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# MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education

## THE MOCK EXAMINATIONS, 2025

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**232/2**

**PHYSICS**

**PAPER 2**

**May, 2025**

**TIME: 2 Hrs**

# MARKING GUIDE Monday, 30<sup>th</sup> June, 2025; 2:00-4:00pm

### Instructions

(a) Write your name, admission number, date, stream and signature in the spaces provided above.



(b) All answers must be written in the spaces provided in this question paper.

(c) This paper consists of **13** printed pages with **2** sections.

(d) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing

(e) Candidate should answer the questions in English

### FOR EXAMINERS' USE ONLY

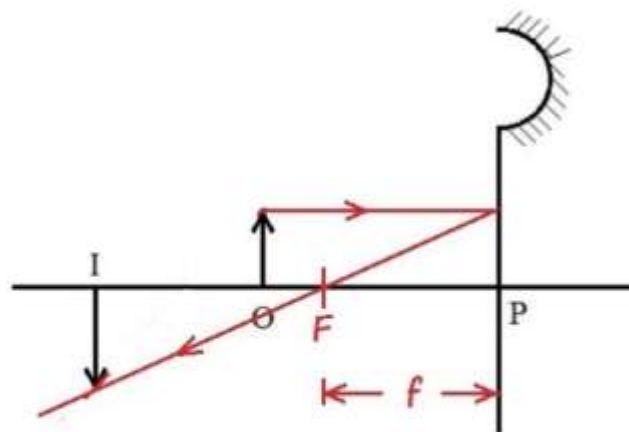
| Section | Question    | Maximum Score | Candidate's Score |
|---------|-------------|---------------|-------------------|
| A       | 1 – 13      | 25            |                   |
| B       | 14          | 13            |                   |
|         | 15          | 14            |                   |
|         | 16          | 15            |                   |
|         | 17          | 07            |                   |
|         | 18          | 06            |                   |
|         | Total Score |               | 80                |



**SECTION A (25 MARKS)**

Answer ALL questions in this section in the spaces provided

1. State and explain the effect of increasing the E.H.T. in an X-ray tube on the X-rays produced (2 marks)  
*The speed of the electrons produced increases <sup>1</sup> hence the strength of x-rays is increased. <sup>1</sup>*
2. Give a reason why attraction in magnetism is not regarded as a reliable method of testing for polarity. (1 mark)  
*Attraction can occur between magnets and between a magnet and a magnetic material. <sup>1</sup>*
3. What is the purpose of having a national grid in power transmission? (1 mark)  
*It ensures that there is power to consumers even when one of the power stations fails. <sup>1</sup>*
4. **Figure 1** shows an object 'O' and its image 'I' as formed by a concave mirror



*<sup>1</sup> correct rays locating F*  
*<sup>1</sup> correct indication of 'f' as distance btw F and P*

Figure 1

Complete the ray diagram and indicate the focal length of the mirror. (2 marks)



5. In large circuits, large resistors in parallel are preferred to low resistors in series. Explain.

*Connection of resistors in parallel gives a cumulatively lower resistance than when in series, hence minimizes chances of overheating.* (1 mark) ✓<sup>1</sup>

6. Figure 2 (a) and Figure 2 (b) show diagrams of the human eye.

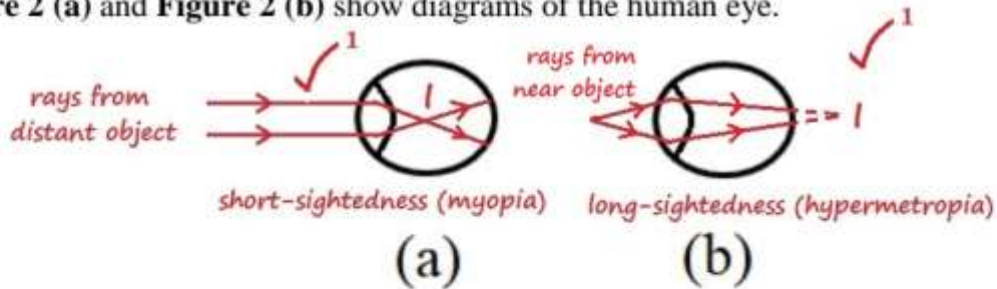


Figure 2

Sketch in Figure 2 (a) a ray diagram to show short sightedness and in Figure 2 (b) long sightedness.

