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# PHYSICS PAPER 2

## KCSE 2011

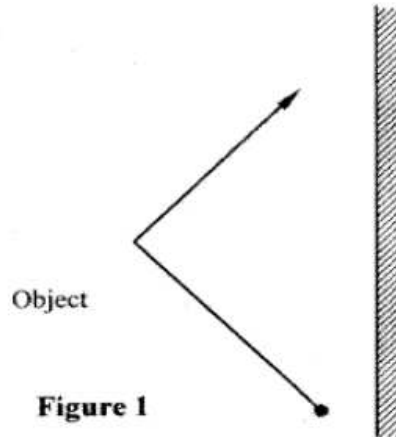
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2.2.1 Physics Paper 2 (232/2)

SECTION A (25 marks)

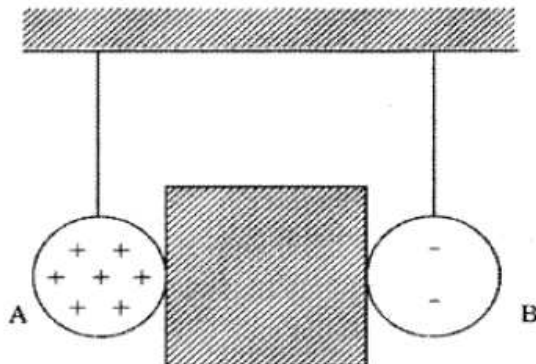
Answer all the questions in this section in the spaces provided.

- 1 **Figure 1**, shows an object placed in front of a plane mirror.



Sketch the image of the object as seen in the mirror.

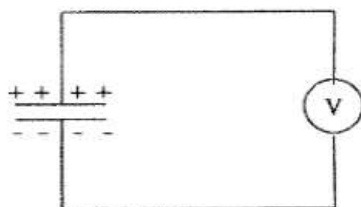
- 2 **Figure 2**, shows two identical pithballs A and B suspended with insulated threads. They are separated by an insulator X. A is positively charged while B is negatively charged. The quantity of charge on A is three times the quantity of charge on B.



**Figure 2**

Sketch on the space besides the figure, the final position of the pithballs after the insulator is removed.

- 3 **Figure 3**, shows a voltmeter connected across two charged parallel plates.



Parallel plates

**Figure 3**

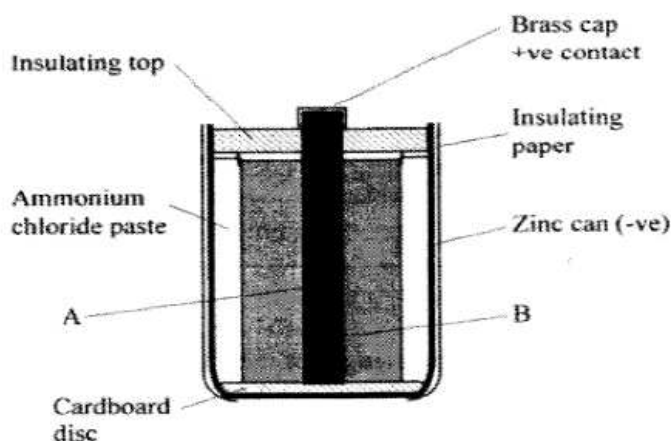
When a thin sheet of mica is inserted between the plates, the voltmeter reading is observed to reduce. Explain this observation. (3 marks)

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**Figure 4**, shows the cross-section of a dry cell. Use the information on the figure to answer questions 4 and 5.



**Figure 4**

- 4 Name the parts labelled **A** and **B**. (2 marks)
- 5 State the use of the manganese (IV) oxide in the cell. (1 mark)
- 6 One method of producing a weak magnet is to hold a steel rod in the North South direction and then hammer it continuously for some time. Using the domain theory of magnetism explain how this method works. (2 marks)

**Figure 5**, shows a motor connected to a magnetic switch called a relay operated by an ordinary switch  $S_1$ . Use the information in the figure to answer questions 7 and 8.

