ALLIANCE GIRLS HIGH SCHOOL MOCK 2017
PHYSICS PAPER 2

Answer All the questions in this section in the spaces provided

1. **Figure 1** shows a plane mirror, a point object (P) and the position of the observer's eye. Show whether the observer will see the image of the object point P or not. **(1 mark)**

Figure 1 *Eye* P

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2. State one difference between lead-acid battery and a Leclanche' cell. **(1 mark)**

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3. A Form One student at Alliance Girls' High School connected a simple electric circuit as shown in **Figure 2** below.

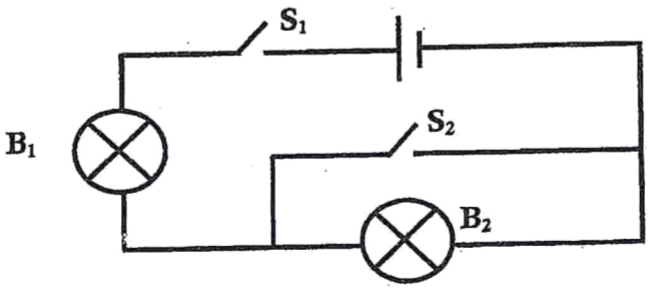

Figure 2

State and explain the observation made on bulbs B_1 and B_2 when switches S_1 and S_2 are both closed. **(2 marks)**

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Figure 3 shows an X – ray tube used to produce X – *rays*. Use it to answer questions 4 and 5.

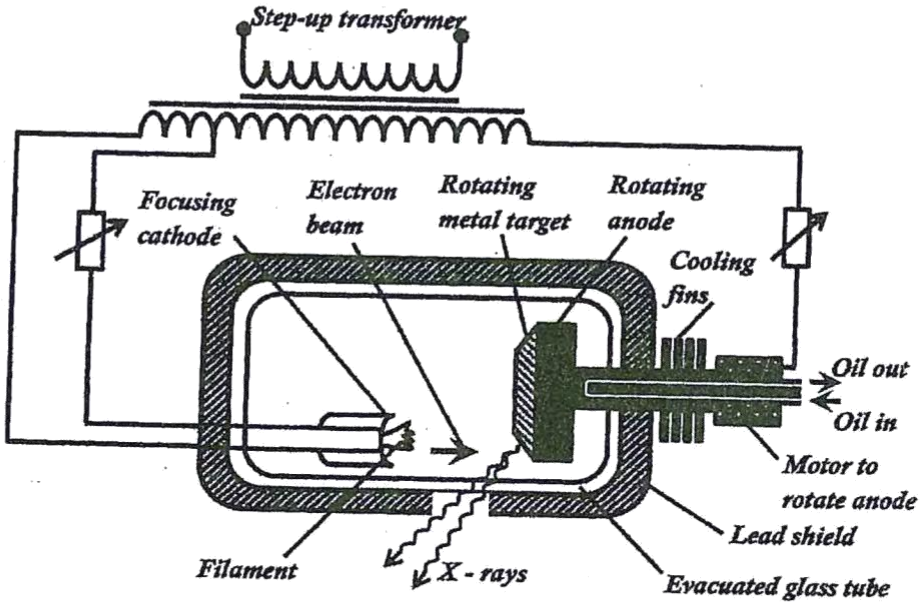

Figure 3

4. Give a reason why;
   (a) The metal target is made to rotate. **(1 mark)**

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   (b) Lead metal is used to shield the X – ray tube. **(1 mark)**

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5. The X – ray tube in **Figure 3** produces electrons which are accelerated by a p.d. of 12 *k*V. Assuming all the energy goes to produce X- rays, determine the maximum frequency of the $X - rays$ produced. (Plank's constant $h = 6.62 \times 10^{-34}\ Js$ and charge on an electron, $e = 1.6 \times 10^{-19}$ C). **(3 marks)**

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6. **Figure 4** (not drawn to scale) shows a bright electric bulb placed behind a screen which has a hole with an object cross-wire. A concave mirror of focal length 30 *cm* is placed in front of the screen. The position of the mirror is adjusted until a sharp image of the cross-wire is formed on the screen.

