

## FORM FOUR CLUSTER KCSE MODEL13

### PHYSICS PAPER 2 QUESTIONS

#### SECTION A (25 Marks)

##### Answer all the questions

1. Figure 1 shows two plane mirrors A and B inclined at a right angle. By use of an accurate ray diagram, show how this arrangement forms three images of an object O as observed by an eye E.

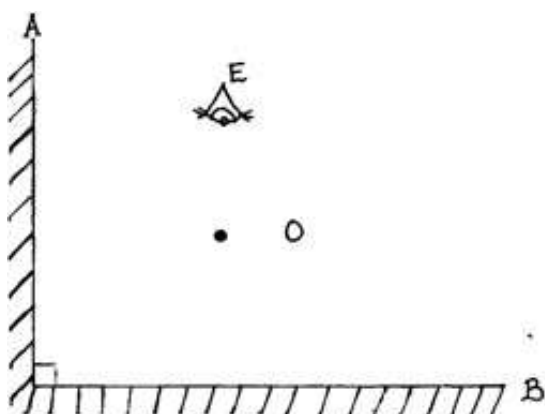


Figure 1

2. Figure 2 shows a coil wound over a soft iron core. A small piece of steel bar is placed near the end A of the core.

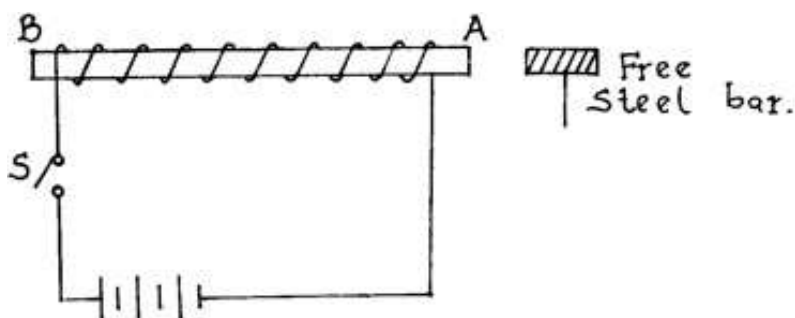
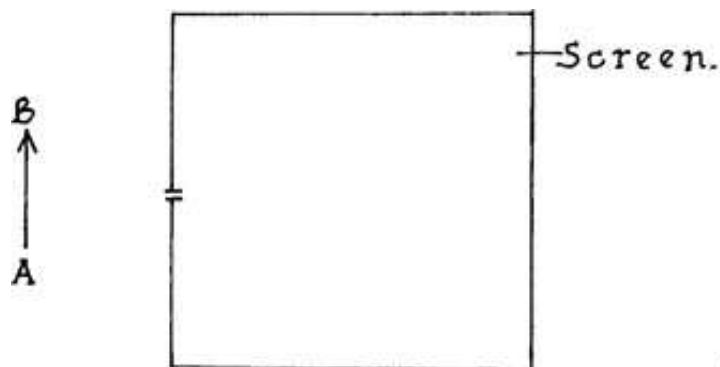


Figure 2

State and explain the observations made on the steel bar when S is closed.

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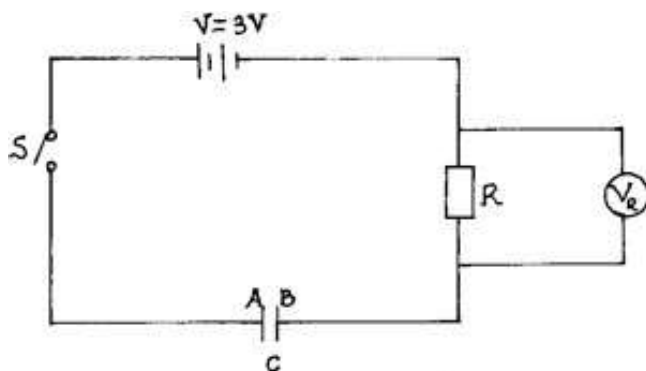
3. One condition for total internal reflection of light to occur is that a ray of light must travel from an optically more dense medium to an optically less dense medium. State a reason why this is regarded as a condition for total internal reflection.
- .....
4. Figure 3 shows an object AB placed near the pin hole camera.



**Figure 3**

By means of an accurate ray diagram determine the position of the image of AB.

