

**Nov. 2018 - 2 hours**

Name ..... Index Number .....

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

**Instructions to candidates**

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) This paper consists of **two** sections: **A** and **B**.
- (d) Answer **all** the questions in sections **A** and **B** in the spaces provided.
- (e) All working **must** be clearly shown in the spaces provided in this booklet.
- (f) Non programmable silent electronic calculators may be used.
- (g) **This paper consists of 16 printed pages.**
- (h) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (i) **Candidates should answer the questions in English.**



**For Examiner's Use Only**

Section	Question	Maximum Score	Candidate's Score
<b>A</b>	<b>1-14</b>	<b>25</b>	
	<b>15</b>	<b>10</b>	
<b>B</b>	<b>16</b>	<b>11</b>	
	<b>17</b>	<b>12</b>	
	<b>18</b>	<b>11</b>	
	<b>19</b>	<b>11</b>	
<b>Total Score</b>		<b>80</b>	

584

A102



SECTION A (25 marks)

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Answer *all* the questions in this section in the spaces provided.

- 1. Explain why the walls of a studio are padded with woollen materials. (2 marks)

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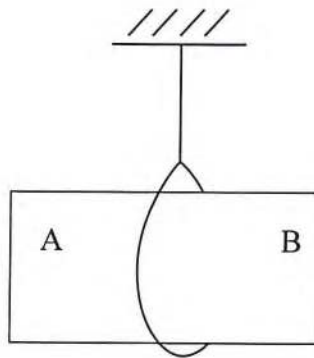
- 2. State **one** characteristic of soft X-rays that distinguish them from hard X-rays. (1 mark)

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- 3. **Figure 1** shows a bar magnet AB suspended by a string.



A102

Figure 1

When the North pole of another magnet is brought close to end A, there is repulsion. State the polarity of end B. (1 mark)

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- 4. State what happens to the image formed by a pin hole camera when the size of the hole is increased. (1 mark)

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5. The angle of incident for a ray of light moving from air to a certain liquid is  $30^\circ$ . Given that the refractive index of the liquid is 1.36, determine the angle of refraction. (2 marks)

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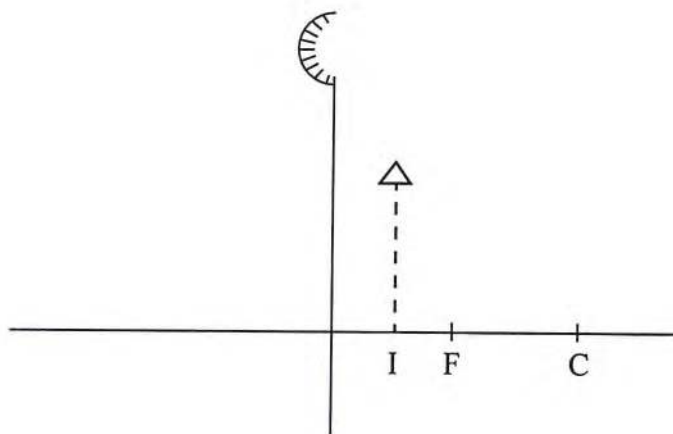
6. An electric kettle is rated 1.8 kW, 240 V. Determine the rating of the fuse that may be used in the kettle. (3 marks)

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7. Figure 2 shows the image of an object O placed on the principle axis of a convex mirror.



**Figure 2**

On the figure, draw a ray diagram to locate the object. (3 marks)

584

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8. Define *radioactivity*. (1 mark)  
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9. A transformer has 600 turns in the primary coil and 9000 turns in the secondary coil. If the transformer is 100% efficient and the current in the secondary coil is 0.15 A, determine the current in the primary coil. (3 marks)

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10. The sharp point of a pin is brought near the cap of a positively charged electroscope. State and explain the observation made on the leaf of the electroscope. (3 marks)

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A102

11. Arrange the following radiations in the order of increasing wavelengths;  
*Purple light, Gamma rays, infrared and ultraviolet.* (1 mark)

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12. State the purpose of manganese (IV) oxide in a dry cell. (1 mark)

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13. State the meaning of the term *battery*.

