

FORM 3 DECEMBER HOLIDAY ASSIGNMENT
(2020)

Answer all the questions in this section.

1. Figure 1 shows the image formed in a plane mirror as seen by an observer.

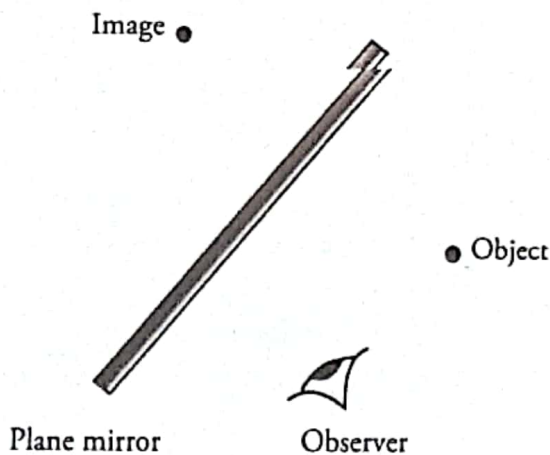


Figure 1

Complete the diagram to locate the object and draw rays to show how the observer is able to see the image.

(2 marks)

2. Give one difference and one similarity between a dry cell and a capacitor. (2 marks)
3. A current 12.5 A flows through a heating element of resistance 9.5Ω for 2.5 minutes . Calculate the quantity of heat produced. (3 marks)
4. Distinguish between soft and hard magnetic materials. (1 mark)
5. A negatively charged rod is brought near the cap of a lightly positively charged electroscope. State the observation as the rod is brought nearer the electroscope. (1 mark)
6. Why do prisms disperse white light into the component colours? (1 mark)
7. A charge of magnitude $14 \times 10^3 \text{ C}$ flows through a point in 12 minutes . Calculate the current passing through the point. (3 marks)
8. Figure 2 shows path of ray of a monochromatic light through a glass prism. The refractive index of the prism material for the light is 1.60 . Determine the speed of the light through the material. (Speed of light in vacuum = $3.0 \times 10^8 \text{ m/s}$) (3 marks)

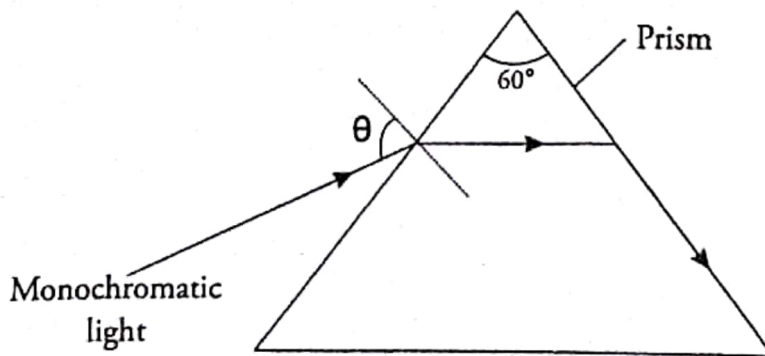


Figure 2

9. Use ray diagram to show how a concave mirror forms a magnified real image.

(2 marks)

10. In the dry cell, carbon powder mixed with manganese dioxide is packed round the carbon anode. What is the purpose of the carbon powder? (1 mark)
11. Calculate the quantity of heat supplied by a heating element of resistance 85Ω if a current of 2.5 A flows through it for 3 minutes. (3 marks)
12. Figure 1 show the loose turns of a conductor coil connected to a power source through a switch.

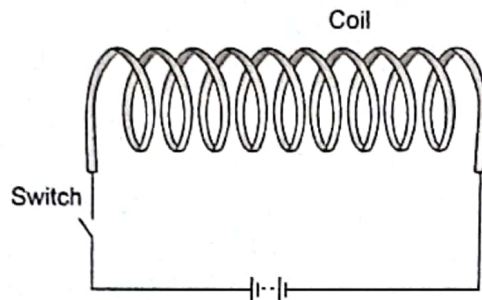


Figure 1

When the switch in the circuit is switched on and current flows through the coil, the turns of the coil are observed to come closer together. Explain why. (3 marks)

13. When a conductor is brought close to the cap of a charged electroscope, the electroscope leaf divergence decreases. Explain this observation. (2 marks)
14. Figure 2 shows a bulb connected to two dry cells.

