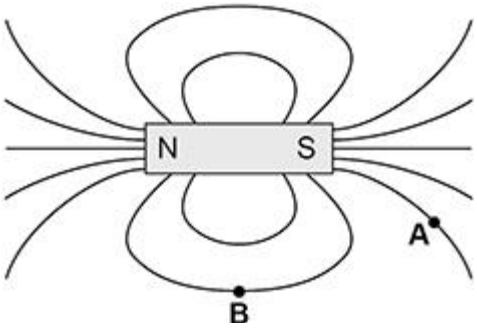
Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Q1.

Figure 1 shows the magnetic field pattern around a bar magnet.

Figure 1



(a) Draw an arrow at point **A** and point **B** to show the direction of the magnetic field at each point.

(1)

(b) A bar magnet produces its own magnetic field.

Complete the sentence.

Choose the answer from the box.

an electromagnet	**an induced magnet**	**a permanent magnet**

A bar magnet is an example of _____.

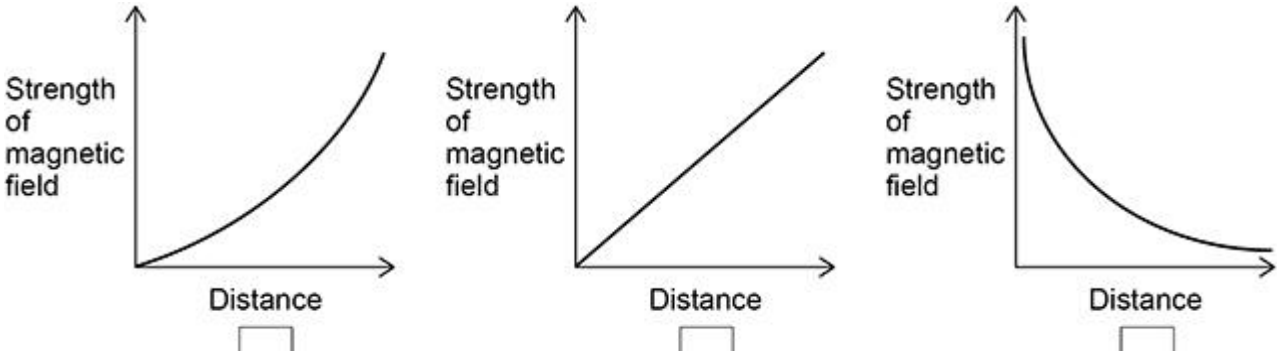
(1)

(c) Which graph shows how the strength of the magnetic field varies with distance from the bar magnet?

Give a reason for your answer.

Tick (✓) **one** box.

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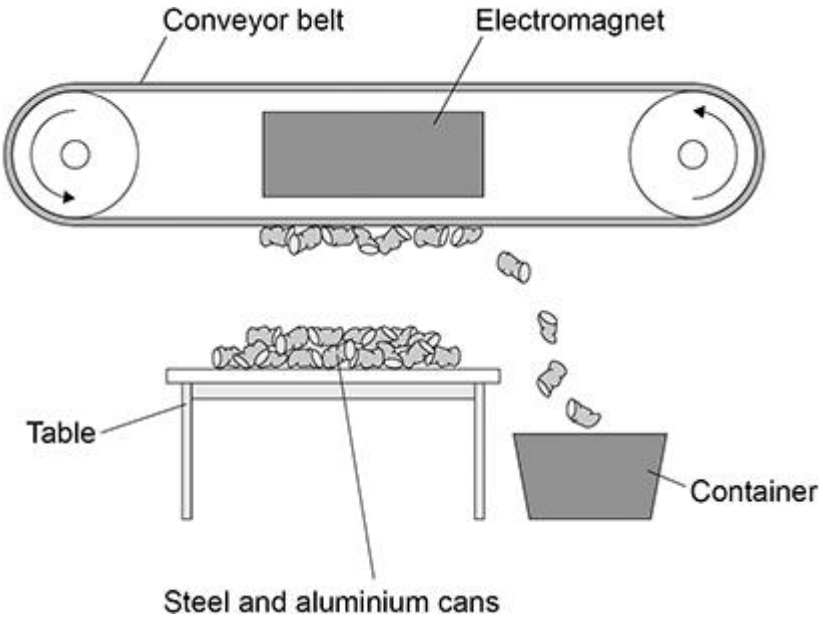
Reason _____

_____

(2)

Figure 2 shows an electromagnet being used to separate aluminium cans from steel cans.

