Name MARKING SCHEME ..... Index No.....

Candidate's Signature: ..... Date: .....

232/2
PHYSICS
Paper 2

2 Hours

JOINT EXAM 2021

Kenya Certificate of Secondary Education (KCSE)

INSTRUCTION TO CANDIDATES

- Write your name, index number and school in the spaces provided.
- This paper consists of TWO sections: A and B
- Answer ALL questions in section A and B in the spaces provided.
- ALL workings MUST be clearly shown.
- Mathematical tables and electronic calculators may be used.

For examiner's use only.

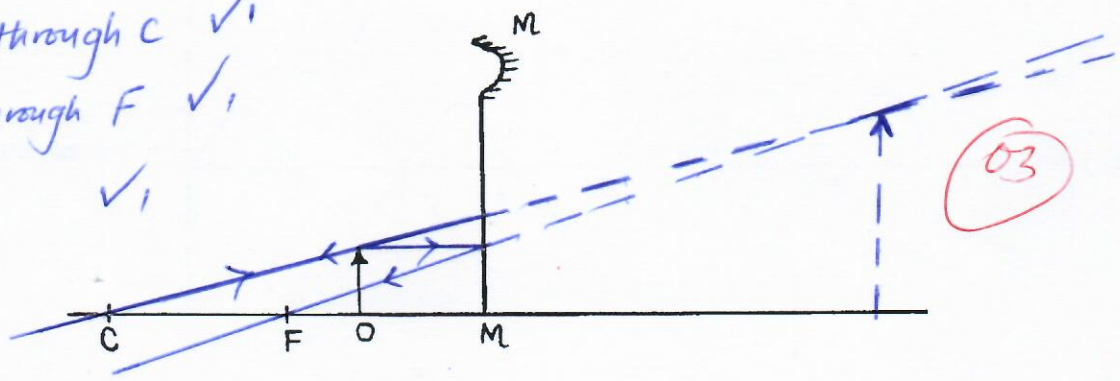
Section	Question	Maximum score	Candidate's score
A	1 – 12	25	
B	13	16	
	14	14	
	15	14	
	16	11	
	Total	80	

*This paper consists of **12** printed pages. Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.*

1. The figure below shows an object O in front of a curved mirror M.

a) On the figure, locate the image formed. (3 marks)

- Ray through C ✓1
- Ray through F ✓1
- Image ✓1



03

2. State **two** ways of decreasing the strength of an electromagnet. (2mks)

- Decreasing the amount of current.
- Decreasing the number of turns in the coil.
- Increasing the length of the solenoid.

Any two 02

3. State **one** disadvantage of using a convex mirror as a driving mirror. (1mk)

Does not give the actual distance of the vehicles behind. ✓1

01

5. State **two** factors that affect the resistivity of an electrical conductor. (2mks)

- Resistance of the Material
- Cross sectional area of the conductor
- The length of the conductor.

Any 2 02

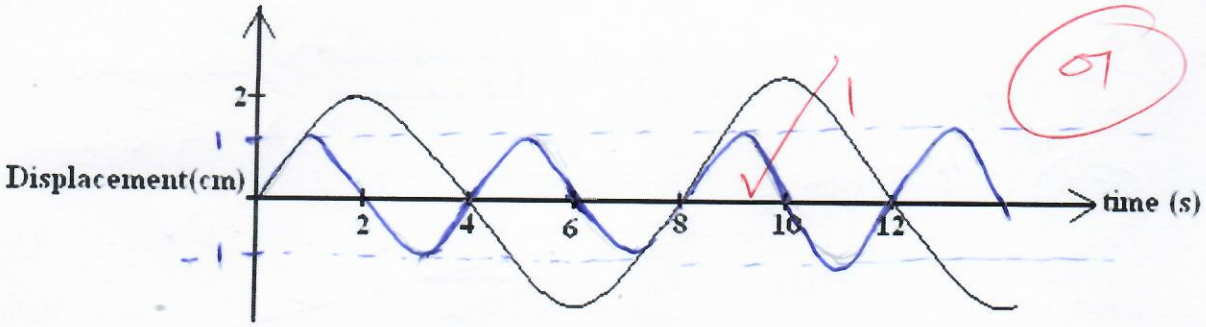
6. A coin is placed at the bottom of a beaker containing a transparent liquid. When viewed from the top, the coin appears nearer the surface than it actually is. Explain the observation. (2 marks)