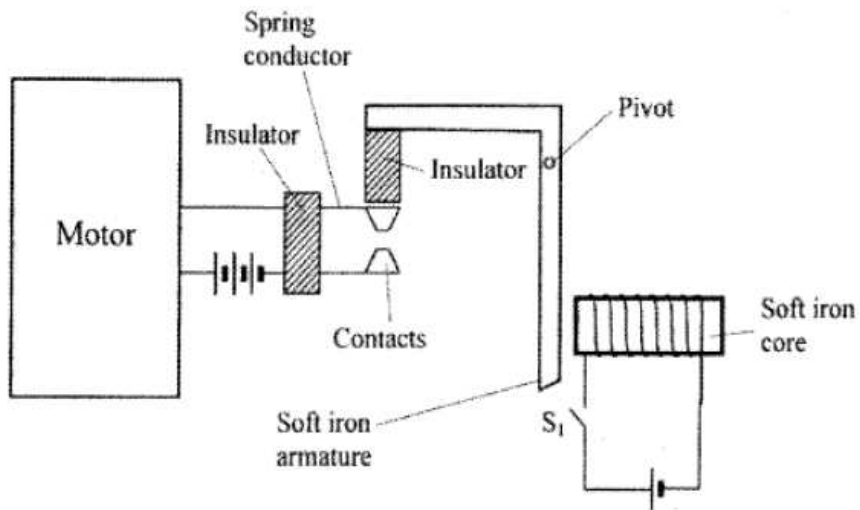


Figure 5

- 7 Explain how the relay switches on the motor when  $S_1$  is closed. (3 marks)
- 8 State with a reason the effect on the motor, if the iron core is replaced with a steel core and switch  $S_1$  is put on and then off. (2 marks)
- 9 Figure 6, shows standing waves on a string. It is drawn to a scale of 1:5

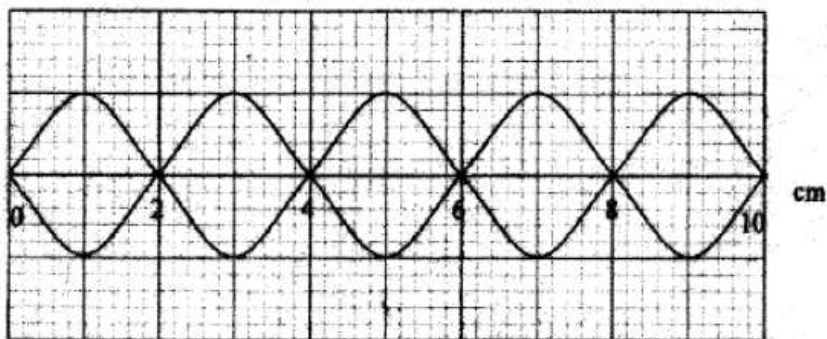
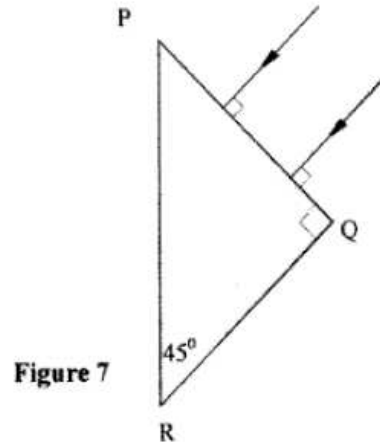


Figure 6

- (a) Indicate on the diagram the wavelength of the standing wave. (1 mark)
- (b) Determine the wavelength of the wave. (1 mark)

- 10 **Figure 7**, shows two rays of light incident normally on face PQ of a glass prism, whose critical angle is  $42^\circ$ .



Complete the diagram to show the paths of the two rays as they pass through the prism. (3 marks)

- 11 A  $4\Omega$  resistor is connected in series to a battery of e.m.f 6V and negligible internal resistance. Determine the power dissipated by the resistor. (2 marks)
- 12 Table 1 shows radiations and their respective frequencies.