Figure 2



(d) Explain how the electromagnet and conveyor belt are used to separate the steel cans from the aluminium cans.

_____

_____

_____

_____

(2)

(e) At the top of the table the strength of the magnetic field is only just enough to pick the cans up.

Describe **two** ways to increase the strength of magnetic field at the top of the table.

1 _____

_____

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2 _____

_____

(2)

(f) Write down the equation which links distance travelled (*s*), speed (*v*) and time (*t*).

_____

(1)

(g) The conveyor belt moves a can at a speed of 1.7 m/s.

Calculate the time taken to move the can 3.3 m at this speed.

Give your answer to 2 significant figures.

_____

_____

_____

_____

_____

Time taken (2 significant figures) = _____ s

(4)

(Total 13 marks)

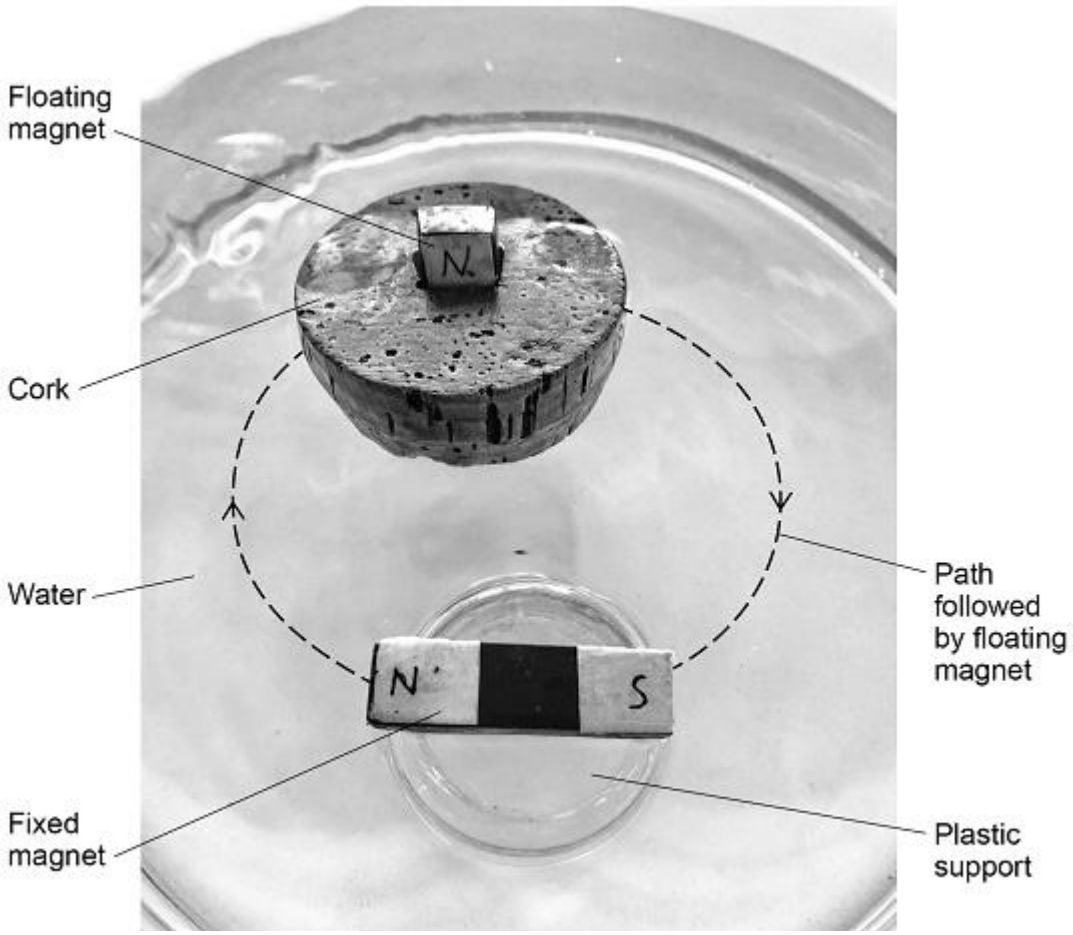
Q2.