5. State one property that is common to all images that are upright and formed by curved mirrors.  
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6. Figure 4 shows a circuit used for charging a parallel plate capacitor of capacitance C.



**Figure 4**

a) State the polarities of A and B.

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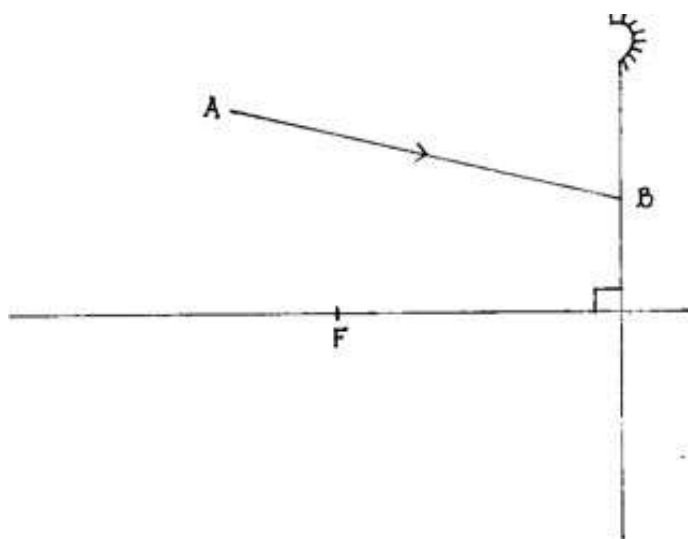
b) State the value of  $V_R$  when S is closed so that C is at full charge.

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7. Explain why sound is regarded as a mechanical wave.

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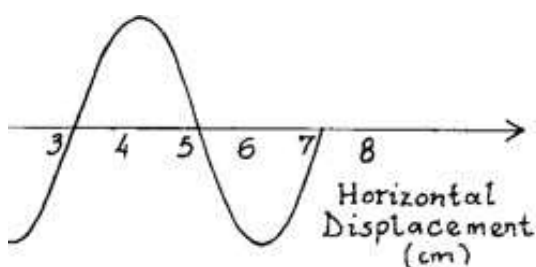
8. Figure 5 shows a ray of light incident on a concave mirror.



**Figure 5**

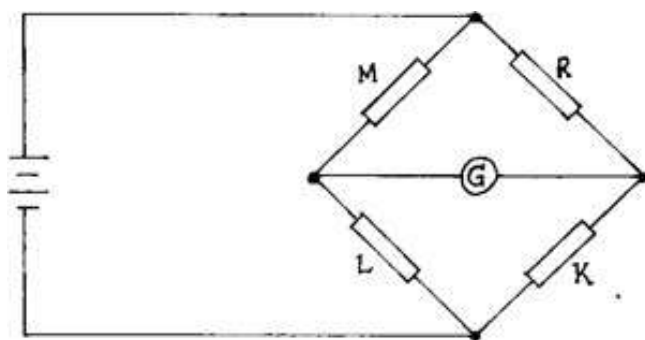
Complete the ray diagram to show how the ray AB is reflected after striking the mirror.

9. A gold leaf electroscope is charged positively by induction. State and explain the observations made on its leaf when a burning match stick is brought near but not touching the cap of the electroscope.  
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.....
10. A certain nichrome wire has a resistance of  $R \Omega$ . State and explain the effect on its resistance when the resistor is cooled.  
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11. Figure 6 shows a wave profile.



**Figure 6**

- a) From the profile above, state the wavelength of the wave.  
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.....
- ) On the same profile, draw a wave that is  $180^\circ$  out of phase with the wave given.
12. Explain why polarization is regarded as a defect of a simple cell.  
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13. Figure 7 shows a wheat stone bridge.



**Figure 7**

a) Give a reason why a galvanometer, G is used in this bridge as opposed to an ordinary Ammeter.

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b) Four resistors have the resistance of M, R, K and L as shown when the bridge is balanced. Give the relationship between the values of the four resistors at this state.

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14. A part from temperature and other physical conditions, state any other condition that must be fulfilled for a conductor to obey Ohm's law.

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15. Figure 8 shows an isolated positive point charge Q. On the figure, sketch the electric field pattern around the charge.