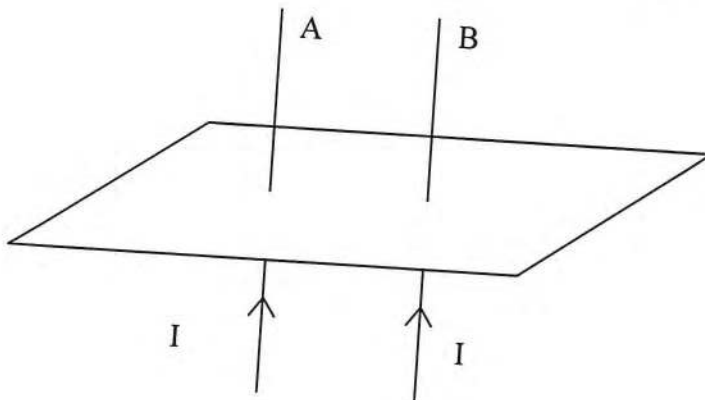
(1 mark)

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14. **Figure 3** shows two current-carrying wires A and B passing through a cardboard.



**Figure 3**

On the diagram, sketch the magnetic field lines around the wires to show how the fields interact.  
(2 marks)

SECTION B (55 marks)

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Answer *all* the questions in this section in the spaces provided.

15. (a) Electrical energy is transmitted at very high voltages and low current.

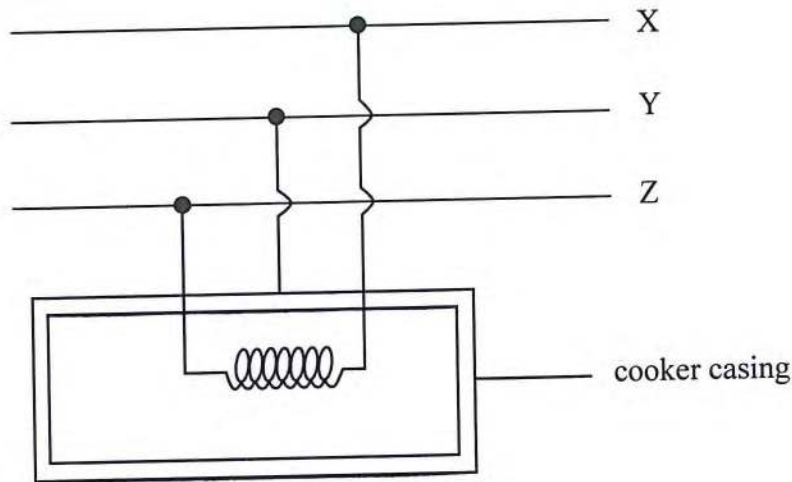
(i) Describe how the high voltages are attained. (1 mark)

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(ii) State **two** reasons why thick aluminium wires are preferred to copper wires for transmission over long distances. (2 marks)

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(b) **Figure 4** shows an electric cooker connected to the mains supply. X, Y and Z are the mains wires.



**Figure 4**

State with a reason the name of wire Y. (2 marks)

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A102



(c) A student has some coloured bulbs rated 60 W, 240 V to be connected for decorations.

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- (i) State the number of such bulbs that can be connected normally to a 240 V supply through a 5A fuse. (2 marks)

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- (ii) If the cost of electric energy is Ksh 3.00 per kWh, determine the cost of running the bulbs in (c) (i) for 5 hours daily for 20 days. (3 marks)

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A102



16. (a) State the meaning of the following terms:  
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(i) *Photoelectric effect*

(1 mark)