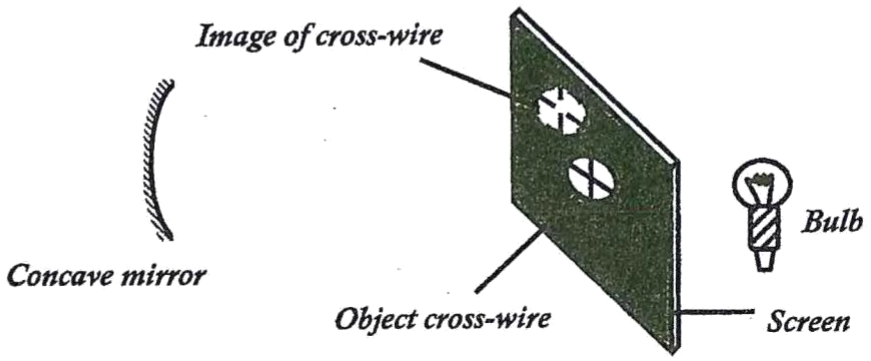

Figure 4

Determine the distance between the mirror and the screen. **(1 mark)**

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7. In a house, there is a cooker rated 6 *k*W. The mains potential is 240 V and the fuses available are 35 A, 30 A, 15 A, and 13 A. Determine the fuse that would be suitable for the cooker. **(3 marks)**

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8. When X – rays are passed above the cap of a positively charged electroscope it is observed that the leaf divergence decreases. Explain this observation. **(2 marks)**

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9. Several 200 Ω carbon resistors are to be connected in a circuit so that a current of 2 A flows from a 50 V source. Determine how many resistors are required. **(3 marks)**

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10. **Figure 5** shows part of a wiring circuit for a house.

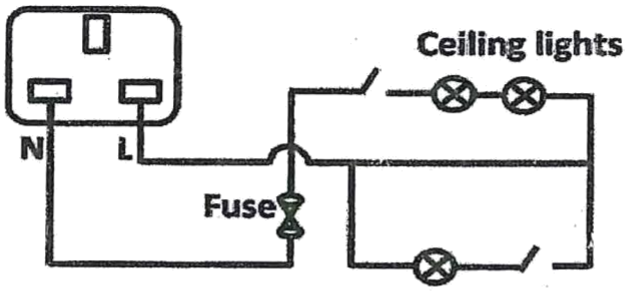

Figure 5

Correct two faults made in the wiring. **(2 marks)**

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11. The current of electrons hitting the screen of a C.R.O. is 15 mA. Given that the charge of one electron is $1.6 \times 10^{-19}C$, determine the number of electrons that hit the screen per second. **(2 marks)**

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12. **Figure 6** shows an electromagnetic spectrum in the increasing order of wavelength from X to Y.

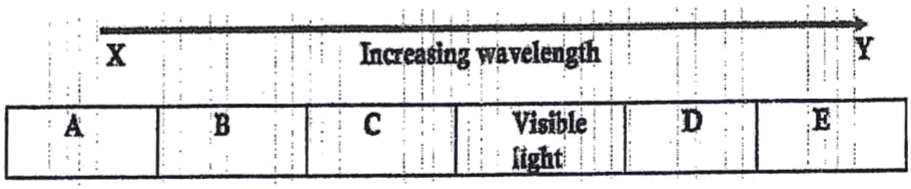

Figure 6

(a) Identify the region of the spectrum labeled C. **(1 mark)**

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(b) Give one similarity between the spectrum labeled B and the visible light. **(1 mark)**

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13. Give a reason why electrical power is transmitted over long distances at high voltage. **(1 mark)**

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SECTION B (55 Marks)

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

14. (a) State what is meant by thermionic emission. **(1 mark)**

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(b) **Figure 7** shows a beam of cathode rays entering the space between two charged metal plates. Continue the dotted line to show the path of the cathode rays as they travel between the plates and into the space beyond the plates. **(1 mark)**

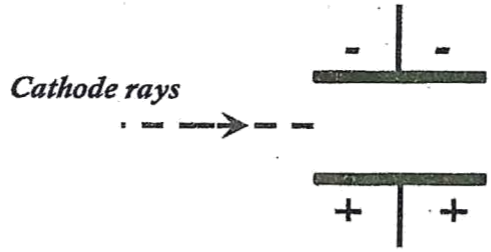

Figure 7

(c) **Figure 8** shows a cathode ray tube of a cathode ray oscilloscope (C.R.O).