(2 marks)

7. Explain why the inner part of a pin hole camera is painted black

(1 mark)

*To absorb any incident light ray that falls on the walls of the pinhole camera.* ✓<sup>1</sup>

8. Figure 3 shows a simple water heater.

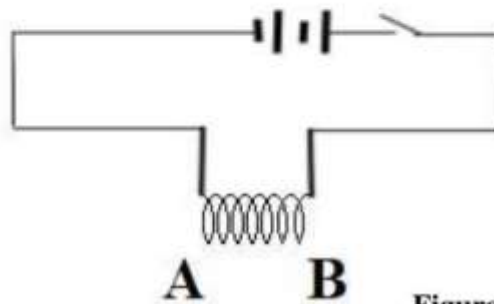


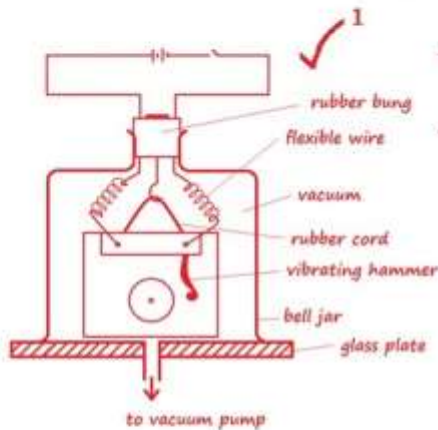
Figure 3

Give a reason why AB is coiled.

*To increase the length and hence resistance of the conductor. A high amount of electrical energy per unit time is thus converted to heat when the switch is closed.* ✓<sup>1</sup> (2 mark)



9. With the use of a diagram, describe an experiment to show that sound cannot travel in a vacuum. (4 marks)



- Set up the apparatus as shown
- Switch on the circuit to make the bell ring continually as air is pumped out slowly using the vacuum pump
- The intensity of the sound diminishes/fades continually as air is pumped out
- This explains that sound does not travel in a vacuum

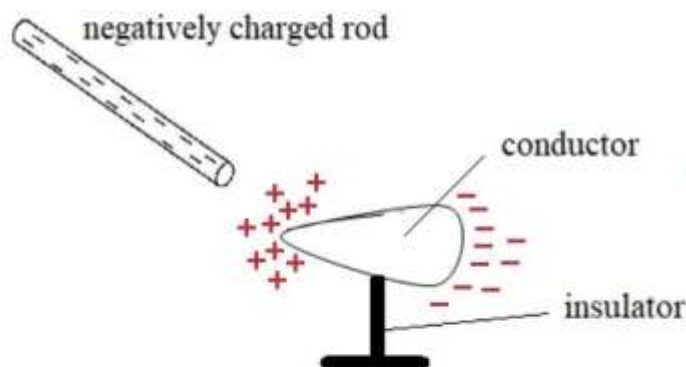
10. State two qualities that are used to determine whether an accumulator require charging or not. (2 marks)

- E.m.f. of the cell drops below 1.8V
- Relative density of the acid falls below 1.12 (using a hydrometer)

11. Explain why radio wave signals are easier to receive than TV waves signals in a place surrounded by hills. (2 marks)

Radio waves are easily diffracted around hills than T.V. waves since radio waves have longer wavelengths.

12. (a) Figure 4 below shows a negatively charged rod placed near an uncharged conductor resting on an insulation support.



the number of +ve and -ve charges must be the same

Figure 4



Show the charge distribution on the conductor. (1 mark)

(b) State the effect:

(i) Of momentarily touching the conductors with a finger while the charged rod is still near the conductor. (1 mark)

.....  
The repelled negative charges flow to the ground ✓<sup>1</sup> leaving the  
conductor positively charged......

(ii) On the charge distribution of withdrawing the negatively charged rod after momentarily touching the conductor (1 mark)

.....  
Due to repulsion, the positive charges spread on the conductor but  
the density is relatively higher on the sharp end. ✓<sup>1</sup>.....

13. State **two** ways by which the speed of rotation of a motor can be increased (2 marks)

- Winding the coil on a soft iron core. ✓<sup>1</sup>.....
- Increasing the number of turns per unit length of rotating coil. ✓<sup>1</sup>.....
- Using a stronger magnet...... [any two correct]
- Multiplying the number of coils and commutator segments.

**SECTION B (55 MARKS)**

Answer ALL questions in this section in the spaces provided

14.