Table 1

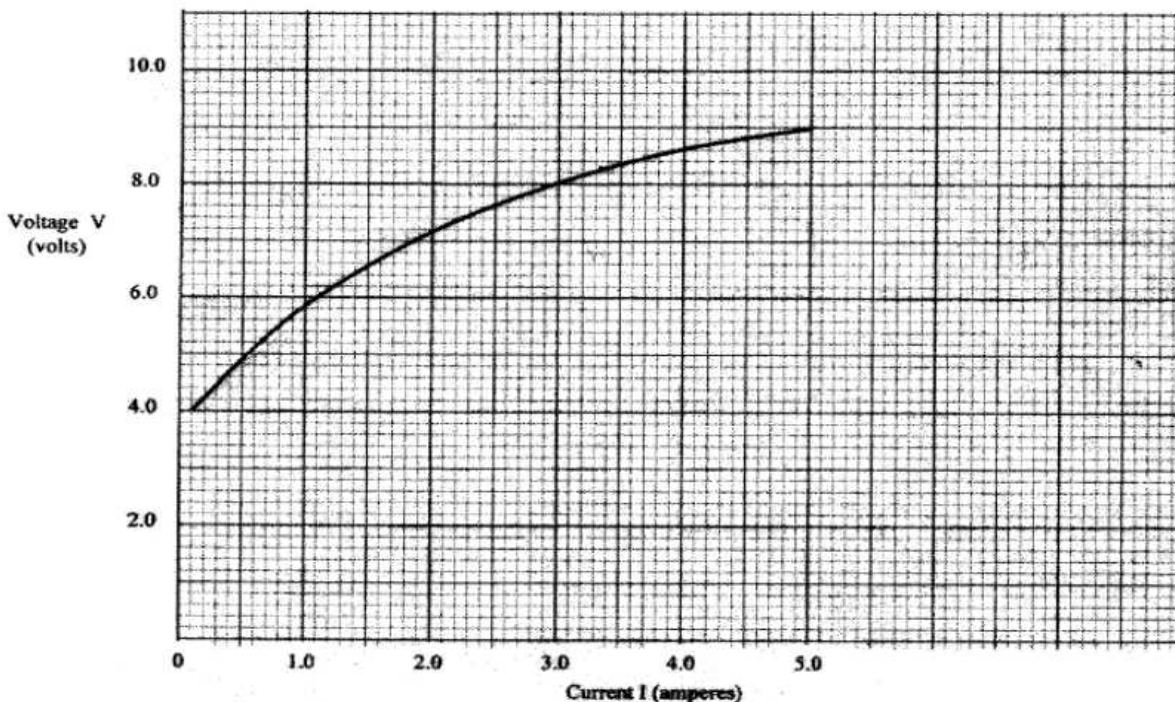
Type of radiation	Yellow light	Gamma rays	Radio waves	Micro waves
Frequency (Hz)	$1 \times 10^{15}$	$1 \times 10^{22}$	$1 \times 10^6$	$1 \times 10^{11}$

- Arrange the radiations in the order of increasing energy. (1 mark)
- 13 State the reason why electrical power is transmitted over long distances at very high voltages. (1 mark)
- 14 State the meaning of the term "threshold frequency" as used in photoelectric emission. (1 mark)

**SECTION B (55 marks)**

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

- 15 (a) **Figure 8**, shows a graph of potential difference  $V$  (volts) against a current  $I$  (amperes) for a certain device.