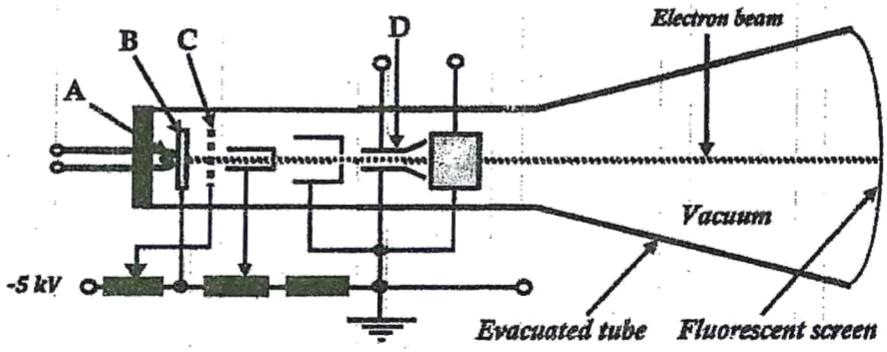

Figure 8

(i) Name the parts labeled **A** and **D**. **(2 marks)**

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(ii) What property does the part labeled **B** have for its efficient functioning. **(1 mark)**

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(iii)State the function of the part labeled **C**. **(1 mark)**

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(b) **Figure 10** shows a ray of light travelling from water towards its interface with air. The critical angle, C, of water is 49°.

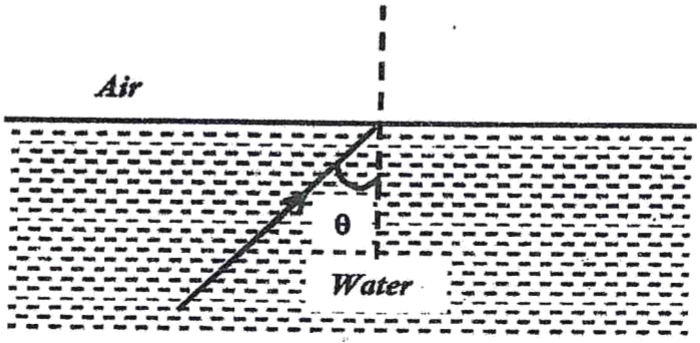

Figure 10

(i) Sketch the path of the ray on the diagram above after striking the interface at;

I. An angle of incidence, $\theta = C$. Label the ray as R_1. **(1 mark)**

II. An angle if incidence, $\theta > C$. Label the ray as R_2. **(1 mark)**

(ii) Calculate the absolute refractive index, n, of water. **(3 marks)**

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(b) A student struck the prongs of a tuning fork against a hard surface in the laboratory. The prongs vibrate producing a longitudinal wave passing through air as shown in the **Figure 11**.

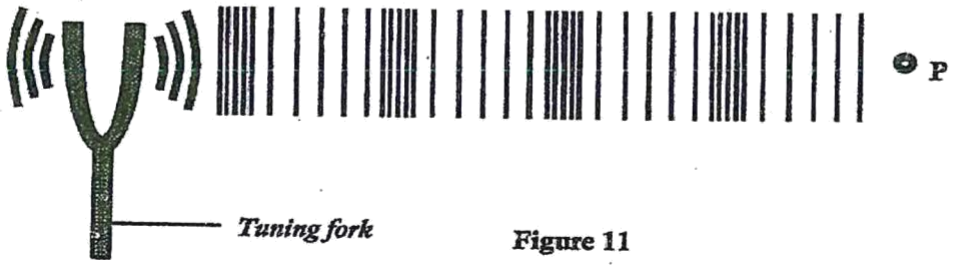

Figure 11

(i) Label compression and rarefaction regions on the longitudinal wave. **(1 mark)**

(ii) Using a line with a double arrow, indicate on the diagram a distance **d** equal to one wavelength of the wave. **(1 mark)**

(iii) On the diagram, show with an arrow the direction of motion of the air particle **P** as the waves pass. **(1 mark)**

(c) State one advantage of optical fibre cable over conventional copper cables as used in telecommunication. **(1 mark)**

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16. (a) **Figure 12** shows ammeters and resistors connected to a battery of e.m.f 15.0 V and negligible internal resistance.