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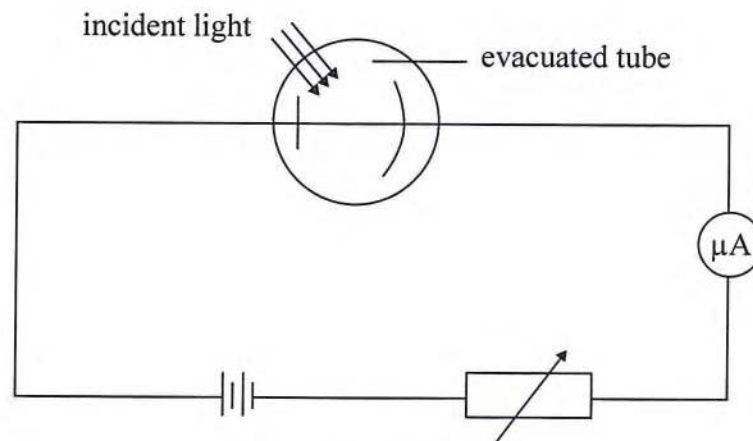
(ii) *Threshold frequency*

(1 mark)

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(b) **Figure 5** shows some light incident on the cathode of a photocell. The photocell is connected in series with a battery, a variable resistor and a microammeter.

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**Figure 5**

(i) Explain how the microammeter reading is affected when the intensity of the incident light is increased. (2 marks)

(2 marks)

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(ii) State the reason why the tube is evacuated. (1 mark)

(1 mark)

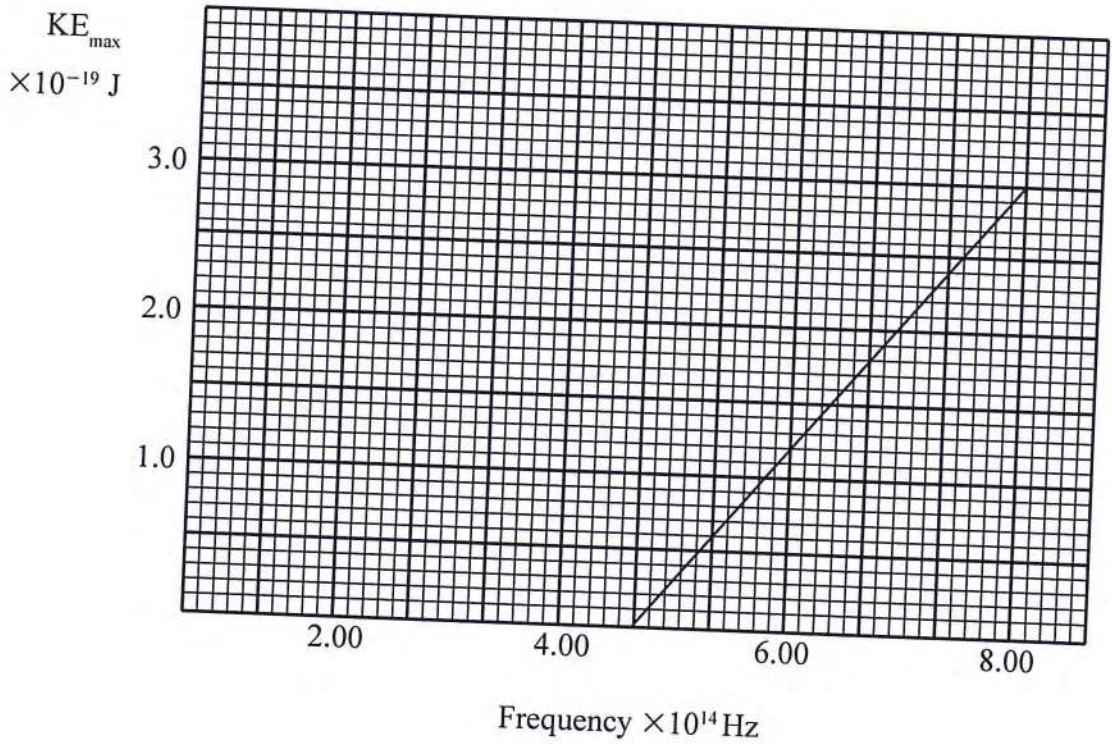
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A102





(c) **Figure 6** shows a graph of maximum kinetic energy ( $KE_{\max}$ ) of photoelectrons against the frequency of the incident radiation.