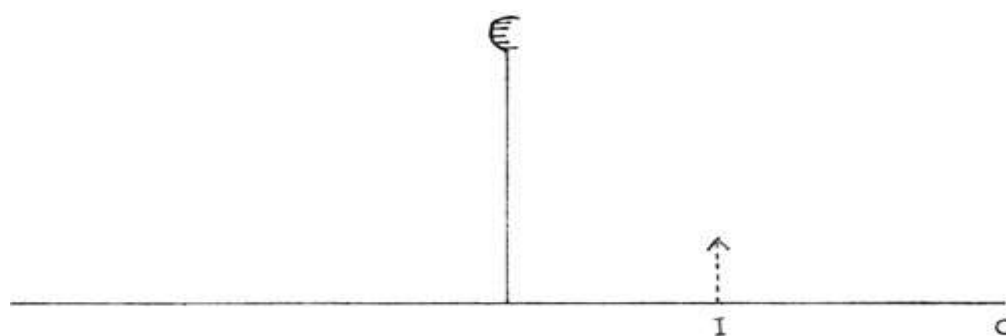
Q

**Figure 8**

## SECTION B (55 Marks)

### Answer all the questions

16. a) Figure 9 shows the image of an object formed by reflection in a diverging mirror. C is the centre of curvature of the mirror.



**Figure 9**

Complete the diagram to show:

i. How incident rays are reflected to form the image:

ii. The object position.

b) A concave mirror forms a real image magnified three times the size of the object. The distance between the object and the image is 40cm. Find by calculation;

i) The image and object distances measured from the mirror.

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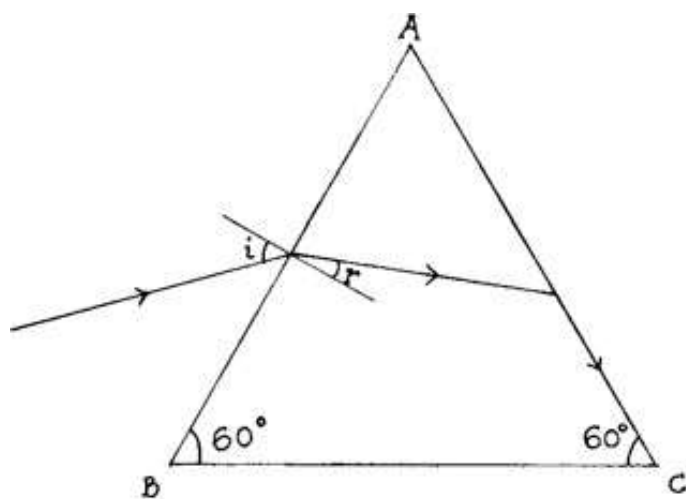
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ii) The focal length of the mirror.

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c) Figure 10 shows a ray of light passing into a glass prism ABC.



**Figure 10**

The critical angle of the glass prism is  $40^\circ$ .

i) Find the value of  $r$ .

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ii) Determine the refractive index of the prism.

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iii) Determine the value of  $i$ .

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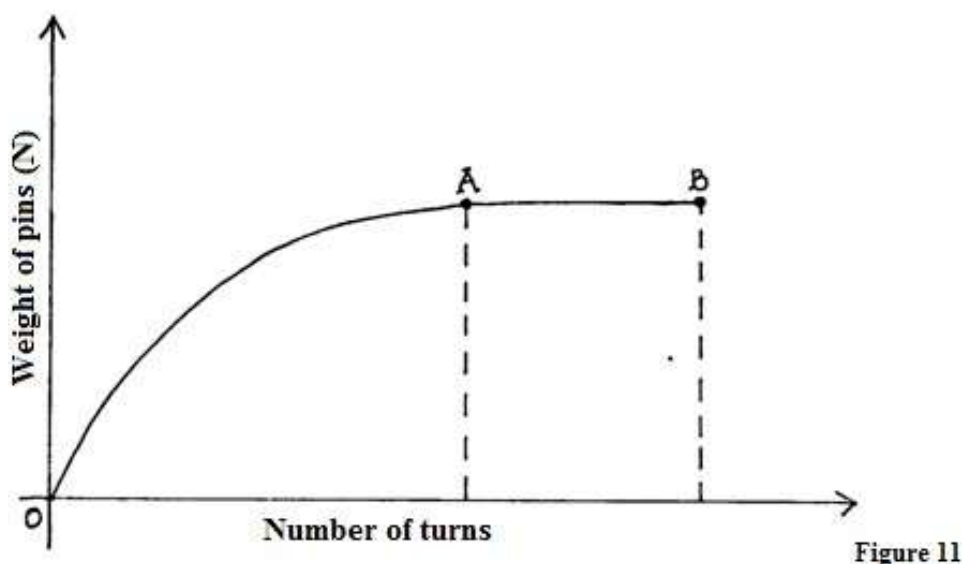
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17. a) State the reason why the magnetic field strength of a magnet is greatest at the poles.

