating = 60W, 30V ✓

iii. Determine the current in the primary coil (3mks)

$E = \frac{\text{Power output}}{\text{Power input}} \times 100 \Rightarrow \frac{80}{100} = \frac{60}{P_I}$ ✓

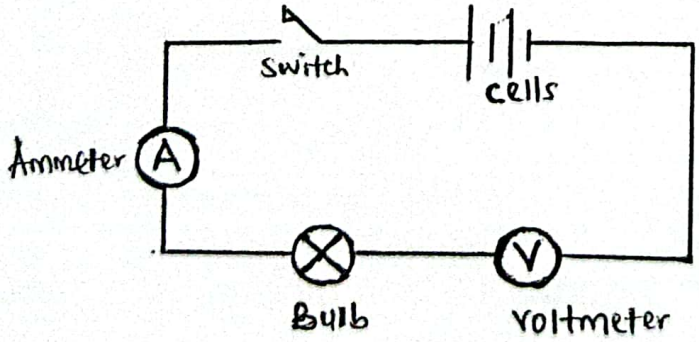
$\Rightarrow$ Power input = 75W $\therefore I_p \times V_p = 75$ ✓

$I_p = 75/240 = 0.3125\ A$ ✓

17. a)Apart from physical factors state any other factor which affects Ohm's law.(1mk)

- Temperature ✓

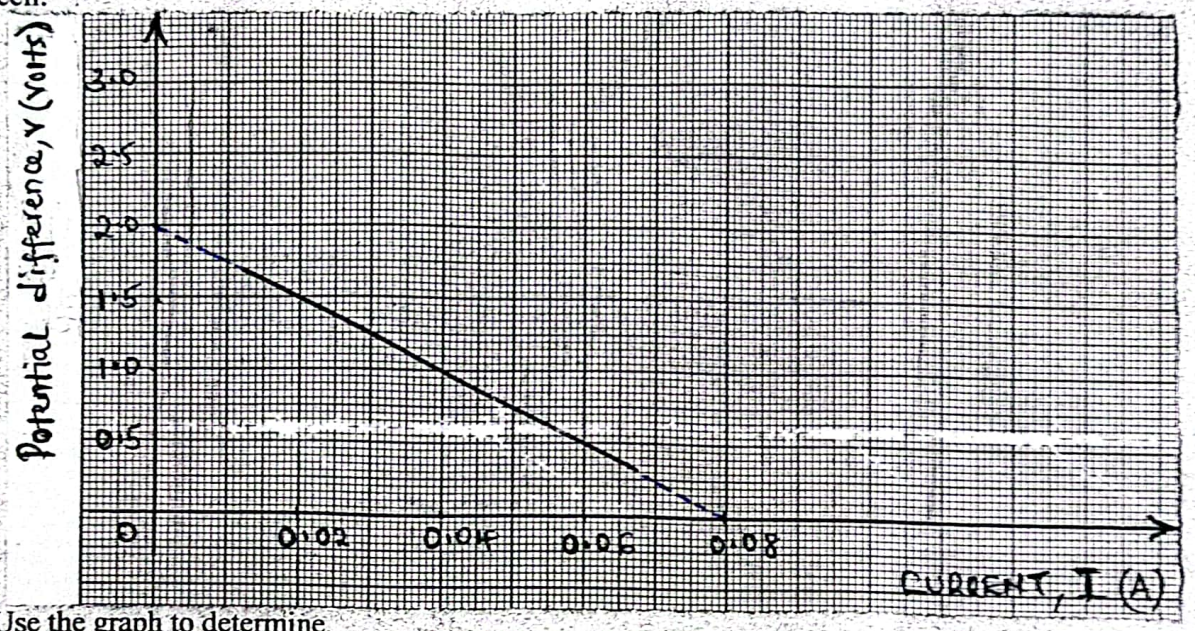
b)The circuit below was drawn by a group of students during a class experiment to investigate current – voltage characteristics of a torch bulb



Identify any 2 mistakes made by the students in drawing the circuit.(2mks)

(i) Putting Voltmeter in Series with other Components. ✓
(ii) Voltmeter to be connected across the device under investigation ie Bulb ✓

c)The graph drawn shows a variation of potential difference, V with current I for a certain cell.