**Figure 6**

From the graph, determine:

- (i) Planck's constant  $h$ , (3 marks)

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- (ii) the threshold wavelength  $\lambda_0$  given that the speed of light  $C$  is  $3.0 \times 10^8 \text{ ms}^{-1}$ . (3 marks)

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A102



17. (a) Water waves from a certain source move from the shallow end to the deep end. State the change that occurs at the deep end on the following:

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(i) Frequency (1 mark)

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(ii) Wavelength (1 mark)

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(iii) Velocity (1 mark)

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(b) (i) A biconvex lens forms an upright image twice the size of the object. If the focal length of the lens is 20 cm, determine the object distance. (4 marks)

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(ii) State **two** optical instruments which produce a magnified real image using a convex lens. (2 marks)

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(c) State **one** difference between the working of the human eye and the lens of a camera. (1 mark)

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A102



(d) A lens of focal length 20 cm forms a virtual image when an object is placed 60 cm from the lens. State with a reason the type of lens used. (2 marks)

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18. (a) (i) Draw a circuit diagram showing the depletion layer of a p-n junction diode connected in the reverse bias mode. (2 marks)

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(ii) State the reason why increasing the external voltage in (i) makes the depletion layer wider. (1 mark)

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(iii) State the meaning of *breakdown voltage* of a junction diode. (1 mark)

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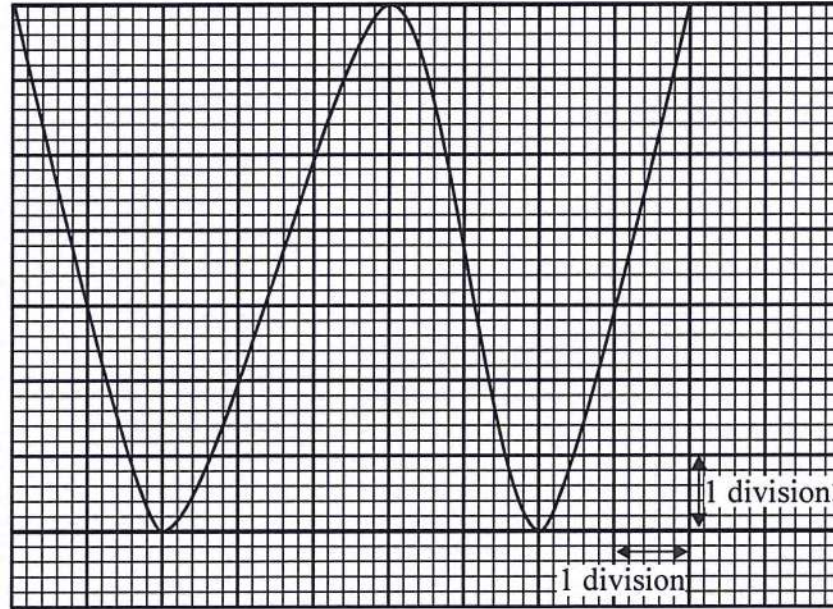
(iv) State **one** application of diodes.

(1 mark)

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(b) **Figure 7** shows the output on a screen of a CRO when an a.c. signal is connected to the y-plates with the time base on.



**Figure 7**

(i) Given that the time control is 5 ms per division and the y-gain is 100 V per division, determine the:

(I) frequency of the a.c. signal (2 marks)

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(II) peak voltage of the input signal (3 marks)

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A102



(ii) State the adjustment that may be made in order to halve the frequency of the a.c. signal. (1 mark)

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19. Figure 8 shows two waves of nearly equal frequency produced simultaneously.

