SECTION A (25 Marks)

1. State the property of light associated with formation of shadows

2. A mine worker stands between two vertical cliffs 400m from the nearest cliff. The cliffs are x metres apart. Every time he strike the rock once, he hears two echoes, the first one after 2.5 seconds, while the second follows 2 seconds later. Calculate:

   i) The speed of sound in air.

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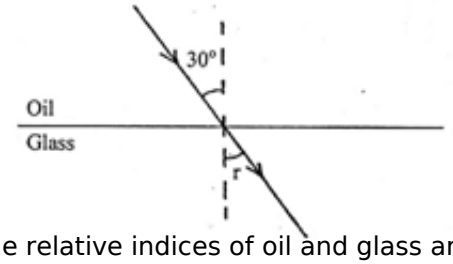
   .....

   ii) The value of x

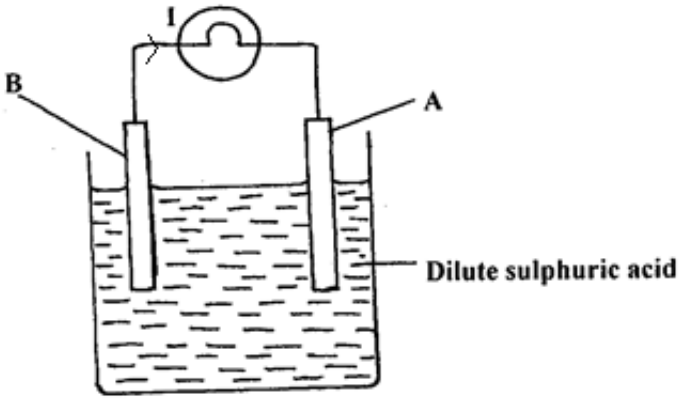
3. The coil of an electric motor is usually wound on a soft iron armature. State the purpose of soft iron armature.

4. The diagram below shows a ray of light incident on a glass –oil interface.



   If the relative indices of oil and glass are 6/3 and 3/2 respectively, determine the value of r.

5. The figure shows a simple cell.



   Use the information on the figure to answer the questions below.

   a) Name the metals labeled A and B.

   A.....

b) It is observed that the bulb goes off after a short time. Explain this observation.
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6. State one advantage of using optical fibres in communication.

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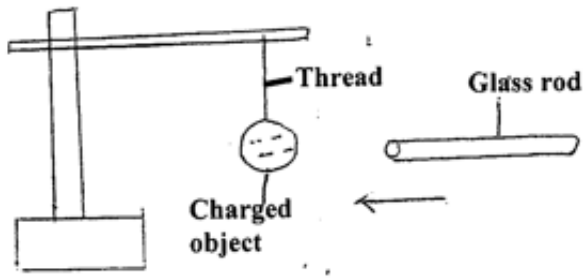
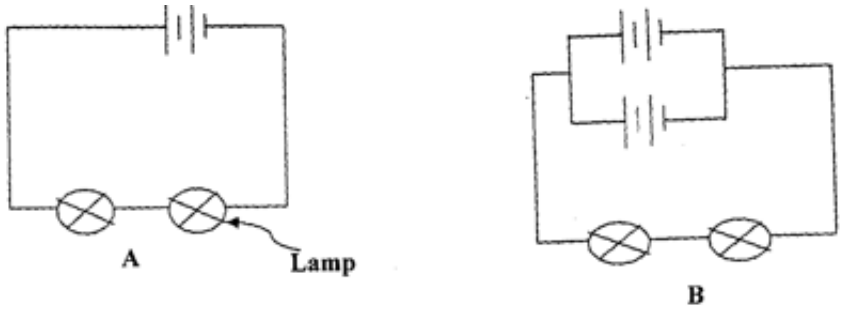
7. Figure below shows a negatively charged object suspended using a thread. A glass rod was rubbed using a woolen cloth until it is heavily charged and then brought closer to the object.



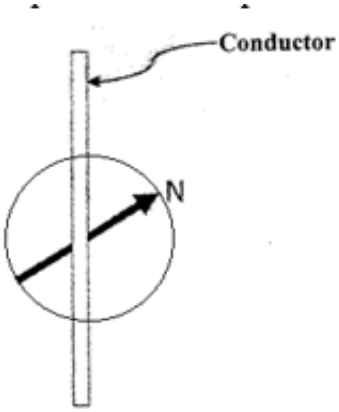
State the observation made when a rubbed glass rod is brought closer to the object

8. In the figure below the lamps in the two circuits A and B are identical and the cells have the same electromotive force



Explain why the lamps in B mays glow brighter than those in A when the circuits are closed at the same time

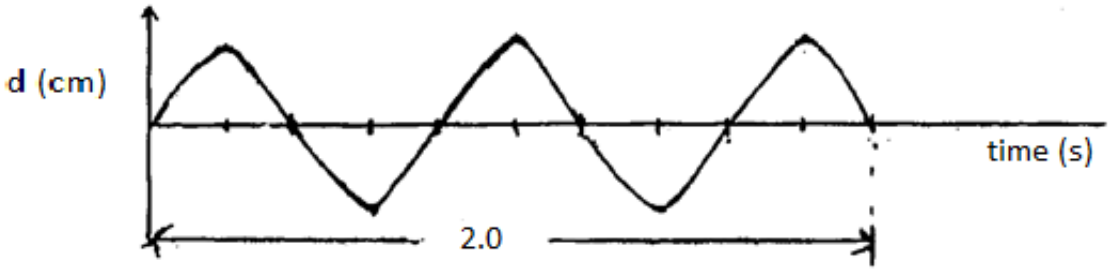
9. a) A compass needles is placed below a currents carrying conductor as shown below.