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b) In an experiment to determine the strength of an electromagnet, the weight of pins that can be supported by the electromagnet, was plotted against the number of turns on the coil used. Figure 11 shows the experiment results obtained at a constant value of current.



i) Use the domain theory to explain the nature of the curve.

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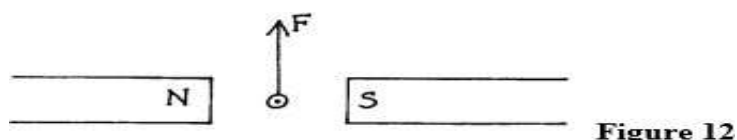
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ii) Sketch on the same axes, the curve that would be obtained using a higher value of current.

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c) Figure 12 shows a wire carrying current placed in a magnetic field.

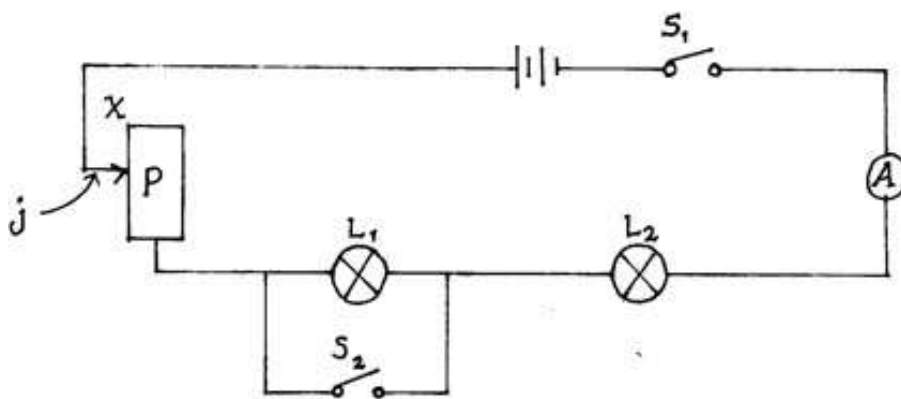


Explain why the wire experiences an upward force  $F$ , as shown.

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18. Figure 13 shows a circuit consisting of a potentiometer P, two identical bulbs L1 and L2 two switches and cells in series.



**Figure 13**

A current of 1A is read on the ammeter when S1 is closed while S2 is open.

a) State and explain the observations on L1 and L2 when;

i) S1 is closed and S2 is open.

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ii) Both S1 and S2 are closed.

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b) S1 is closed while S2 is open. After sometime, L1 blows off. State and explain the observations made on L2 after this time, t. ....

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c) S1 is closed while S2 is open. State and explain the observations made on the ammeter A when the jockey j is moved along P towards point Y.

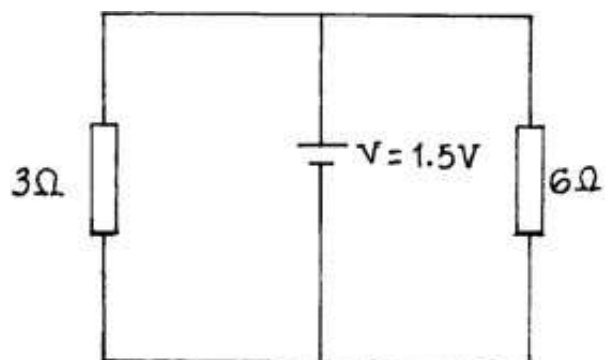
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19. Figure 14 shows a circuit consisting of two resistors and a dry cell of internal resistance of  $0.5\Omega$ .



**Figure 14**

Determine;

a) The total resistance in the circuit.

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b) The total current that flows in the circuit.