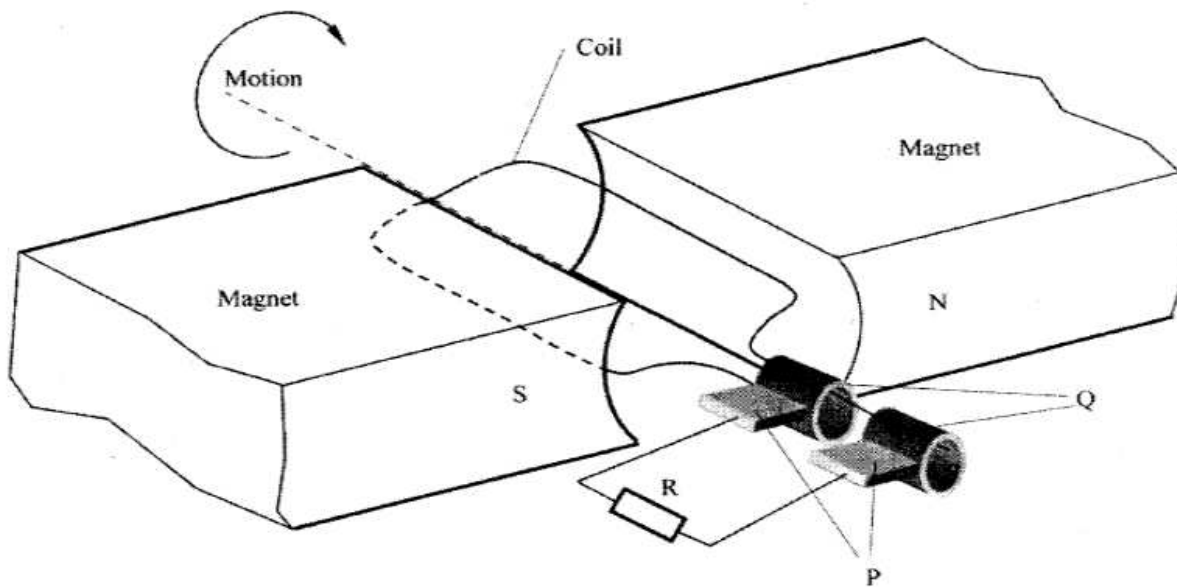


From the graph:

- (i) state with a reason whether or not the device obeys ohms law. (2 marks)
  - (ii) determine the resistance of the device at;
    - (I)  $I = 1.5\text{A}$  (2 marks)
    - (II)  $I = 3.5\text{A}$  (2 marks)
  - (iii) From the results obtained in (ii) state how the resistance of the device varies as the current increases. (1 mark)
  - (iv) State the cause of this variation in resistance. (1 mark)
- (b) Three identical dry cells each of e.m.f.  $1.6\text{V}$  are connected in series to a resistor of  $11.4\Omega$ . A current of  $0.32\text{A}$  flows in the circuit. Determine:
- (i) the total e.m.f. of the cells; (1 mark)
  - (ii) the internal resistance of each cell; (3 mark)
- 16 (a) State the meaning of the term "principal focus" as applied in lenses. (1 mark)

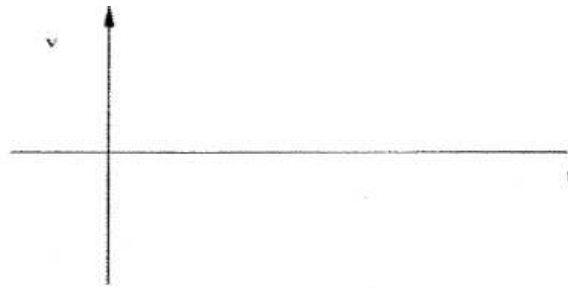
- (b) You are provided with the following apparatus to determine the focal length of a lens:
- a biconvex lens and lens holder.
  - a lit candle.
  - a white screen.
  - a metre rule
- (i) Draw a diagram to show how you would arrange the above apparatus to determine the focal length of the lens (1 mark)
- (ii) Describe the procedure you would follow. (1 mark)
- (iii) State **two** measurements that you would take. (2 marks)
- (iv) Explain how the measurements in (iii) would be used to determine the focal length. (2 marks)
- (c) An object is placed 30cm in front of a concave lens of focal length 20cm. Determine the magnification of the image produced. (4 marks)

- 17 (a) State what is meant by the term “electromagnetic induction”. (1 mark)
- (b) **Figure 9**, shows a simple electric generator