Indicate on the conductor the direction of the current.

b) State the difference a soft magnetic material and hard magnetic material

10. The figure below shows a wave pattern



a) Determine the periodic time.

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b) Hence calculate the frequency of the wave.

11. By use of diagrams illustrate how a convex mirror provides a wider field of view than a plane mirror for the same angle of view.

Answer all the questions in this section

12. . a) State the basic law of magnetism.

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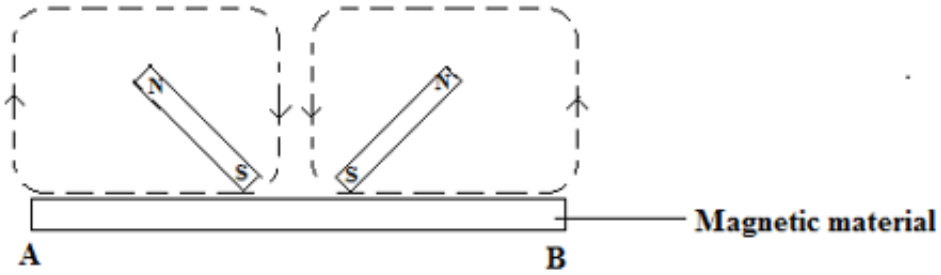
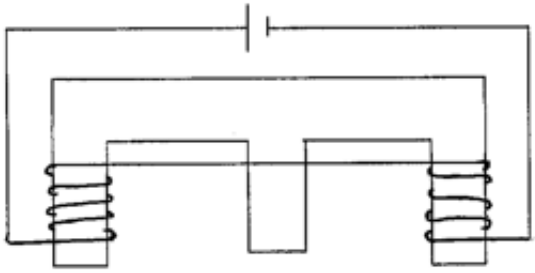
b) In an attempt to make a magnet, a student used the double stroke method as shown:



State the polarities at the ends A and B.

A.....
B.....

c) The figure below shows an E shaped steel block being magnetized by a current through two coils in series

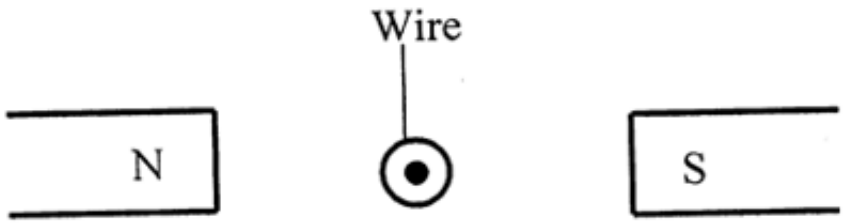


. On the figure, indicate i) The north and south poles of the resulting magnet.

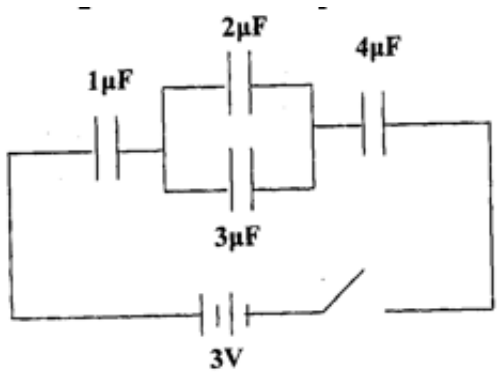
ii) The complete magnetic field pattern between the poles.

iii) Give two factors which affect the strength of the electromagnet.

d) A wire carrying current is placed in a magnetic field as shown below. Indicate on the diagram the resultant magnetic field and the direction of the force.



13. a) The figure below shows an arrangement of four capacitors connected to a 3.0V power supply.



Calculate:

i. The effective capacitance

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ii. The charge stored by the 3μF capacitor.

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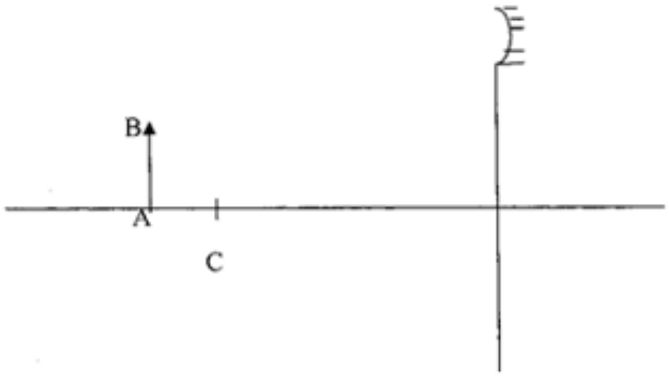
b) Describe how you would charge a gold leaf electroscope positively by induction using a negatively charged rod.