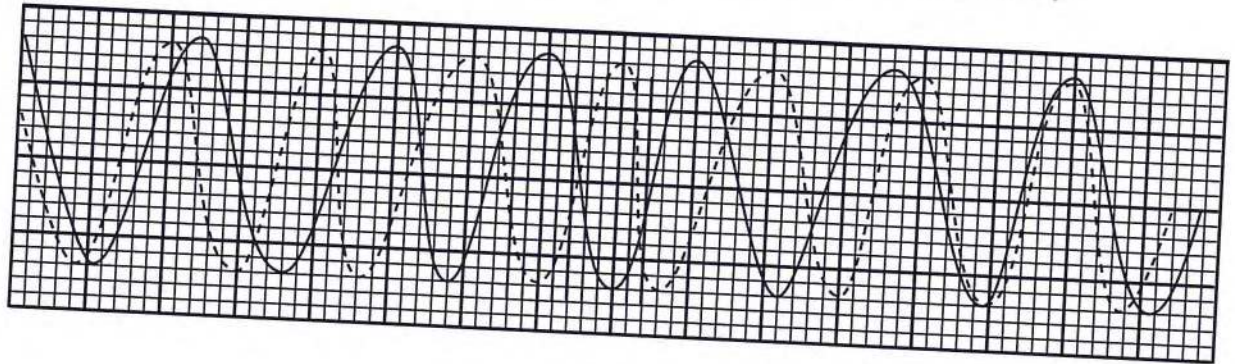


Figure 8

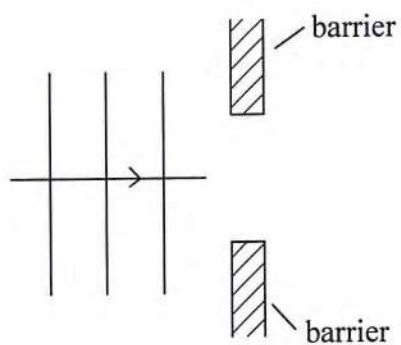
On the space provided, sketch the resultant of the two waves (beats).

(2 marks)

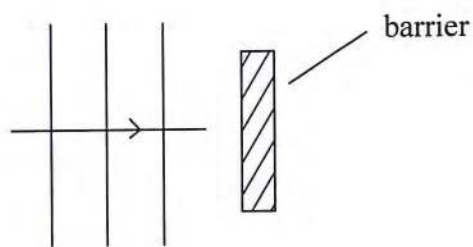
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A102

(b) **Figure 9(a)** and **9(b)** show barriers placed in the path of plane waves.  
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**Figure 9(a)**



**Figure 9(b)**

On each figure, sketch the pattern of waves after they pass the barrier.

(2 marks)

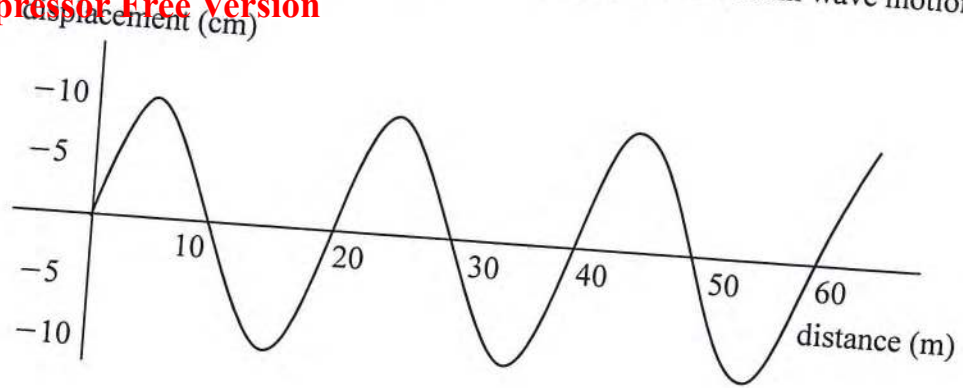
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(c) **Figure 10** shows a displacement–distance graph for a certain wave motion.

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**Figure 10**

- (i) Indicate on the figure with letters **A** and **B** any two points that are in phase. (1 mark)

(ii) Determine the:

(I) amplitude of the wave

(1 mark)

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(II) wavelength of the wave

(1 mark)

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584

A102

(iii) Given that the frequency of the waves is 50 Hz, determine the:  
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(1 mark)

(I) period

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(II) speed of the wave

(3 marks)

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A102