This is due to refraction of light. ✓1 A ray of ✓1 light from the coin will undergo refraction as it moves from denser medium (water) to less dense medium (air)

02

10

7. The figure below shows a wave in progress.



Determine the

a) Amplitude (1mk)

2 cm ✓1

b) Frequency (2mks)

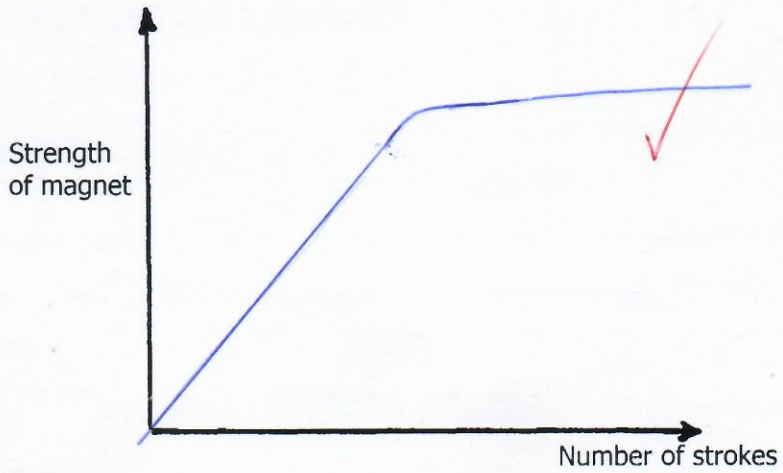
$f = \frac{1}{T}$ | $f = \frac{1}{8}$ ✓1

$T = 8s$ | $= 0.125Hz$ ✓1

Formula ✓
Ans with ✓1
Units

c) On the figure above, draw how the wave would appear if the period and amplitude is halved. (1mk)

8. A ferromagnetic material is being magnetized by single stroking method. On the axes provided, sketch a graph to show how the strength of the magnet being created varies with the number of strokes (1mk)



9. Figure 4 shows a conductor carrying current placed in the magnetic field and moves in the direction shown

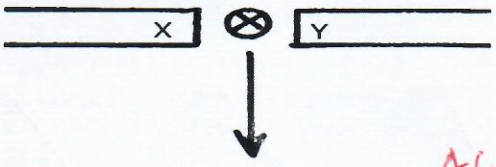


Figure 4

Identify the polarities of X and Y (2mks)

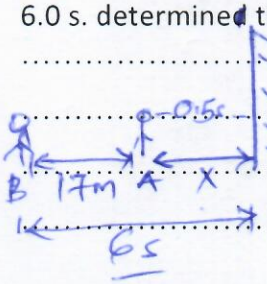
X..... North pole / North .....

Y..... South pole / South .....

Accept
- North
- South

02

10. A boy standing in front of a cliff blows a ~~while~~ whistle and hears echo after 0.5s. He then makes 17metres further away from the cliff and blows the whistle again. He now hears the echo after 6.0 s. determined the speed of the sound (3mks)



$S_A = \frac{2d}{t}$

$S_A = \frac{2x}{0.5}$ --(i)

$S_B = \frac{2(17+x)}{6}$

$S_B = \frac{34+2x}{6}$ --(ii)

$S_A = S_B$

$\frac{2x}{0.5} = \frac{34+2x}{6}$

03

11) What is meant by the term electric current? (1mk)

Rate of flow of electric current. ✓

01

b) 0.25A of current passes through a point in a conductor in 3.5 minutes. Calculate the amount of charge passing through the point in this time (2mks)

$Q = It$ ✓

$Q = 0.25 \times 3.5 \times 60$ ✓

$= 52.5\,C$ ✓

02

12. An unmagnetized steel rod is clamped facing North-South direction and then hammered repeatedly for some time. When tested, it is found to be magnetized. Explain this observation (2mks)

By hammering the dipoles vibrate. ✓1

The earth's Magnetic field then aligns the dipoles in North-South direction Making the steel Magnetized ✓1