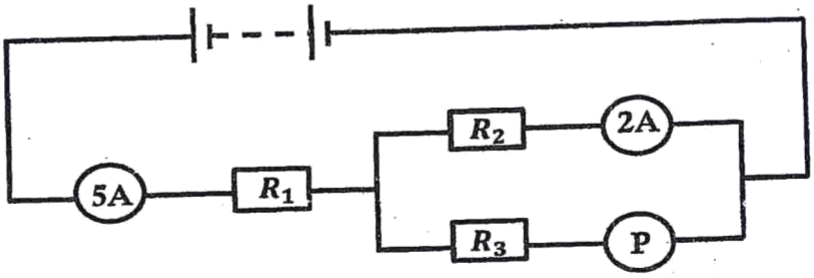

Figure 12

(i) Find the reading of the meter P. **(1 mark)**

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(ii) If the resistance of R_1 is 1.2 Ω, determine as shown in Fig. 1 the values of R_2. **(3 marks)**

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(b) **Figure 13** shows two charged plates P and Q one is earthed and the other is connected using a copper wire to the cap of an electroscope which was initially uncharged.

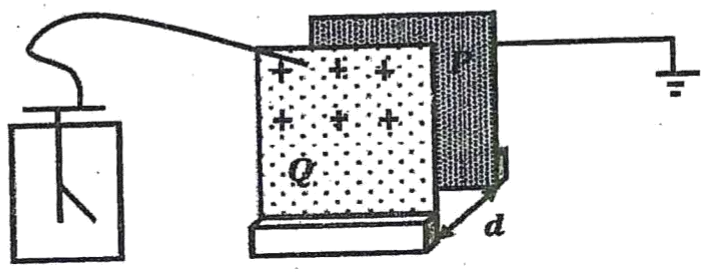

Figure 13

State what happens to the leaf of the electroscope when plate ***P*** is moved sideways while keeping plate ***Q*** and distance of separation ***d*** constant. **(1 mark)**

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(c) **Figure 14** shows a circuit where a battery of e.m.f. 4.5 V, switches A and B, two capacitors $C_1 = 0.4\ \mu F$ and $C_2 = 0.6\ \mu F$ and a voltmeter are connected.

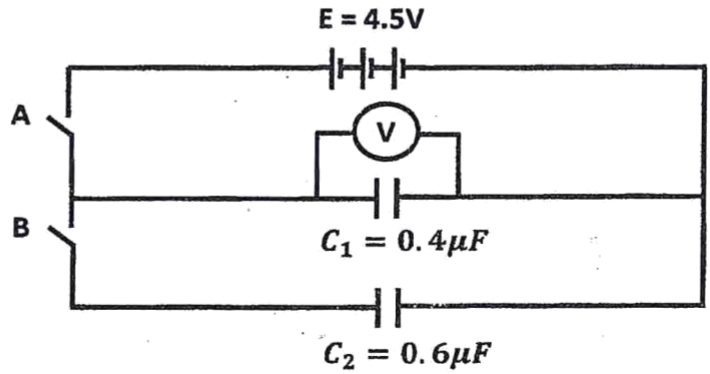

Figure 14

Determine the voltmeter reading when:

(i) Switch A is closed and switch B is open. **(1 mark)**

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(ii) Switch A is closed and opened, and then B is closed. **(3 marks)**

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(d) **Figure 15** shows a conductor C placed on a negatively charged polythene rod. Identify the charges on conductor C and sphere S when C is connected to S using a wire.