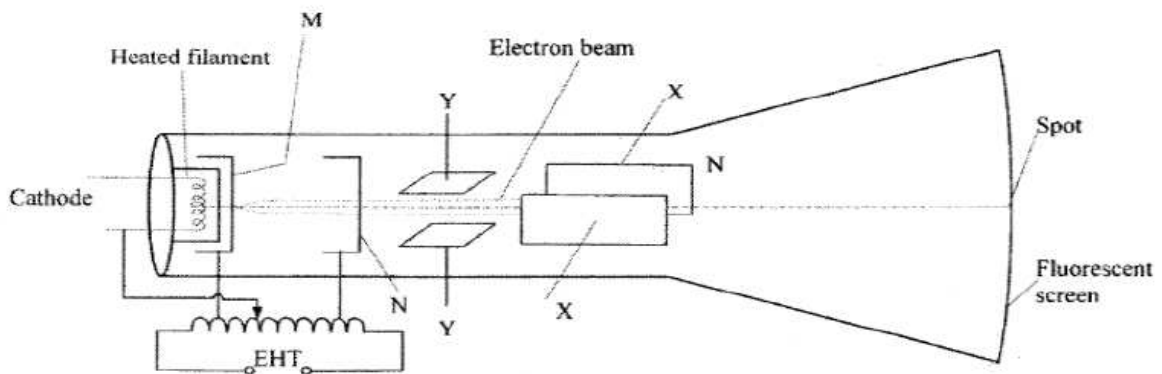


**Figure 9**

- (i) Name the parts labelled P and Q. (2 marks)
- P .....
- Q .....
- (ii) Sketch on the axes provided, a graph to show how the magnitude of the potential difference across R, changes with the time t. (1 mark)



- (iii) State **two** ways in which the potential difference produced by such a generator can be increased. (2 marks)
- (c) In a transformer, the ratio of primary turns to the secondary turns is 1:10. A current of 500mA flows through a  $200\Omega$  resistor in the secondary circuit. Assuming that the transformer is 100% efficient, determine:
- the secondary voltage; (1 mark)
  - the primary voltage; (2 marks)
  - the primary current. (2 marks)
- 18 (a) State **two** differences between cathode rays and electromagnetic radiations. (2 marks)
- (b) **Figure 10**, shows the main features of a cathode ray oscilloscope (CRO).



**Figure 10**

- Name the parts labelled M and N. (2 marks)
 

M .....

N .....
- Explain how electrons are produced in the tube. (2 marks)



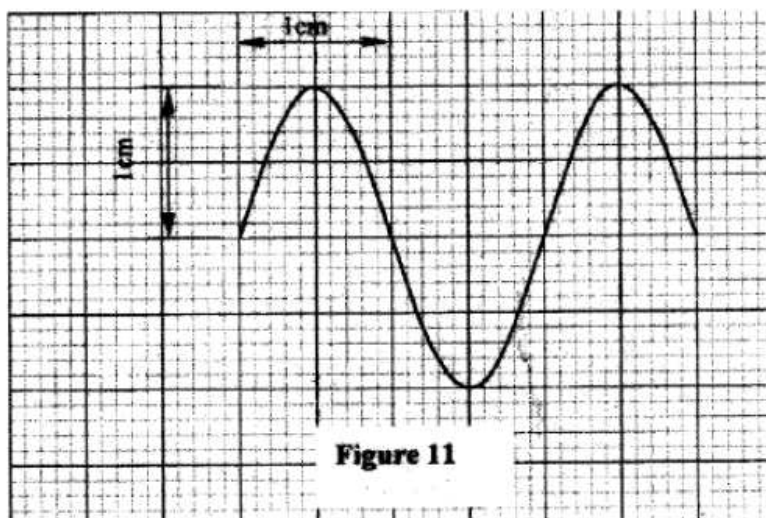
(iii) When using the CRO to display waveforms of voltages, state where the following should be connected:

(I) the voltage to be displayed on the screen; (1 mark)

(II) the time base voltage. (1 mark)

(iv) state why the tube is highly evacuated. (1 mark)

(c) **Figure 11**, shows the waveform of a voltage displayed on the screen of a CRO. The Y-gain calibration was 5V per cm.



(i) Determine the peak-to-peak voltage of the Y-input. (1 mark)

(ii) Sketch on the same figure the appearance of the waveform after the voltage of the input signal is halved and its frequency is doubled. (2 marks)

**19** (a) When a radiation was released into a diffusion cloud chamber, short thick tracks were observed. State with a reason, the type of radiation that was detected. (2 mark)

(b) The half-life of an element X is 3.83 days. A sample of this element is found to have an activity rate of  $1.6 \times 10^3$  disintegrations per second at a particular time. Determine its activity rate after 19.15 days. (2 marks)

(c) State what is meant by an extrinsic semiconductor. (1 mark)