Use the graph to determine.

i) The internal resistance of the cell. (4mks)

$E = I(R+r) \Rightarrow E = IR + Ir \Rightarrow E = V + Ir$

$\therefore V = -r(I) + E \Rightarrow E =$ ✓

$\Rightarrow r = -(\text{Gradient}) = -\left(\frac{0-2}{0.08-0}\right) = \frac{2}{0.08} = 25\Omega$ ✓ ✓ ✓

ii) The e.m.f of the cell.(2mks)

y-intercept when $I = 0$ ✓ (Can be implied from extrapolation of line)

E.M.f = 2.0V ✓

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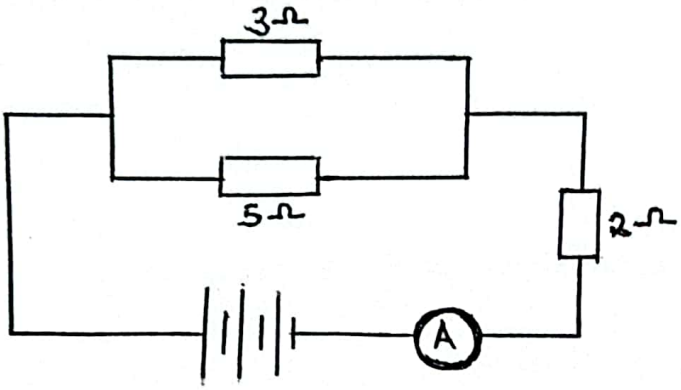
d)The diagram below shows a set of resistors connected to a 4.5V source and an ammeter.



Given that the internal resistance of each cell is 0.1Ω, determine the ammeter reading. (3mks)

$R_{total} = \left(\frac{3\times5}{3+5}\right) + 2 + (0.1\times3) = 4.175\,\Omega$ ✓

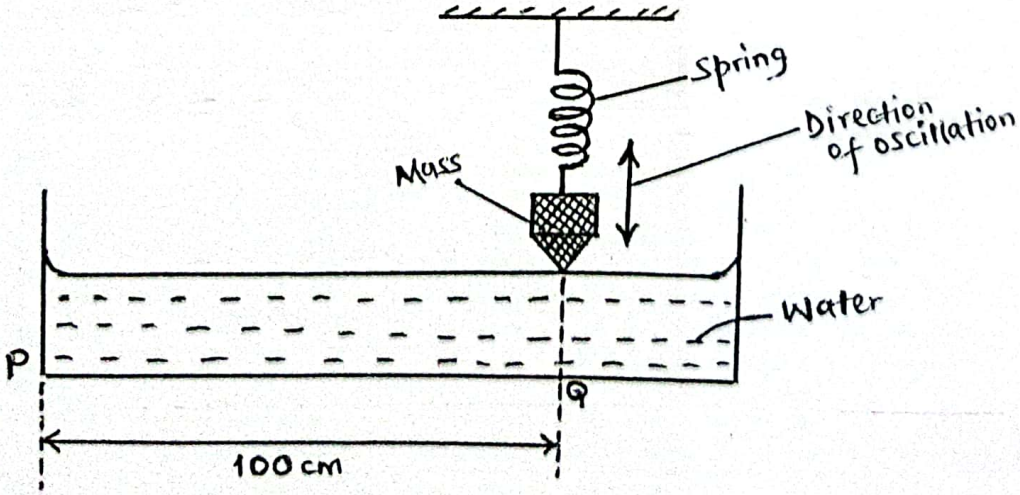
$I = \frac{V}{R} = \frac{4.5}{4.175} = 1.0778$ ✓

$\approx 1.08\,A$ ✓

18. a) Differentiate between a transverse wave and a longitudinal wave. (1mk)

For transverse, the particles in the medium vibrate perpendicularly to wave motion while for Longitudinal, particles vibrate parallel to direction of wave motion. ✓

b)Some students set up a mass attached to a spring such that when it oscillates, it touches the surface of water in some wide shallow tank as shown.



During the oscillation of the mass, the students measured time for 10 oscillations and discovered that it took the mass 25seconds.

i) Determine the periodic time of the mass (2mks)

Period time, $T = \frac{25}{10} = 2.5\,s$

ii) Calculate the frequency of the waves produced on the water surface.(2mks)

Frequency, $f = \frac{1}{T} = \frac{1}{2.5} = 0.4\,Hz$

iii) As the mass oscillated touching the water surface, students counted 5 ripples between the points Q to P. Determine the speed of the waves. (3mks)

$5\lambda = 100cm$

$\lambda = \frac{100}{5} = 20cm\ (0.2m)$

$V = \lambda f = 0.2 \times 0.4 = 0.08\ m/s$

c) Determine the resultant amplitude for two waves out of phase if one wave has an amplitude of 1.0cm and the other 3cm (2mks)

Resultant amplitude $= (3 - 1)$

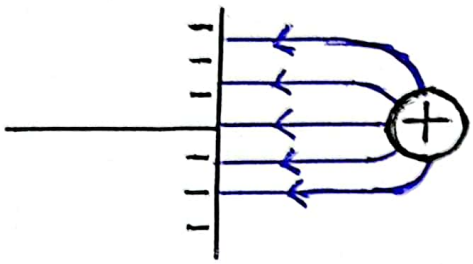
$= 2cm$

d) A man standing between 2 tall walls claps his hands. He hears the first echo after 2.5 seconds and the second echo is heard 1.5 seconds later. If he is 660m from the farthest wall, determine the speed of sound in air. (3mks)