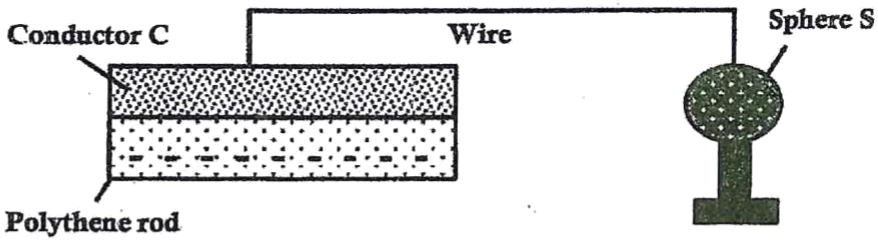

Figure 15

Conductor C..... **(1 mark)**

Sphere S: ..... **(1 mark)**

17. (a) **Figure 16** below shows a steel bolt being magnetized.

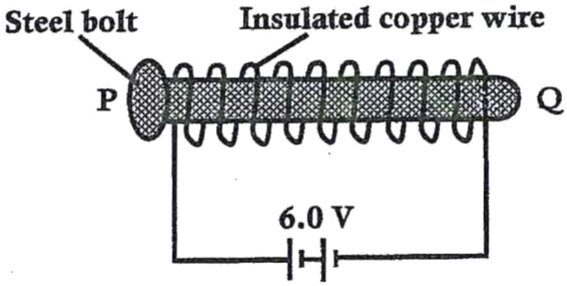

Figure 16

Identify the pole P and Q of the resulting magnet. **(1 mark)**

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(c) **Figure 17** shows an electric device running on a battery.

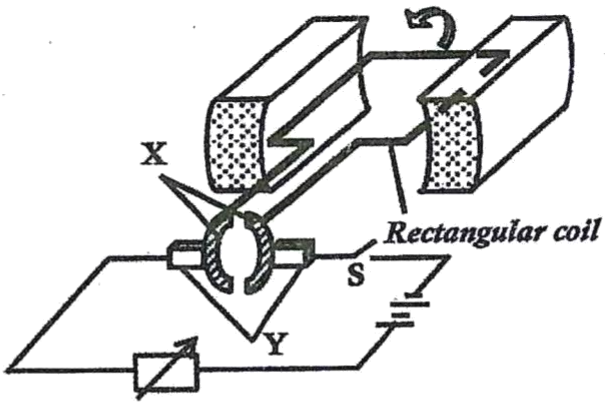

Figure 17

(i) Name the parts labelled X and Y. **(2 marks)**

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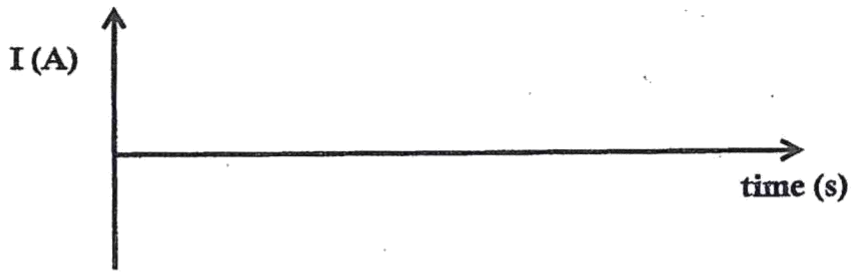
(ii) Given the direction of rotation of the coil is as shown in the diagram, indicate the poles of the magnet on the diagram. **(1 mark)**

(iii) If the battery was replaced with a copper wire, sketch on the axes below a graph of induced current against time flowing through the variable resistor if the coil is made to rotate as it is in the figure above. **(1 mark)**



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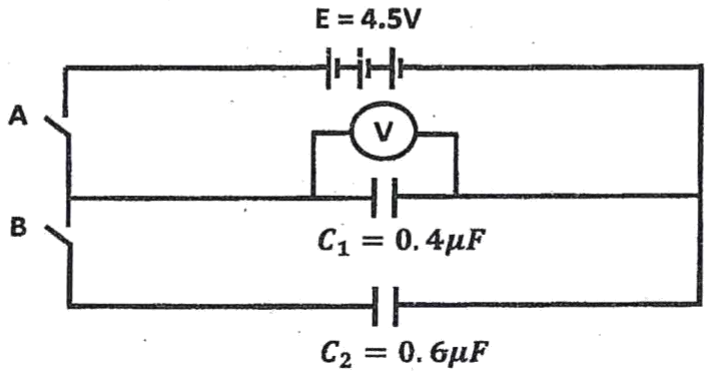

