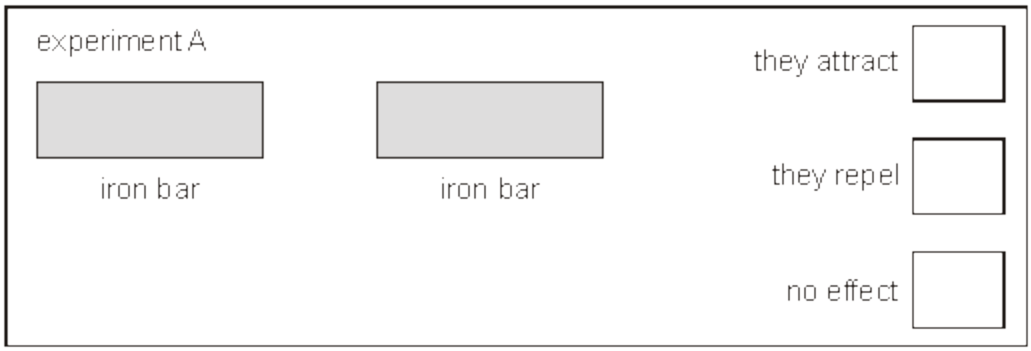
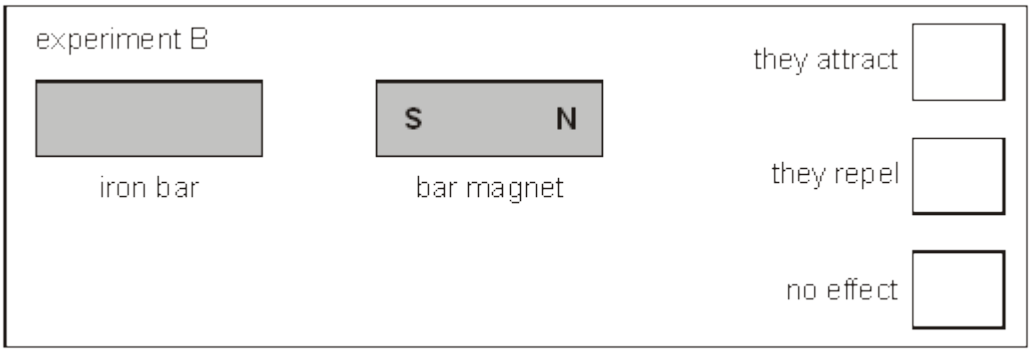
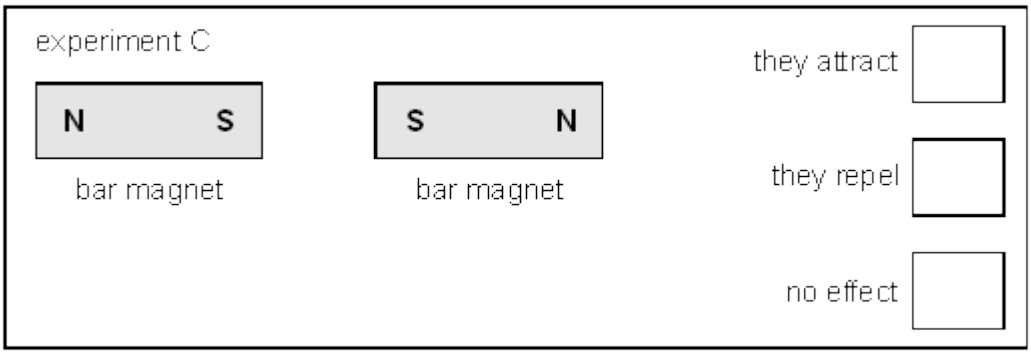
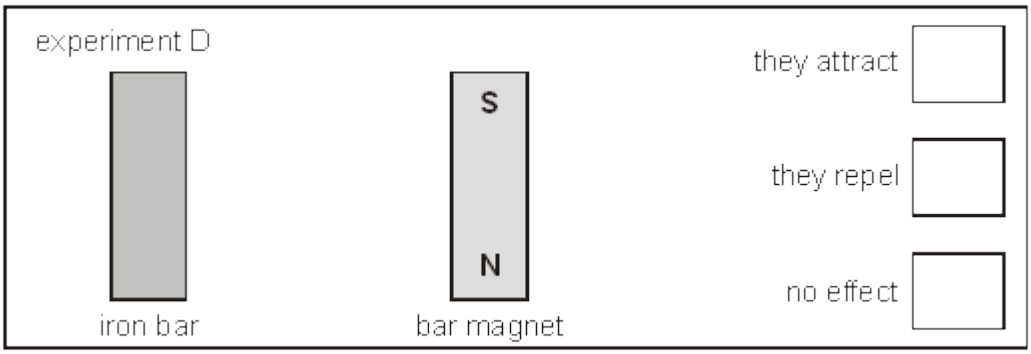
**1** A pupil does four experiments with bar magnets and small, unmagnetised iron bars.
She places them as shown below. For each experiment, tick **one** box to show the effect of the magnetic force between the two objects.