Echo time from farthest wall $= (2.5 + 1.5) = 4.0\,s$ ✓

$$\text{Speed} = \frac{2d}{t} = \frac{2 \times 660}{4} = 330\,m/s$$ ✓ ✓

19. a) Drawn is a positive point charge put close to a negative plate



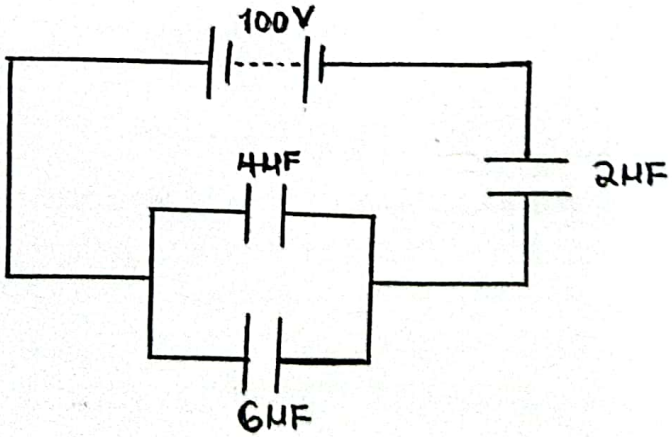
✓ (Check arrow direction)

Sketch the resultant electric field pattern (1mk)

b)State 2 uses of capacitors (2mks)

✓ For storing charges ✓ (Any 2)
✓ For tuning radios ✓
✓ Reducing sparking in inductor circuits
✓ Smoothening rectified currents

c)Study the diagram drawn and use it to answer the questions that follow.



From the diagram

i) Work out the effective capacitance for the arrangement .(3mks)

$C_{//} = 4 + 6 = 10\,\mu F$ ✓

$C_T = \frac{10 \times 2}{10+2} = \frac{20}{12} = 1.667\,\mu F$ ✓

ii) Determine the charge stored on the 6μF capacitor. (3mks)

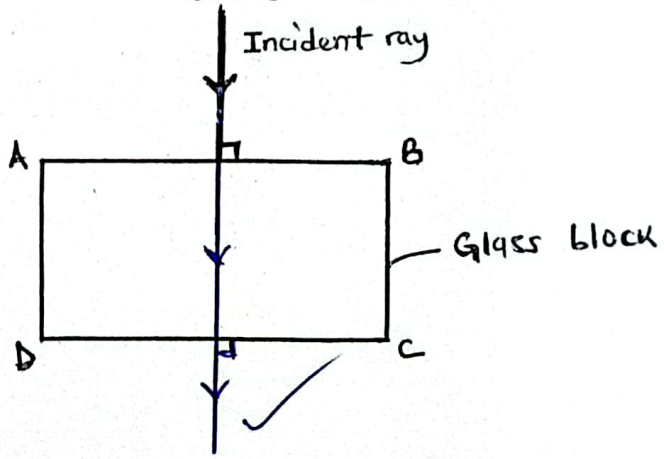
$Q_T = C_T \times V = 1.667 \times 100 = 166.7\,\mu C$ ✓

$Q_{6\mu F} = \frac{6}{10} \times 166.7 = 100.02\,\mu C$ ✓ (Accept alternative method)

20. a) State Snell's law (1mk)

The ratio of sine of angle of incidence to the sine of angle of refraction is a constant. ✓

b)The diagram drawn shows a ray of light incident on a transparent glass block as shown

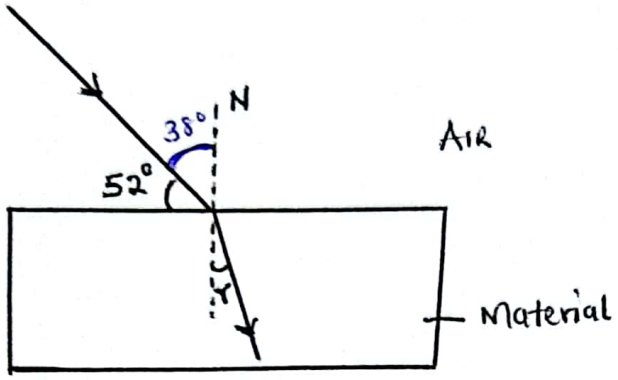


i) State whether or not the ray will undergo refraction. Justify your answer.(2mks)

The ray undergoes Refraction. ✓
This is because although the ray does not change direction, the velocity of the ray in air cannot be equal to its velocity in Glass block. ✓

ii) Complete the ray diagram until it emerges on the face CD. (1mk)

c) A ray of light is incident on a transparent material as shown.



If the refractive index of the material is 1.48, determine the angle of refraction, r (3mks)

$n = \frac{\sin i}{\sin r} = \frac{\sin 38^\circ}{\sin r}$ ✓

$1.48 \sin r = \sin 38^\circ$

$\sin r = \frac{\sin 38}{1.48} = 0.2002$ ✓

$r = \sin^{-1}(0.2002)$

$= 11.54^\circ$ ✓