(a) Define the following:

(i) Photoelectric effect (1 mark)

.....  
The emission of electrons from the surface of a metal by shining  
light/radiation of sufficient frequency or energy on them. ✓<sup>1</sup>.....

(ii) Threshold wavelength (1 mark)

Maximum wavelength of the radiation beyond which no  
photoelectricity occurs/no electron is emitted. ✓<sup>1</sup>.....  
.....



(b) The graph below shows the stopping potential and corresponding frequencies of photocell.

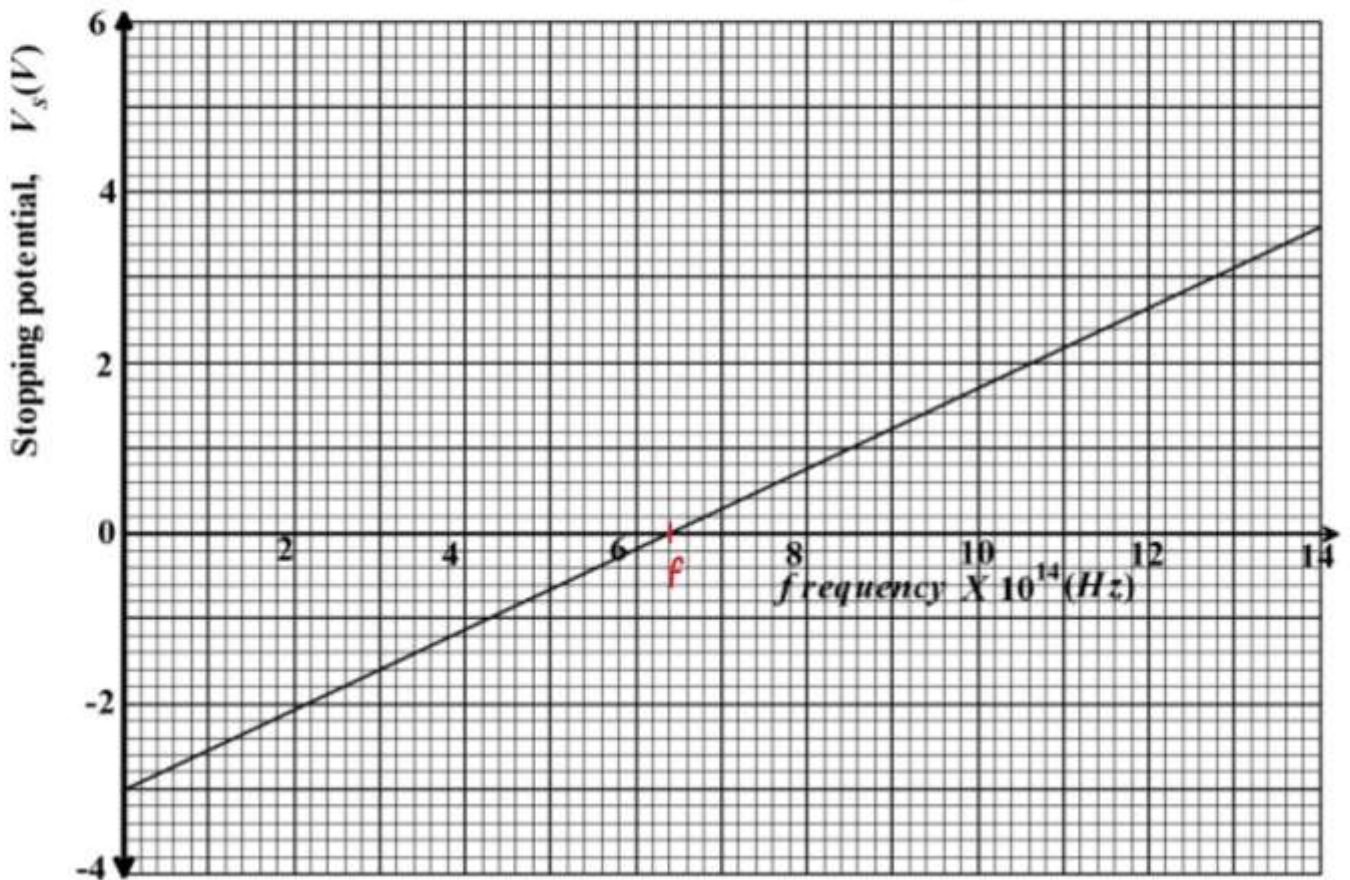


Figure 5

From the graph determine:

(i) The threshold wavelength

$f = 6.4 \times 10^{14} \text{ Hz}$  ✓<sup>1</sup> [shown on graph/stated] (3 marks)

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

$= \frac{3.8 \times 10^8}{6.4 \times 10^{14}}$  ✓<sup>1</sup>

$= 0.4688 \times 10^{-6} \text{ m}$  ✓<sup>1</sup>

(ii) The plank's constant

from y-intercept  $W_0 = 3.0 \text{ eV}$  ✓<sup>1</sup> (3 marks)

$h = \frac{W_0}{f_0} = \frac{3 \times 1.6 \times 10^{-19}}{6.4 \times 10^{14}}$  ✓<sup>1</sup>

$= 7.5 \times 10^{-34} \text{ Js}$  ✓<sup>1</sup>



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(iii) The work function of the metal

(2 marks)

$$W_0 = 7.5 \times 10^{-14} \times 6.4 \times 10^{14} \quad \checkmark^1 \quad \text{OR} \quad W_0 = 3.0 \text{ eV}$$
$$= 4.8 \times 10^{-19} \text{ J} \quad \checkmark^1 \quad = 3 \times 1.6 \times 10^{-19} \quad \checkmark^1$$

T.E. : ans (ii)  $\times 6.4 \times 10^{14}$  = correct ans  $= 4.8 \times 10^{-19} \text{ J} \quad \checkmark^1$

(c) Figure 6 below shows the wiring in a modern mains appliance

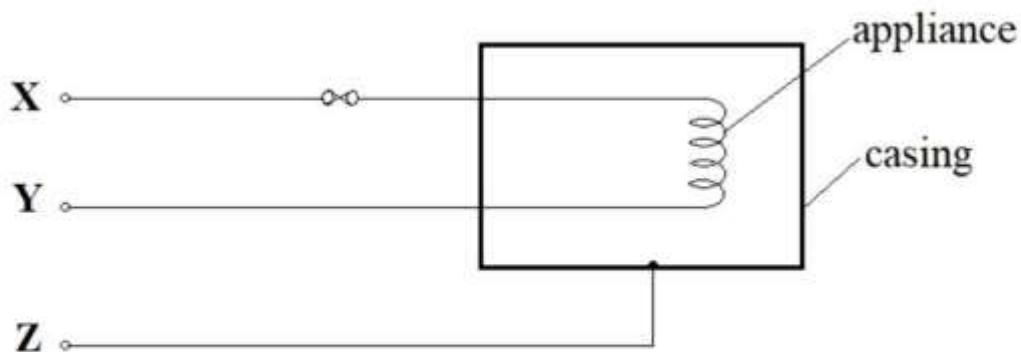


Figure 6

Identify the wire X, Y and Z

(3 marks)

X ..... *Live wire* .....  $\checkmark^1$

Y ..... *Neutral wire* .....  $\checkmark^1$

Z ..... *Earth wire* .....  $\checkmark^1$

15. The Figure 7 below shows apparatus used to produce X-rays.

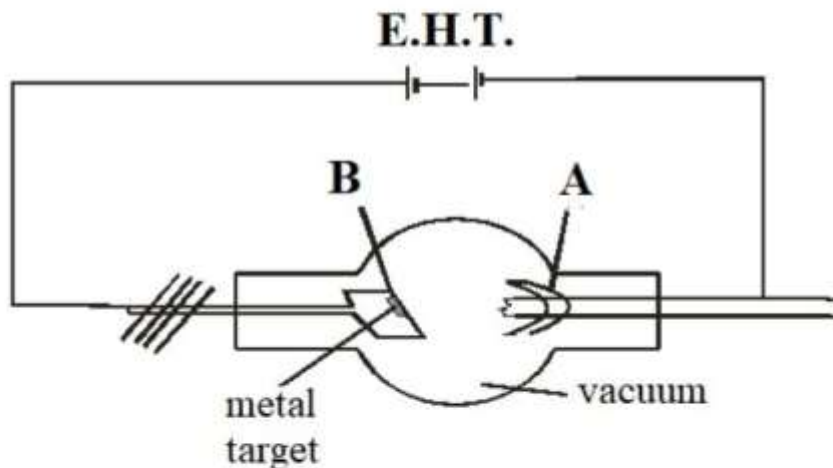


Figure 7



a) Name the part marked A and B (2 marks)

A. Cathode ✓<sup>1</sup>

B. Anode ✓<sup>1</sup>

b) Briefly explain how X-rays are produced in the X-ray tube (2 marks)

When current flows through the filament in the cathode, electrons are produced by thermionic emission. ✓<sup>1</sup>

These electrons are accelerated towards the target, where they are suddenly stopped, producing x-rays. ✓<sup>1</sup>

c) An X-ray tube is operating with an anode potential of 5KV and a current of 10 mA.