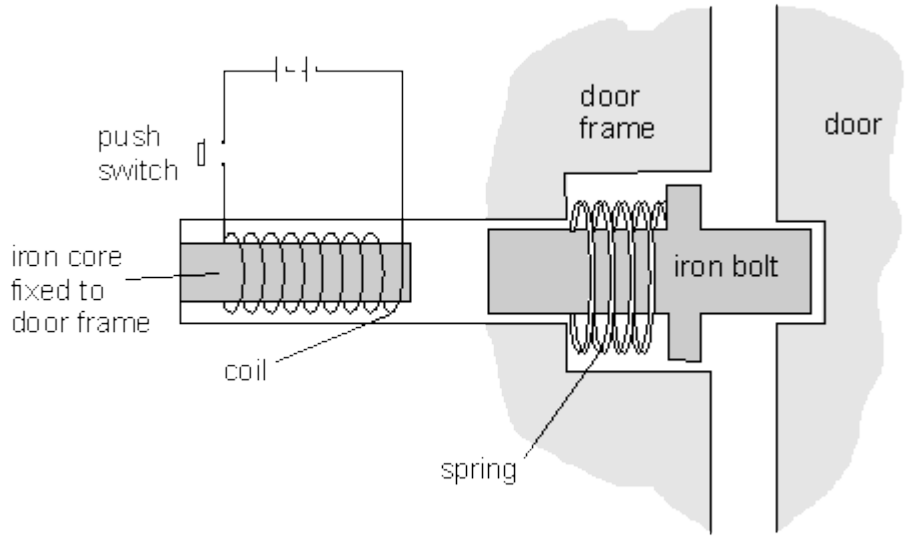




4 marks

**2** The diagram shows an electromagnet used in a door lock.




(a) The push switch is closed and the door unlocks. Explain in detail how this happens.

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.....

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3 marks

(b) The switch is released and the door locks. Explain in detail how this happens.

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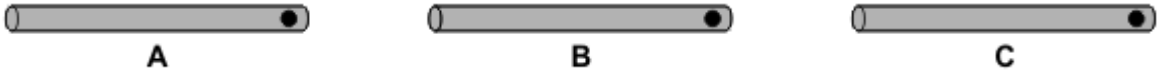
.....

.....

2 marks

Maximum 5 marks

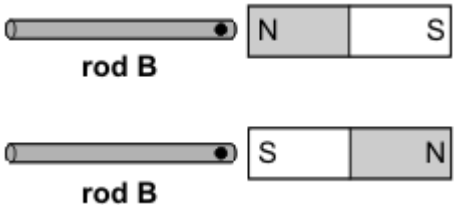
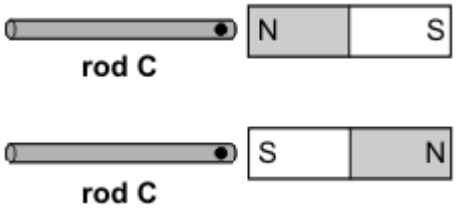
**3** Hannah has three rods (A, B and C) made from different metals.
One rod is a **magnet**; one is made of **copper**; and one is made of **iron**.
She does not know which rod is which.




Each rod has a dot at one end.