Figure 14

Determine the voltmeter reading when:

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(ii) Switch A is closed and opened, and then B is closed. **(3 marks)**

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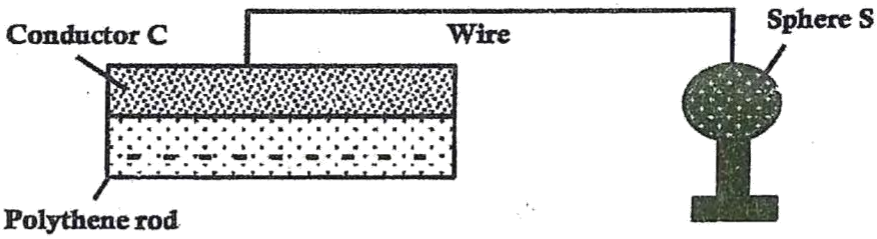

Figure 15

Conductor C..... **(1 mark)**

Sphere S: ..... **(1 mark)**

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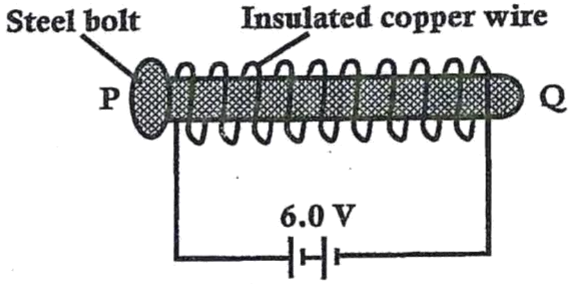

Figure 16

Identify the pole P and Q of the resulting magnet. **(1 mark)**

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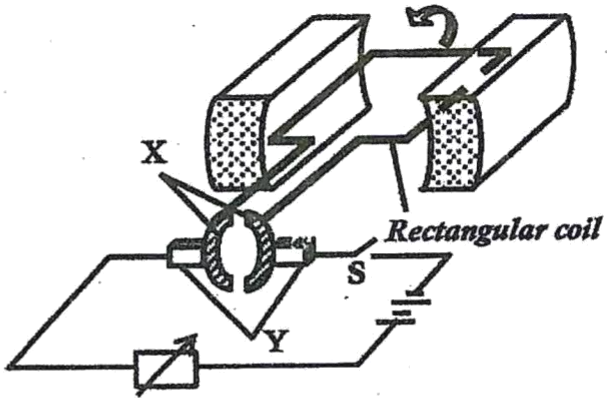

Figure 17

(i) Name the parts labelled X and Y. **(2 marks)**

.....

.....

(ii) Given the direction of rotation of the coil is as shown in the diagram, indicate the poles of the magnet on the diagram. **(1 mark)**

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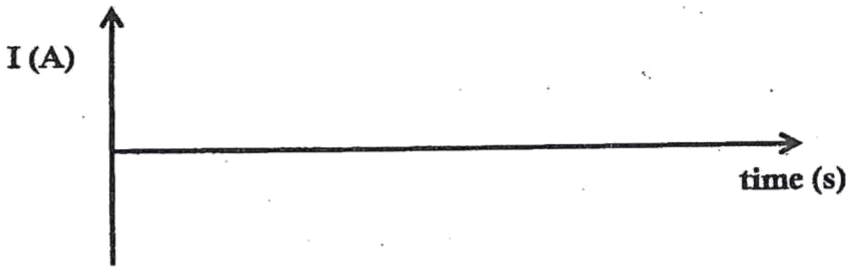

(iv) Suggest one improvement that can be made to increase the magnitude of induced current in (iii) above. **(1 mark)**

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(c) The input voltage of a transformer is 220 V and its output voltage is 12 V. When a 60 W bulb is connected across the secondary coil, the current in the primary coil is 0.32 A. Determine the efficiency of the transformer. **(3 marks)**

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(d) One of causes of energy loss in a transformer is through formation of eddy currents. State one way in which eddy currents lead to energy loss in a transformer. **(1 mark)**

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(e) **Figure 18** shows a connection to a three pin plug.