(i) Explain how the intensity of X-rays from such a tube may be increased (1 mark)

By increasing the heating/filament current. ✓<sup>1</sup>

(ii) Explain how penetrating power of the X-ray in such a tube may be increased (1 mark)

By increasing the accelerating potential difference. ✓<sup>1</sup>

(iii) Calculate the number of electrons hitting the anode per second (2 mark)

$$Q = It$$
$$= \frac{10}{1000} \times 1$$
$$= 0.01C$$
$$n = \frac{Q}{e}$$
$$= \frac{0.01}{1.6 \times 10^{-19}}$$
$$= 6.25 \times 10^{16} \text{ electrons}$$



(iv) Determine the velocity with which the electrons strike the target (Take  $e=1.6 \times 10^{-19}$  C and  $M_e=9.1 \times 10^{-31}$  kg) (2 marks)

$$eV = \frac{1}{2} m v^2$$
$$V^2 = \frac{1.6 \times 10^{-19} \times 5000 \times 2}{9.1 \times 10^{-31}}$$
$$= 1.758 \times 10^{15}$$
$$V = 4.193 \times 10^7 \text{ m/s}$$

(v) What property of lead makes it suitable for use as shielding material? (1 mark)

Its high density  $\checkmark^1$  hence it absorbs stray x-rays

d) A modern cathode ray oscilloscope has a set of deflection plates called X and Y-plates and a time base.

(i) What is the purpose of the time base (1 mark)

It varies voltage on the x-plates for horizontal deflection of the spot formed on the screen.  $\checkmark^1$

(ii) What would be the trace seen when the time base is switched off and

a. A d.c. voltage applied to the y- plates (1 mark)

The spot will move up or down  $\checkmark^1$  depending on the polarity of the plates.

rej: up and down

b. An a.c voltage is applied to the Y-plates? (1 mark)

A vertical line will be seen on the screen. || A spot will move up and down continuously.  $\checkmark^1$

16.

a) State Lenz's law of electromagnetic induction (1 mark)

The direction of induced emf is such that the induced current which it causes to flow, produces a magnetic effect that opposes the change producing it.  $\checkmark^1$



- b) A coil is moved quickly away from the end of a stationary magnet Y and current is flowing as shown by **Figure 8** below;

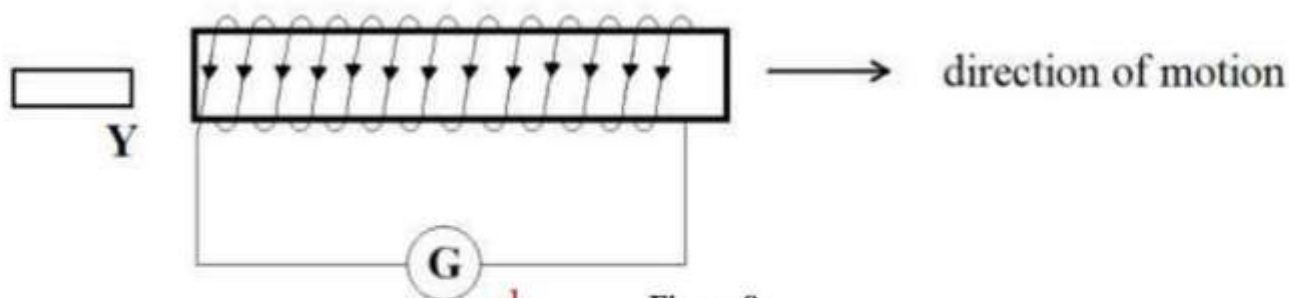


Figure 8

State the polarity of Y... *North* ✓<sup>1</sup>.....

(1 mark)

- c) State the essential condition for e.m.f to be induced in a conductor. (1 mark)

*There must be relative motion between the field and the conductor*  
*(i.e. there must be change in flux linkage.)* ✓<sup>1</sup>

- d) A student wound two coils on a cardboard tube as shown in **Figure 9** below.