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c) The potential difference across the  $3\Omega$  resistor.

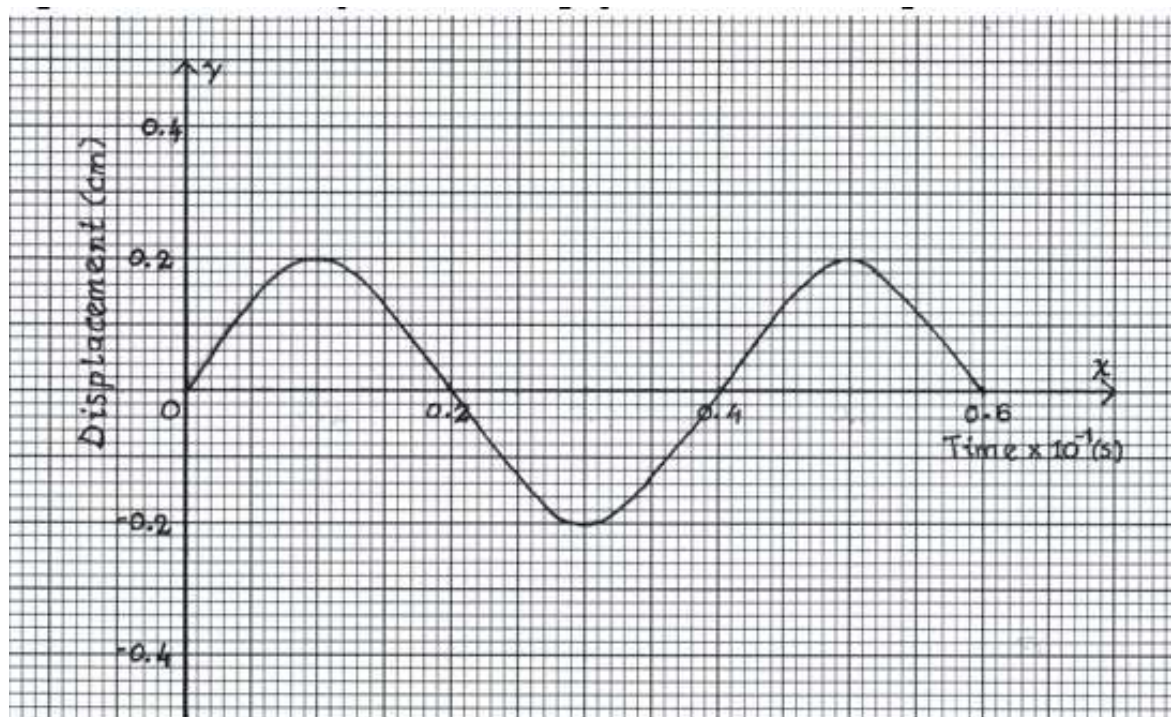
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20. Figure 15 shows the displacement time graph of a wave travelling at  $200\text{cm/s}$ .





**Figure 15**

Determine from the wave the;

a) Amplitude.

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b) Period

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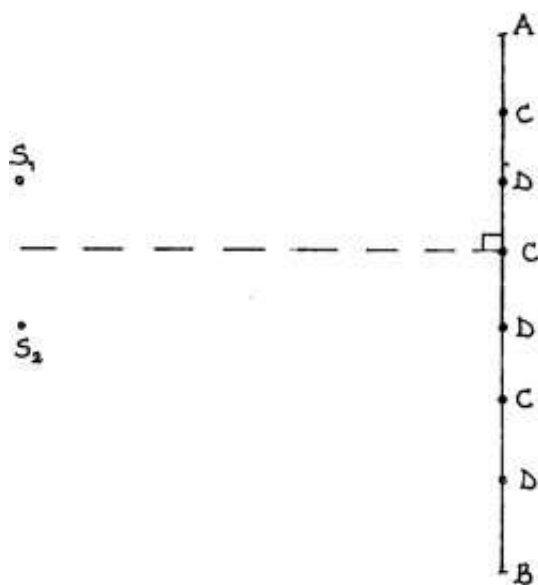
c) Frequency

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d) Wavelength

.....  
 .....

21. Figure 16 shows a set up for observing interference waves from two sources S1 and S2. The points C and D represents positions of the constructive and destructive interference respectively as observed by a person moving along AB.