02

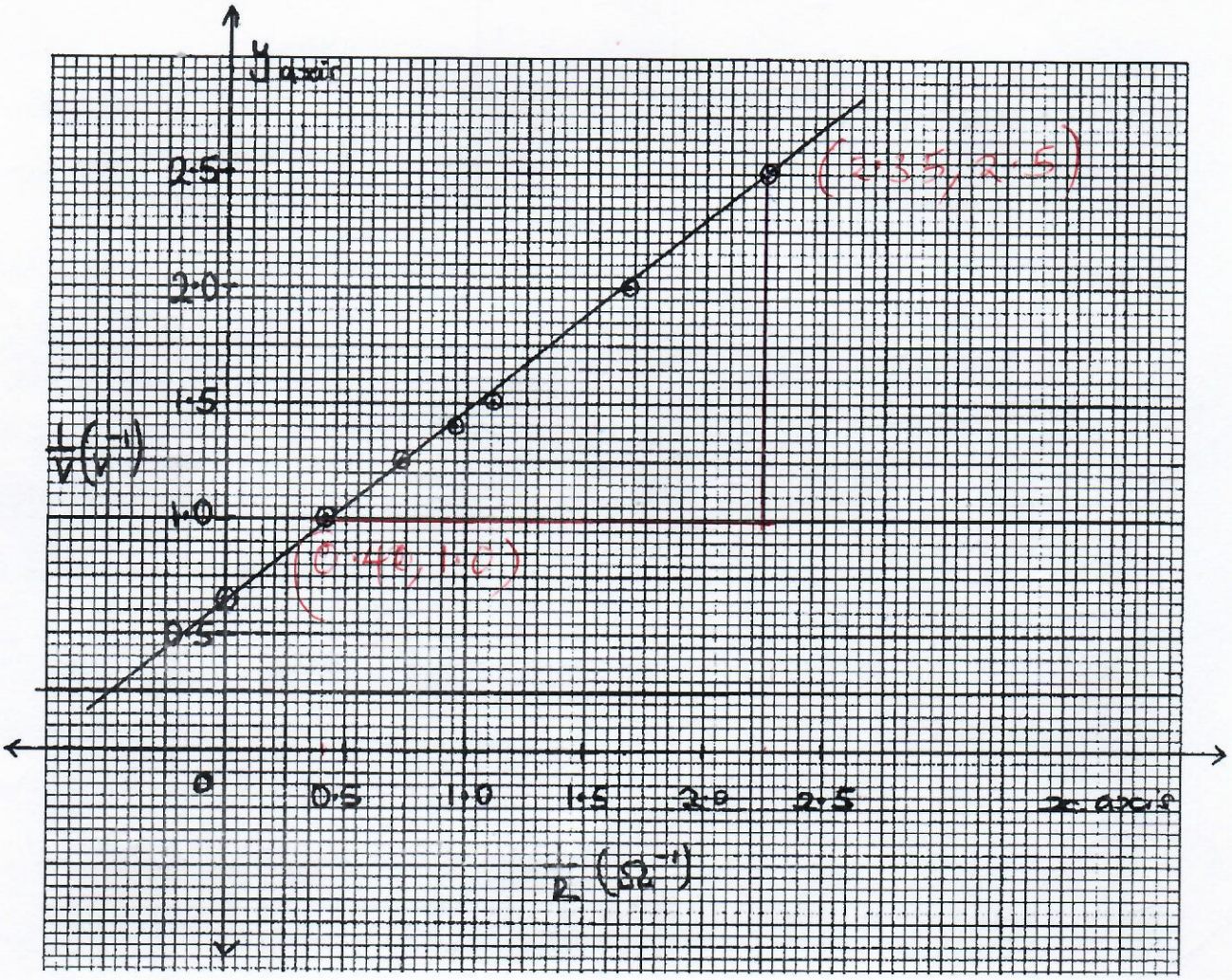
SECTION II (55MARKS)

13. (a) State Ohm's law. (1 mark)

The current flowing through a conductor is directly proportional to the potential difference across it provided the temperature and other physical conditions are kept constant. ✓1

07

b). The graph below shows results obtained in an experiment to determine the e.m.f.(E) and the internal resistance, r, of a cell.