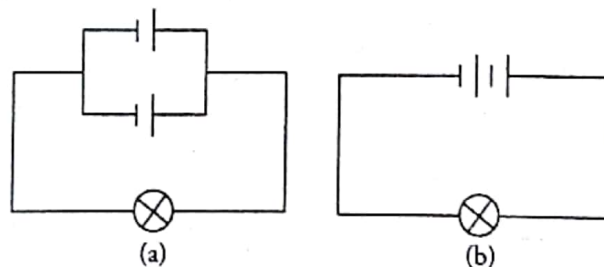


Figure 2

In which of the two circuits does the bulb light for a longer time. Explain your answer. (2 marks)

State two ways in which local action is considered a defect in an electric cell. (2 marks)

15. Figure 3 shows a conductor coil is placed between the poles of a magnet.

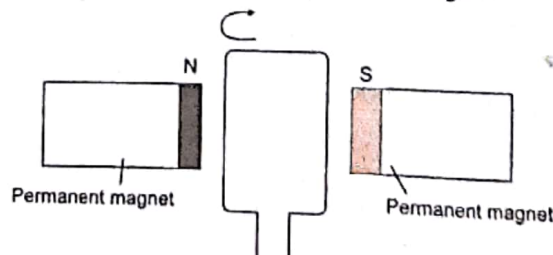


Figure 3

If the coil rotates in the clockwise direction, show on the diagram, the direction of flow of current in the coil. (1 mark)

- 16 Draw a transverse wave showing two wavelengths in a grid diagram. (2 marks)
- 17 Given that the length of the wave train is 6 m and that the wave covers this distance in 0.6 s, calculate
 a) The velocity (2 marks)
 b) The frequency of the wave (2 marks)
- (Use the information in question number 9 to answer questions 10 and 11.)
- 18 On the same diagram in **question 8**, show the wave covering the same distance with double the wavelength. (1 mark)
- 19 If the velocity of the wave remains constant, determine the new frequency. (2 marks)
- 20 Explain why sound waves cannot travel through a vacuum. (2 marks)

Section B: (55 marks)

Answer all the questions in this section.

21. a) State one factor which determines the velocity of sound in air. (1 mark)
- b) **Table 1.1** shows data collected by a ship studying an underwater rock formation using sound waves directed into the water and then reflected back to the ship. The time taken by the reflected waves was determined at various distances from the shore.

Table 1.1

Distance from shore (m)	0	50	100	150	200	250	300	350
Time taken to receive the echo (s)	0	27.4	13.7	6.86	11.0	27.4	27.4	27.4

- i) How far away from the shore is the top of the rock formation. (1 mark)
- ii) From the data given, determine distance of the top of the formation below the water surface. (Take the velocity of sound in water = 1450 ms^{-1}) (3 marks)
- iii) Calculate the height of the rock formation above the ocean floor. (3 marks)
22. a) **Figure 4** shows two charged capacitor plate separated by a distance, **d**. The lower plate is connected to the cap of an electroscopes.

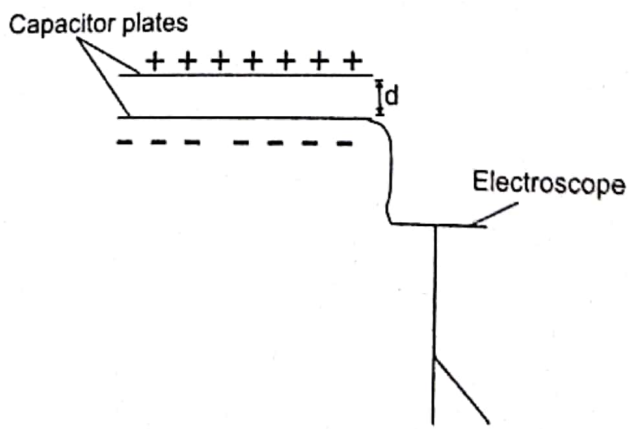


Figure 4

The distance, **d**, between the plates is now reduced. State and explain what happens to the leaf of the electroscopes. (3 marks)