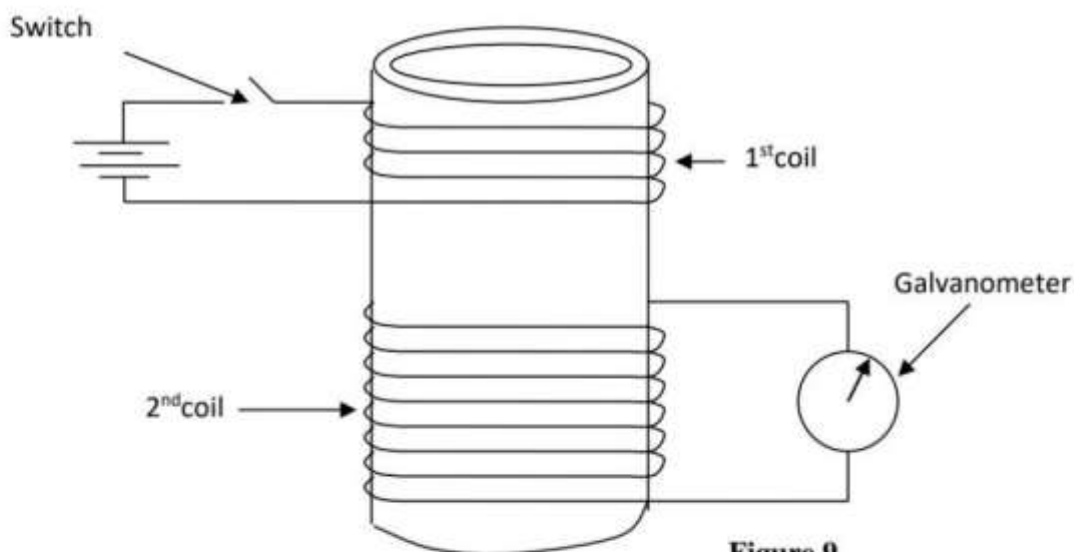


Figure 9

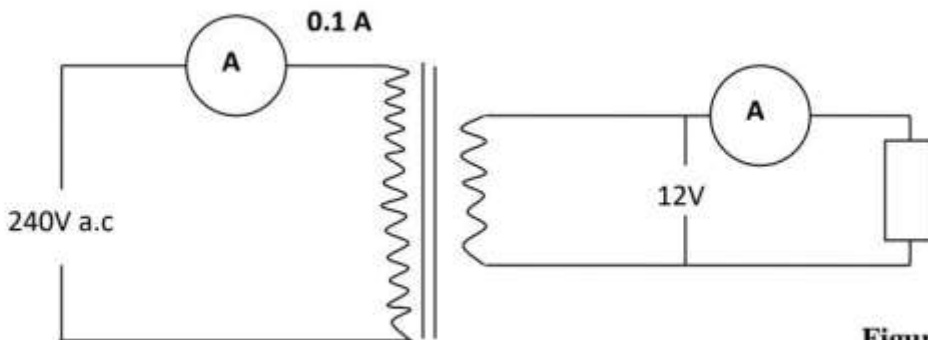
- (i) Explain what happens when the switch is closed. (3 mark)  
*Current flow in the first coil builds up to maximum and the magnetic field produced cuts across the second coil* ✓<sup>1</sup>  
*a changing magnetic flux linkage is created* ✓<sup>1</sup>  
*in the coil, inducing an e.m.f.* ✓<sup>1</sup>  
*hence current in the second coil causes a deflection on the galvanometer.*



- (ii) What would happen if the experiment were repeated but this time a soft iron is put inside the cardboard tube? Explain. (2 marks)

There would be greater deflection ✓<sup>1</sup> since it will have a greater  
changing magnetic field due to easy magnetisation of the soft iron  
core. ✓<sup>1</sup>

- e) The **Figure 10** below shows a transformer used to step down power for use by an electrical appliance.



**Figure 10**

- (i) Calculate the input power to the transformer from the mains. (1 mark)

Power = Voltage X Current  
= 240 X 0.1 = 24W ✓<sup>1</sup> [correct answ with working]

- (ii) Assuming there is no power losses in the transformer; calculate the reading in the ammeter on output part. (2 marks)

$V_p I_p = V_s I_s$   
 $240 \times 0.1 = 12 \times I_s$  ✓<sup>1</sup>  
 $I_s = 2A$  ✓<sup>1</sup>

- (iii) What would be the output power if the transformer had been 80% efficient? (2 marks)

Power output =  $\frac{\text{Efficiency} \times \text{Power input}}{100}$   
=  $\frac{80 \times 24}{100}$  ✓<sup>1</sup> | Power output = 19.2W ✓<sup>1</sup>



- (iv) What would be the reading on the ammeter on the output part had the transformer been 80% efficient? (2 marks)

..... Allow T.E. ....