Given that the equation of the graph is $\frac{E}{V} = \frac{r}{R} + 1$

Use the graph to determine the values of:-

(i) E (2mks)

$\frac{1}{V} = \frac{r}{RE} + \frac{1}{E}$

$\frac{1}{V} = \frac{1}{R}\left(\frac{r}{E}\right) + \frac{1}{E}$

$y = mx + c$

$\frac{1}{E}$ = y-intercept ✓1

$\frac{1}{E} = 0.65\,V^{-1}$

$E = \frac{1}{0.65\,V^{-1}}$

$= 1.538\,V$ ✓1

02

ii) r (3marks)

$\frac{1}{V} = \frac{r}{E}\left(\frac{1}{R}\right) + \frac{1}{E}$

$y = mx + c$

$\frac{r}{E}$ = Gradient ✓1

r = slope × E

slope = $\frac{2.5 - 1.0}{2.35 - 0.40} = \frac{1.5}{1.95}$ ✓1

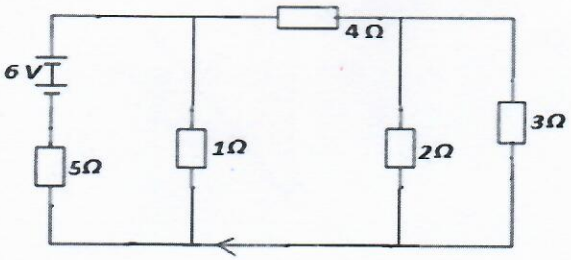
slope = 0.7692 V^{-1}/Ω^{-1}

$r = 1.538 \times 0.7692$ ✓1

$r = 1.1830\ \Omega$ ✓1

03

c) The figure below shows five resistors and a source of voltage of 6V.



i) Find the effective resistance of the circuit (2mks)

$\frac{2 \times 3}{2+3} = \frac{6}{5} = 1.2\Omega$

$1.2\Omega + 4\Omega = 5.2\Omega$

$\frac{5.2 \times 1}{5.2 + 1} = \frac{5.2}{6.2} = 0.8387\Omega$ ✓1

$0.8387\Omega + 5\Omega$

$R_E = 5.8372\Omega$ ✓1

02

ii) Calculate the current through 5Ω (3mks)

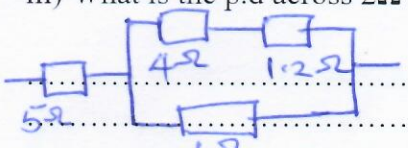
$I = \frac{V}{R}$ ✓1

$I_{5\Omega} = \frac{6}{5.8372}$ ✓1

$I_{5\Omega} = 1.028A$ ✓1

03

iii) What is the p.d across 2Ω (3mks)



$V_{0.8387\Omega} = 1.028 \times 0.8387$

$= 0.8622$ ✓

$I_{5.2\Omega} = \frac{0.8622}{5.2}$ ✓1

$= 0.1658A$

$V_{1.2\Omega} = V_{2\Omega}$ ✓1

$V_{2\Omega} = 0.1658 \times 1.2$ ✓1

$= 0.1990V$ ✓1

03

iv) Calculate the current through 1Ω (2mks)

$I_{1\Omega} = \frac{5.2}{6.2} \times 1.028$

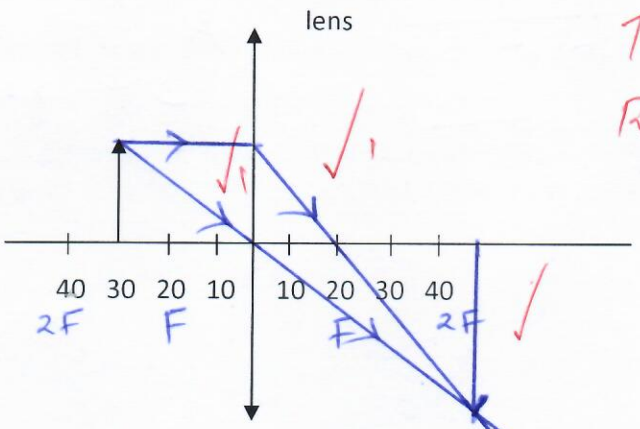
$= 0.8622A$

OR $I_{1\Omega} = \frac{0.8622}{1}$ ✓1

$= 0.8622A$ ✓1

02

14. (a) An object is placed 30cm in front of a thin converging lens of focal length 20cm. The set up is represented in the figure.