**Figure 16**

a) If the observation was made using S1 and S2 as sources of sound, describe

i) How the two sets of coherent sound waves were produced.

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ii) How the constructive and destructive interferences are identified.

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b) Explain how the constructive interference C and the destructive interference D patterns are produced. ....

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c) Draw;

i) The line joining all points where waves from S1 and S2 have travelled equal distance. Label it A.

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 .....

ii) The line joining all points where waves from S2 have travelled one wavelength further than the waves from S1 . Label it B. ....

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22. Figure 17 shows a digital meter that records frequency and wavelength of any electromagnetic wave, when shone on it.

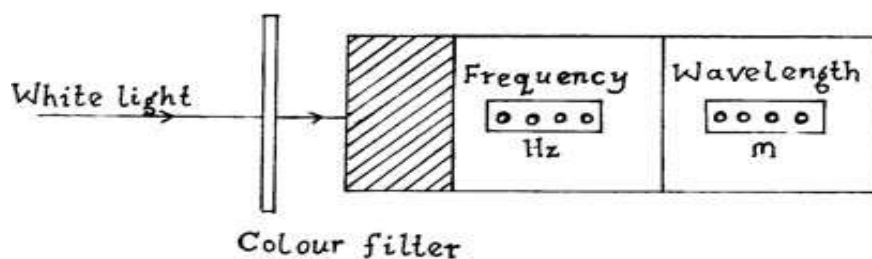


Figure 17

In an experiment to verify the relationship between frequency and wavelength of white light, different colour filters were used and a graph of frequency against

$$\frac{1}{\text{wavelength}}$$

shown

was plotted as

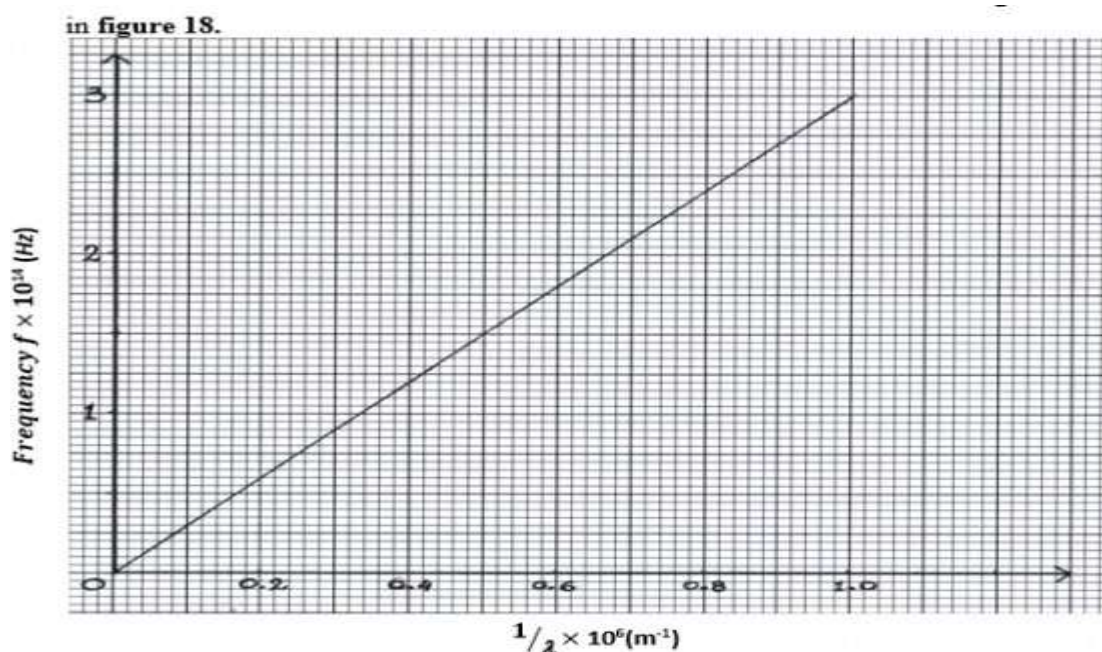


Figure 18

a) From the graph, determine; i) Wavelength of light that corresponds to a frequency of.....

$7.5 \times 10^{13} \text{ Hz}$ .

ii) The slope of the graph.

b) What is the physical significance of the slope calculated in a (ii) above?