14. a) The figure below shows an object AB placed in front of a converging mirror. C is the centre of curvature of the mirror



Using a ray diagram, locate the position of the image of AB as reflected by the mirror.

b) A convex mirror of focal length 10cm forms an image 5cm from the mirror. By calculation, determine the position of the object from the mirror.

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c) i) State two conditions necessary for total internal reflection to take place.

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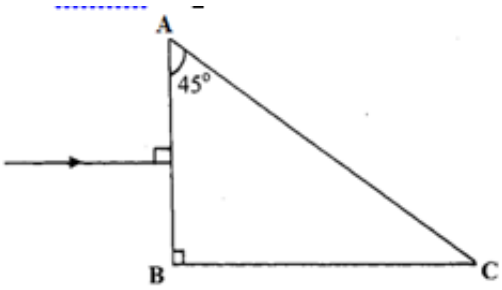
ii) Show on the diagram the path of the incident ray after striking AB of glass prism whose critical angle is 420



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15. a) State Ohm's law

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b) A wire was connected to a battery and it was found that the energy converted to heat was 30J when 20C of charge flowed through the wire in 5 seconds. Calculate; i) The p.d between the ends of the wire.

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ii) the current flowing through the wire.

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iii) the resistance of the wire

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v) the average power development in the wire.

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c) The graph below shows results obtained in an experiment to determine the e.m.f (E) and the internal resistance, r, of a cell.

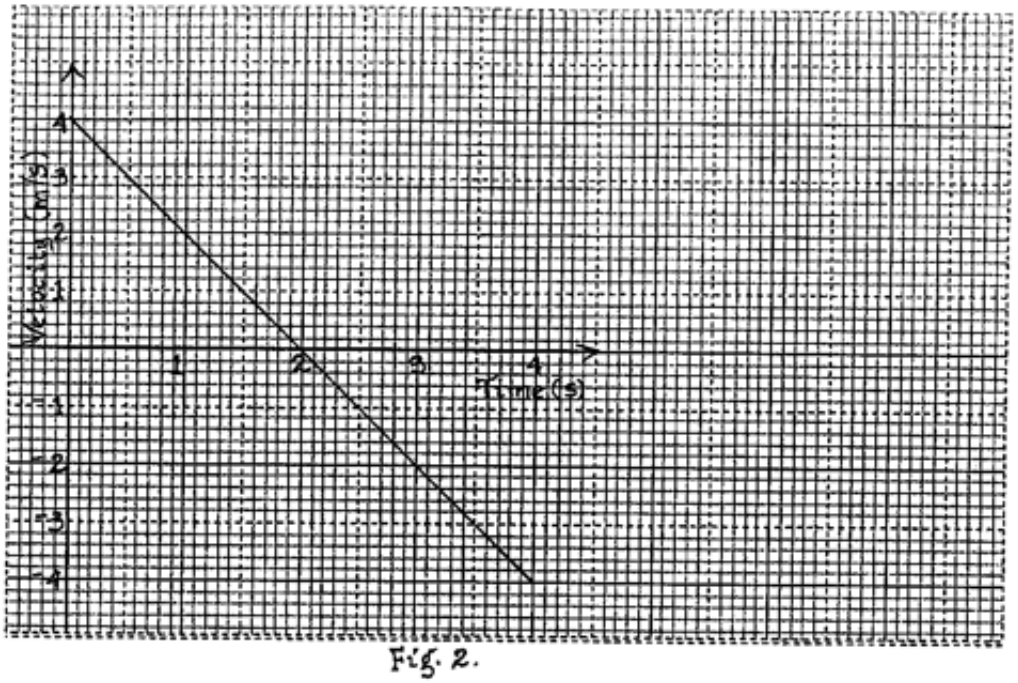

Fig. 2.

Given that the equation of the graph is

$$\frac{E}{V} = \frac{r}{R} + 1$$

Use the graph to determine the values of:-

i) E

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ii) r

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16. a) (i) Distinguish between diffraction and refraction of waves. (1mark)

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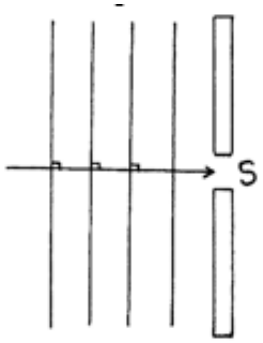
(ii) Complete the diagram below to show the pattern after the slit S.



b) Figure below shows two speakers S1 and S2 of same specifications placed at a distance d apart sending signals of same frequency.

i) Explain the observation made when an observer walks along OO_1

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ii) If the observer was to move along XY, what would be his observation?

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iii) Explain your answer in (ii) above.

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..... c) State two conditions for the waves to be coherent. (2marks) .....