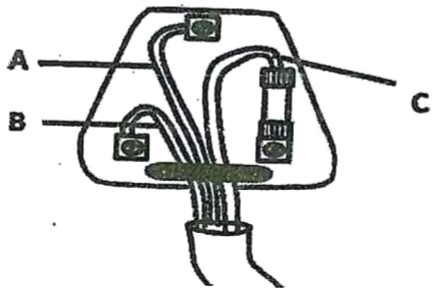

Figure 18

(i) Identify the leads labelled B and C. **(2 marks)**

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(ii) Give a reason why the pin onto which lead A is connected is normally longer than the other two pins. **(1 mark)**

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18. (a) **Figure 19** shows a human eye with a defect.

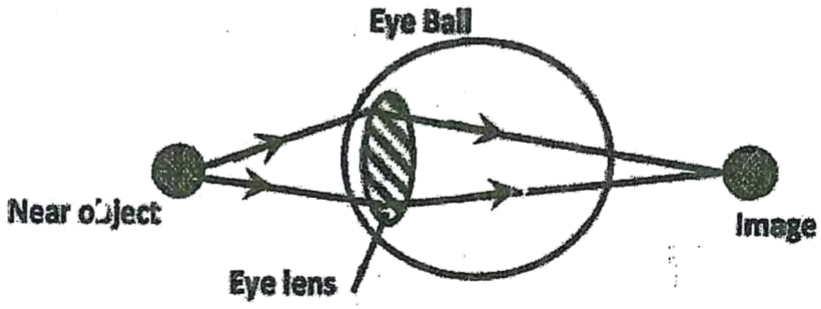

Figure 19

(i) Name the defect. **(1 mark)**

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(ii) State one possible cause of this defect. **(1 mark)**

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(b) A lens forms an image that is four times the size of the object on a screen. If the distance between the object and the screen is 150 cm, determine;

(i) State with reasons what type of lens was used. **(2 marks)**

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(ii) The focal length of the lens. **(3 marks)**

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(c) A barber holds a concave mirror a short distance from his client's face. Given that the described arrangement is as shown on **Figure 20** and the radius of curvature is 40 *cm*;

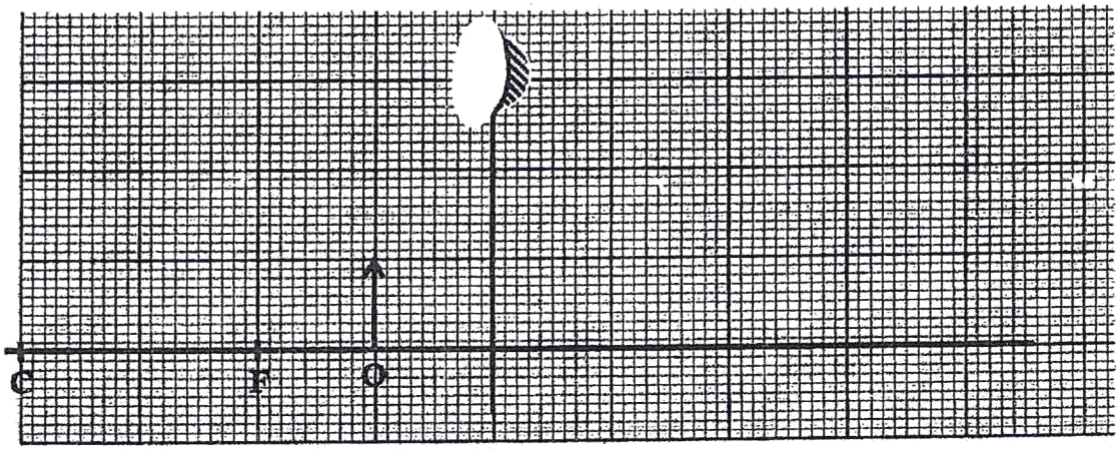

Figure 20

(i) Draw, on the same figure, a ray diagram to show the position of the image of the client's face. **(2 marks)**

(ii) Use the ray diagram to determine the magnification of image. **(1 mark)**

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