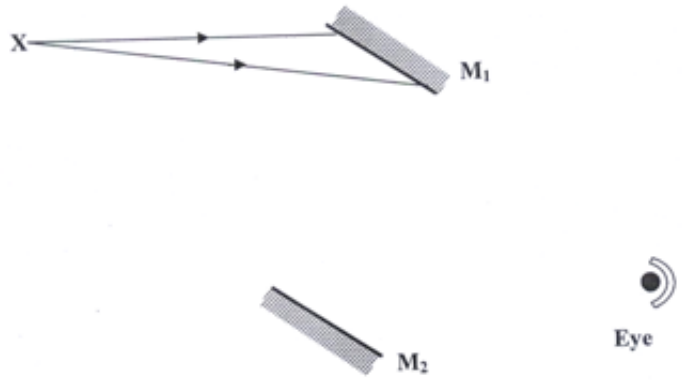
SECTION A (25 Marks)

1. The figure below shows an object X being viewed using two inclined mirrors MI and M2.



Complete the diagram by sketching rays to show the position of the image as seen by the eye.

2. An un magnetized steel rod is clamped facing North - South direction of the earth's magnetic field and hammered several times. When tested, it is found to be magnetized. Explain this observation.

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3. Briefly explain why a guitarist always tunes his guitar whenever there is a change in temperature.

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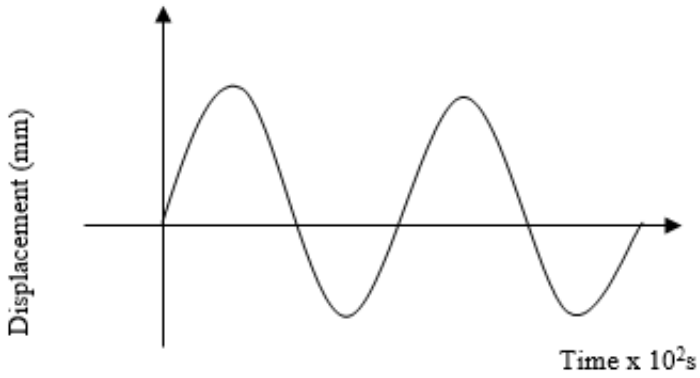
4. The diagram below shows a displacement – time graph for a wave.



Determine the frequency of the wave.

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5. The audible frequency range of a certain person is between 30Hz and 16000Hz. Determine the least wavelength of sound in air that the person can detect. (speed of sound in air is 340m/s)

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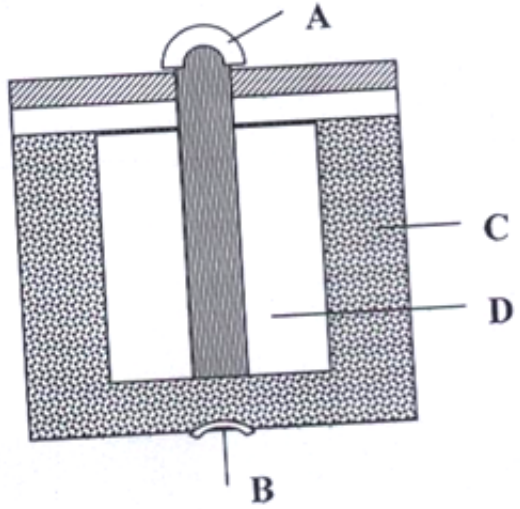
6. The figure below shows the features of a dry cell.



i) State the polarities of the parts labeled A and B

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ii) Name the chemical substance in the parts labeled C and D.

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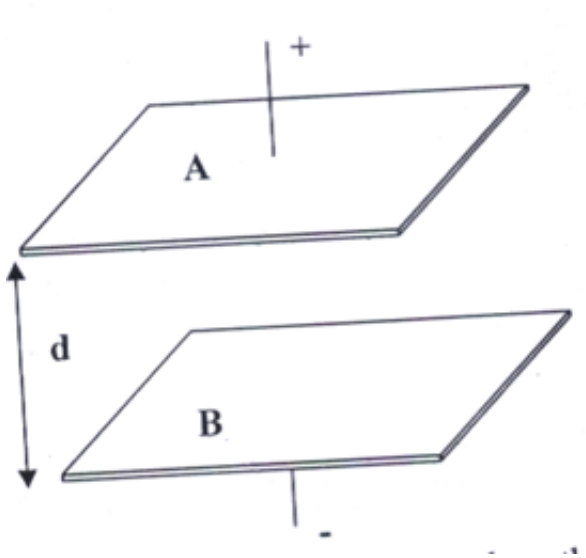
7. The figure below represent two parallel plates of a capacitor separated by a distance ‘d’. Each area has an area of ‘A’ square units.