A student placed a magnet on top of a plastic support in a bowl of water. This magnet was fixed in position and above the surface of the water.

The student put a second magnet into a piece of cork so that the magnet floated on the water. Only the north pole of the floating magnet was above the surface of the water.

The photograph below shows the arrangement of the magnets.

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(a) The floating magnet was placed near to the north pole of the fixed magnet. The floating magnet then moved along the path shown in the photograph.

Explain why.

_____

_____

_____

_____

(2)

(b) The student replaced the floating magnet with a piece of iron.

What happened to the piece of iron?

_____

_____

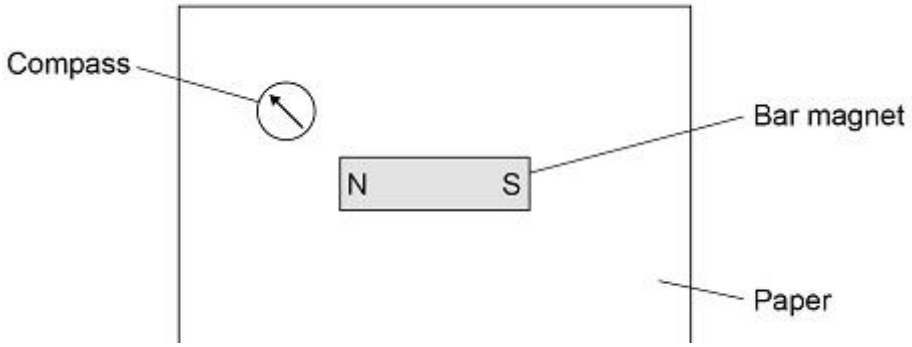
(1)

(c) Describe how to use a compass to plot the magnetic field pattern around a bar magnet.

Use **Figure 1** to help you.

Figure 1

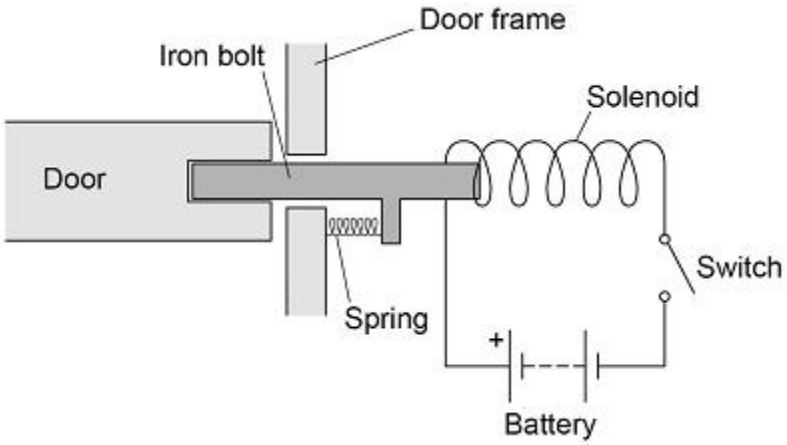
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(4)

Figure 2 shows a diagram of an electromagnetic lock used to secure a door.

Figure 2



(d) **Figure 3** shows an incomplete sequence of how the door unlocks.

Figure 3



Write **one** letter in each box to show the correct sequence.

A The iron bolt moves.

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B A magnetic field is created around the solenoid.

C There is a current in the circuit.

(2)

(e) The electromagnetic lock contains a spring.

When the door is unlocked the extension of the spring is 0.040 m.

spring constant = 200 N/m

Calculate the elastic potential energy of the spring when the door is unlocked.

Use the equation:

$$\text{elastic potential energy} = 0.5 \times \text{spring constant} \times (\text{extension})^2$$

_____

_____

_____

_____

Elastic potential energy = _____ J

(2)

(Total 11 marks)

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