.....  $\text{Power} = \text{Voltage} \times \text{Current}$  ..... =  $\frac{\text{ans. (iii)}}{12}$  ✓<sup>1</sup> .....

.....  $19.2 = 12 \times I$  ✓<sup>1</sup> .....

.....  $I = 1.6\text{A}$  ✓<sup>1</sup> ..... = correct (A) ✓<sup>1</sup> .....

17. Figure 11 shows two speakers connected to an audio – frequency generator.

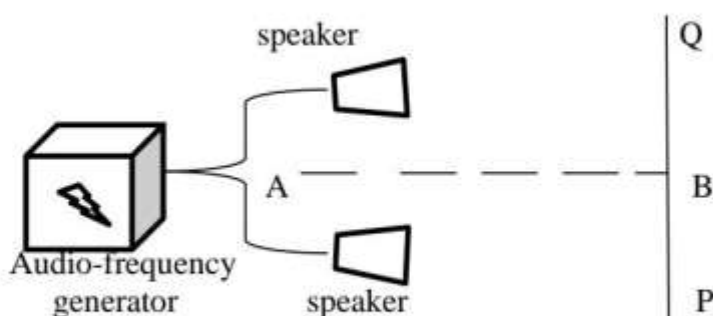


Figure 11

- a) Why are the loudspeakers connected to the same audio – frequency generator? (1 mark)
- ..... It is a coherent sound wave source. ✓<sup>1</sup> .....
- .....
- b) State and explain the observations made by an observer moving along the path PQ (2 marks)
- ..... Alternate loud sound ✓<sup>1</sup> (in regions of constructive interference) .....
- ..... and soft sound ✓<sup>1</sup> (in regions of destructive interference) is heard .....
- ..... along PQ. || Alternate soft and loud sound is heard with central being loudest due to maximum constructive interference.
- c) State the observations made if the frequency of the signal generator was increased. (1 mark)
- ..... When the frequency of the signal is increased, the separation between the alternating loud and soft sound is reduced / is more close. ✓<sup>1</sup> .....
- d) Explain the observation made when an observer walks along AB (2 mark)
- ..... A constant loud sound is heard ✓<sup>1</sup> The path difference is zero  $\lambda$  .....
- ..... || It is the locus of all points equidistant || Line is equidistant from the two speakers ✓<sup>1</sup> .....



- e) State what would be observed if a microphone connected to a cathode ray oscilloscope is moved along line PQ (1 mark)

*There will be formation of a transverse wave || There will be formation of a sine wave. ✓<sup>1</sup>*

*[accept drawing of a transverse wave]*

18.

- a) Define the term refractive index of a material (1 mark)

*It is the ratio of the velocity of light in a vacuum to the velocity of light in the medium. ✓<sup>1</sup>*

*[deny if Snell's law definition is used since Snell's law does not hold when light is incident at 90°]*

- b) State two conditions necessary for total internal reflection to occur (2 marks)

*∴ Light must travel from an optically dense medium to an optically less dense medium. ✓<sup>1</sup>*

*-The angle of incidence must be greater than the critical angle. ✓<sup>1</sup>*

- c) Explain what you understand by the term critical angle as applied in optics (1 mark)

*It is an angle of incidence in the optically denser medium for which the angle of refraction in the less dense medium is 90°. ✓<sup>1</sup>*

- d) The **Figure 12** below shows a ray of light incident on a glass prism

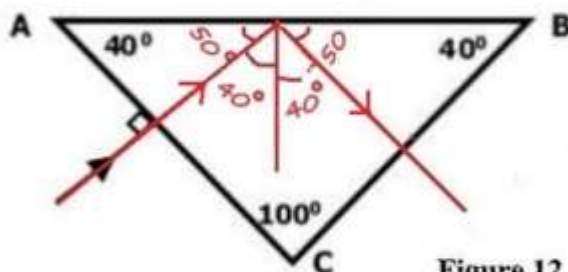


Figure 12

Given that the critical angle for the glass is  $39^\circ$ , **sketch** on the diagram the path of the ray through the prism (2 marks)