Suggest two adjustments that can be made so as to reduce the effective capacitance.

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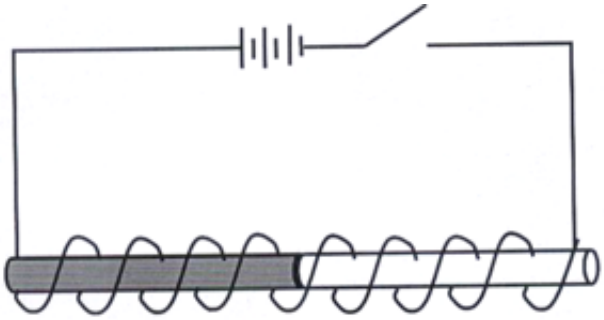
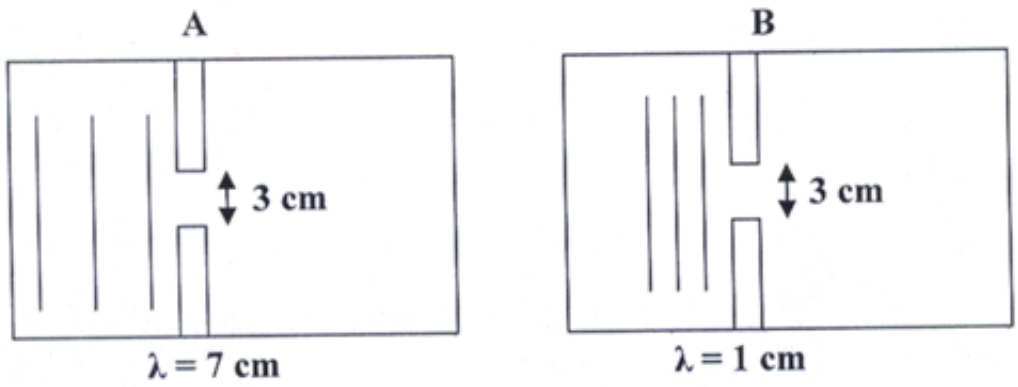
8. The set up below shows two metal rods made of steel and iron materials joined together. Given two nails, briefly explain how you would distinguish between the iron and steel rods.



9. The figure below shows water waves of different wavelengths incident on apertures A and B.



Complete the diagram to show the pattern of the waves beyond the aperture in each case.

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10. An object placed in front of a convex lens of focal length 10cm produces an image at a distance of 15cm from the lens on the same side as the object. Determine the position of the object.

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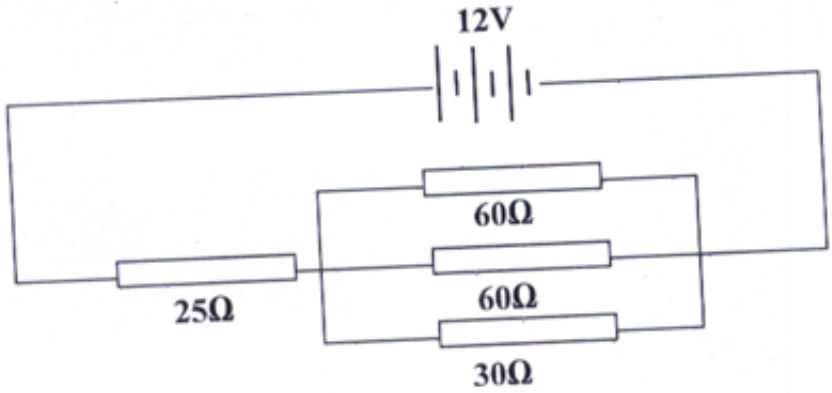
SECTION B (55 Marks)

11. The diagram below shows four resistors connected in a circuit.



Determine:

a) The effective resistance in the circuit.

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b) The potential difference across the 25Ω resistor.

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c) The current through the 30Ω resistor.

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d) Given that the 25Ω resistor has a length 0.4m and a cross section area of $5.0x10^{-6}m^2$, find the resistivity of the material from which it is made.

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12. a) Given a bar magnet, an iron bar and a string, briefly describe an experiment that will enable you to distinguish between the magnet and the iron bar.