Two rays with arrows ✓✓
Real inverted image ✓
03

(i) On the same figure construct a ray diagram to locate the position of the image. (3Mks)

(ii) Determine the magnification produced. (2Mks)

$M = \frac{h_I}{h_o} = \frac{2.2}{1.3}$ ✓ | $M = 1.692$ ✓ | OR $M = \frac{v}{u} = \frac{3.0}{1.8} = 1.667$

02

(b) An object 6cm tall is placed 40cm from a convex lens of focal length 50cm. Find the position of the image. (3Mks)

$f = 50cm$ ✓ | $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$ | $\frac{1}{50} = \frac{1}{v} + \frac{1}{40}$ ✓ | $\frac{1}{v} = \frac{1}{50} - \frac{1}{40}$ | $\frac{1}{v} = \frac{-1}{200}$ ✓ | $v = -200\,cm$ ✓

(c) State two differences between the human eye and the camera. (2Mks)

- The eye has a crystalline convex lens while the camera has a convex lens
- The choroid layer of the eye is black while the camera box is painted black inside

(d) The figure below shows an eye defect.

(i) The focal length of the eye lens is variable while that of the camera is fixed

02

Any 2

(ii) - Cameras (with zoom lens) have variable image distance while the eye has a constant image distance

(iii) - Only one photograph can be taken at a time when the shutter of the camera is open but for the eye it is always changing pictures

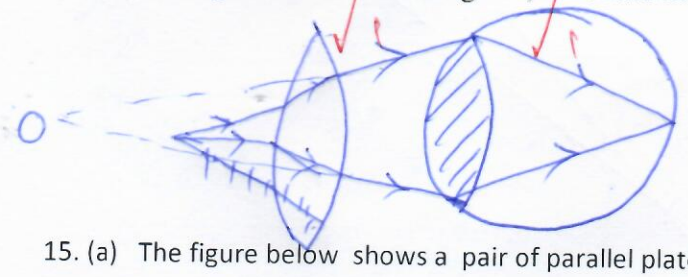
(i) Identify the defect. (1Mk)

Long Sight / Hypermetropia ✓1 — 01

(ii) State the cause of the defect. (1Mk)

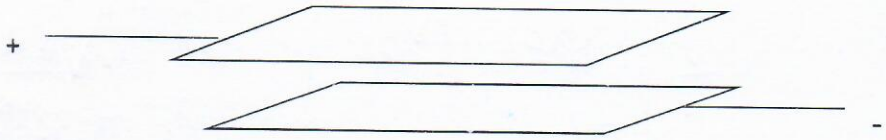
- Eyeball being too short.
- Focal length of the lens being too long. } Any 1 — 01

(iii) Using a well labeled diagram, illustrate how the defect is corrected (2mks)



- Convex Lens ✓1
- Properly drawn rays ✓1 — 02

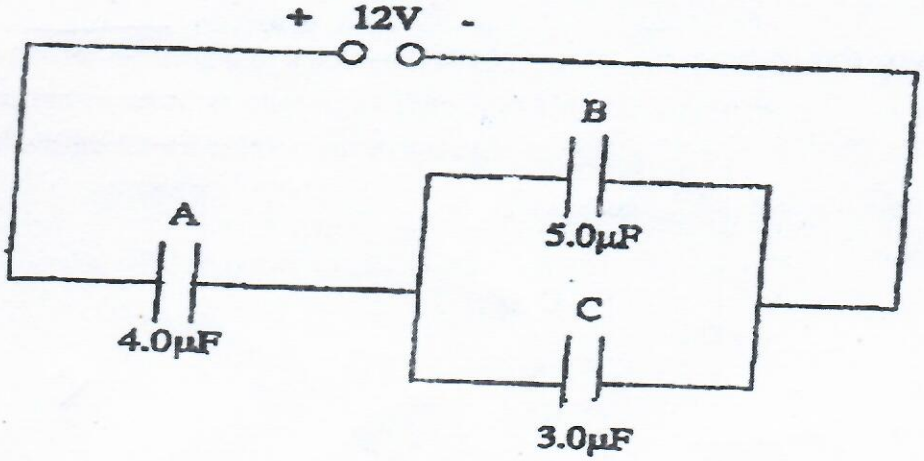
15. (a) The figure below shows a pair of parallel plates of a capacitor connected to a Battery the upper plates is displaced slightly to the left.