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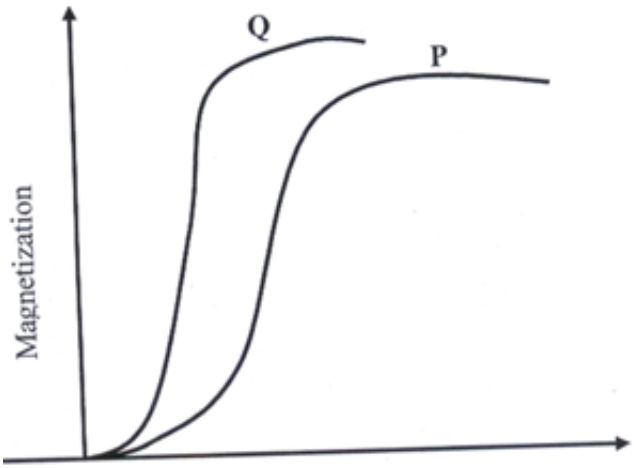
b) In an experiment to magnetize two substances P and Q using an electric current, the following graphs were obtained.



i) Use the domain theory to explain the shape of the graphs.

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ii) Explain the difference between the substances P and Q.

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13. a) Define capacitance of a parallel plate capacitor.

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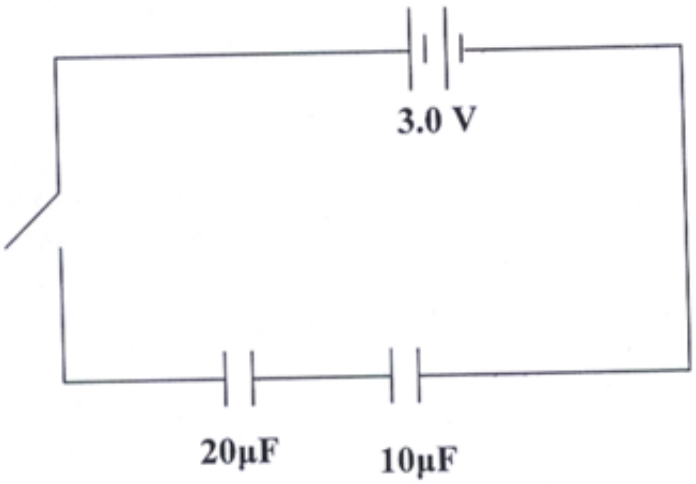
b) The circuit below shows two capacitors connected in series with a 3.0V battery.



Determine:

i) The total charge stored in the combination when the switch is closed.

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ii) The potential difference across the $10\mu F$ capacitor.

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c) Three resistors of values $20\Omega, 40\Omega$ and 60Ω are connected together in a circuit. Draw a diagram to show how the arrangement of the resistors can give:

i) an effective resistance of 30Ω:

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ii) minimum resistance

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14. a) An object is placed 5cm in front of a concave mirror of focal length 10cm.

Use a ray diagram to determine:

i) the image position

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ii) the magnification

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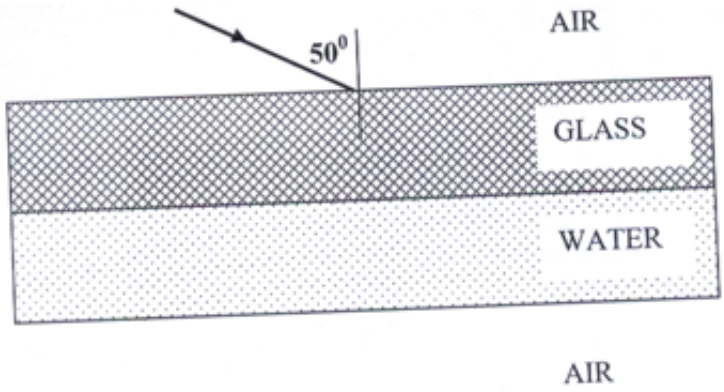
b) A ray of light is incident on an Air- Class – Water boundary at an angle of 500 as shown in the diagram below.



i) Complete the diagram until the ray emerges into air.

ii) Given that the refractive index of water is 4/3 while that of glass is 3/2,

determine the angle of refractive between the Glass –Water boundary.

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c) State two applications of total internal reflection of light.

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15. a) State the meaning of the term 'principal focus' as applied to concave lenses.

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b) A lens forms an image that is four times the size of the object on a screen. The distance between the object and the screen is 100cm when the image is sharply focused. Calculate the focal length of the lens.

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c) In an experiment to determine the focal length of a converging lens, the following readings were obtained.

Image distance v(cm)	13.	15.0	16.7	20.0	30.0
Magnification m	0.3	0.5	0.7	1.0	2.0

i) Plot a graph of m against v on the graph paper below

ii) From the graph, determine the focal length of the lens