State with reason the effect of this movement of the capacitance (2mks)

- Capacitance decreases ✓1
- Moving the upper plates to the left decreases the area of overlap ✓1 — 02

(b) The figure below shows an electrical circuit with three capacitors A, B and C of Capacitance 4.0 μF, 5.0 μF and 3.0 μF respectively connected to a 12V battery



Determine:

(i) The combined capacitance of the three capacitors (3mks)

$5+3=8\mu F$ ✓1 | $C_T = \frac{8\times4}{8+4}$ | $C_T = 2.667\mu F$ ✓1

$C_T = \frac{C_1C_2}{C_1+C_2}$ ✓1 | $= \frac{32}{12}$ | 03

(ii) The charge of the capacitor A (2mks)

$Q = CV$ ✓1 | OR $Q = 32\mu C$ ✓1 | 02

$= 2.667\times10^{-6}\times12$

$= 32.00\times10^{-6}$

(iii) The potential difference across the capacitor B (2mks)

$V_{8\mu F} = \frac{32\times10^{-6}}{8\times10^{-6}}$ ✓1 | $V_{8\mu F} = V_{5\mu F} = 4V$. | 02

$= 4V$ ✓1

c) A positively charged sphere is suspended by an insulating thread. A negatively charged conductor is suspended near it. The conductor is first attracted, after touching the sphere it is repelled. Explain this observation. (2mks)

Attraction is as a result of the two having ✓1 unlike charges

~~The positively charged sphere attracts the negatively charged rod~~, On touching the positive charges on the sphere are neutralized it then acquires negative charges which then repels the negatively charged conductor. ✓1 02

d) A 2μF capacitor is charged to a potential of 200V, the supply is disconnected. The capacitor is then connected to another uncharged capacitor. The p.d across the parallel arrangement is 80V. Find the capacitance of the second capacitor. (3mks)

$Q_1 = CV$ | $Q_{2\mu F} = 2\times80\times10^{-6}$ ✓1 | $C = \frac{Q}{V}$

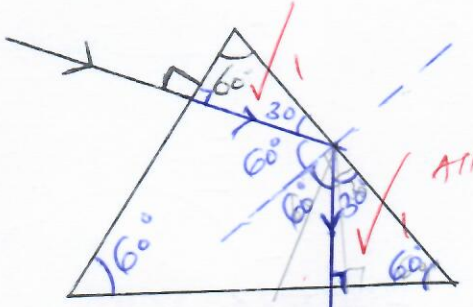
$= 2\times10^{-6}\times200$ | $= 160\times10^{-6}$ ✓1 | $= \frac{240\times10^{-6}}{80}$

$= 400\mu C$ ✓1 | $= 160\mu C$ ✓1 | $= 3\times10^{-6}F$

$Q_T = Q_{2\mu F} + Q_C$ | $Q_C = (400-160)\mu C$ | or

$= 240\mu C$ ✓1 | $C = 3\mu F$ ✓1

16. (a) A single ray of light in incident on an equilateral glass position as shown in the figure below. Complete the diagram to show the path of light through and out of the position.(critical angle of glass = 42^0) (3mks)

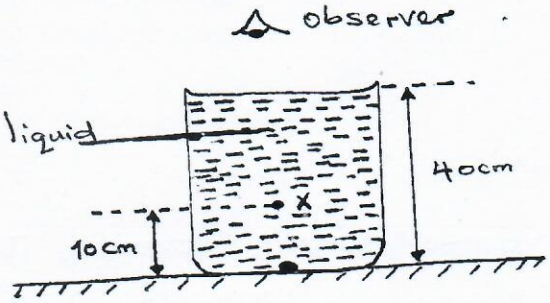


(b) State two (2) conditions necessary for total internal reflection (2 mks)

- The angle of incidence in the optically denser medium must be greater than the critical ✓1
- Ray of light must be travelling from optically denser medium to optically less dense medium. ✓1

02

(c)(i) Figure below shows an object O at the bottom of a beaker full of a liquid. An observer above the beaker sees its image at point X inside a liquid.



Determine the refractive index of the liquid. (3mks)

$n = \frac{\text{Real depth}}{\text{Apparent depth}}$ ✓1 $n = \frac{40}{30}$ ✓1 $= 1.333$ ✓1

03

(i) Define the term critical angle(c) of a medium. (1mk)

The angle of incidence in the optically denser medium for which the angle of refraction is 90^0 in the less dense medium. ✓1

01

d) State two uses of optical fibre (2mks)

- Used in Medicine to view the internal organs ✓1
- Used in telecommunication ✓1

02