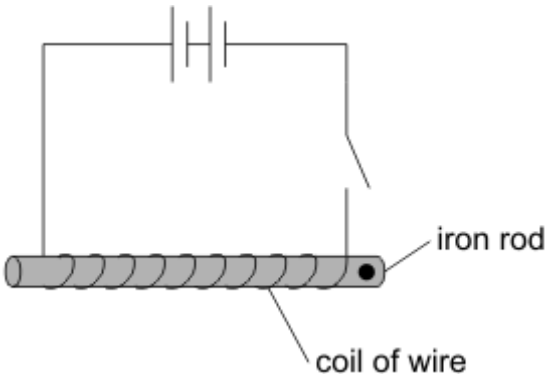
(a) Hannah uses **only** a bar magnet to identify each rod.
She puts each pole of the bar magnet next to the dotted end of each rod.

Complete Hannah's observations in the table below.
Write if each rod is **copper**, **iron** or a **magnet**.

| test | observations | type of rod |
|---|---|---|
|  | attract<br><br>attract | Rod A is<br>..... . |
|  | nothing happens<br><br>..... | Rod B is<br>..... . |
|  | attract<br><br>..... | Rod C is<br>..... . |

3 marks

(b) Hannah uses the iron rod to make an electromagnet.




When the switch is closed the iron rod becomes an electromagnet.
Give **two** ways Hannah could make the electromagnet stronger.

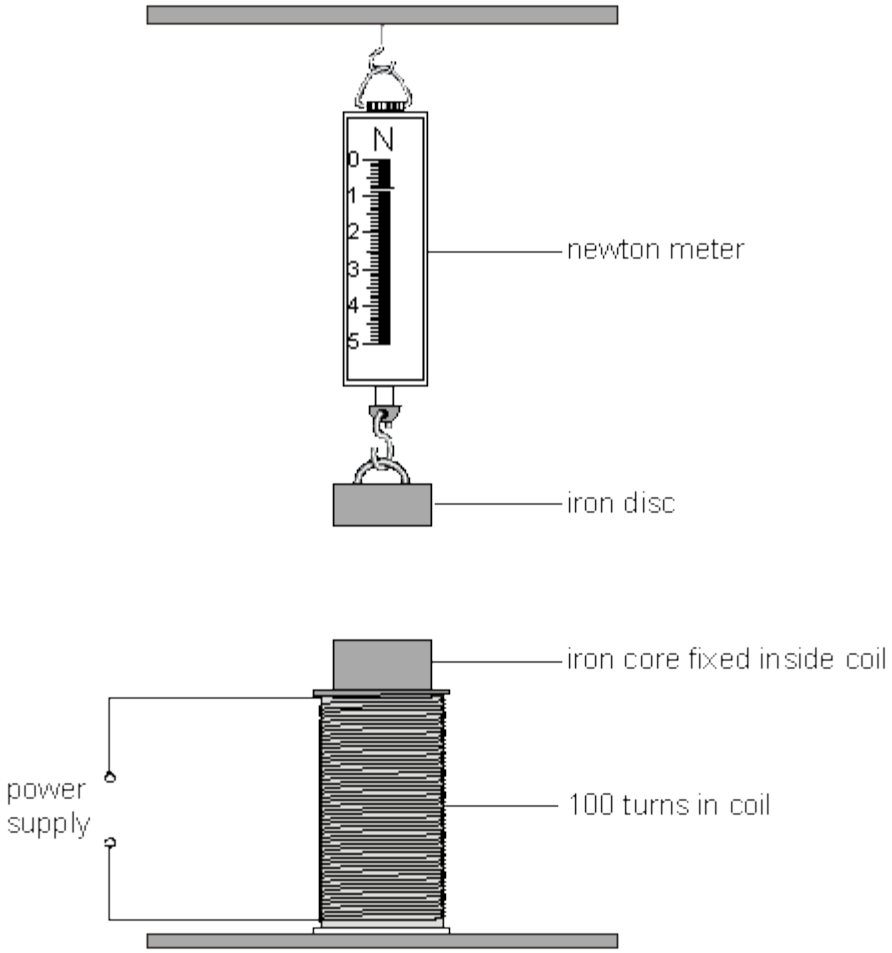
1. .....

1 mark

2. .....

1 mark
maximum 5 marks

**4** Mary used the apparatus below to test the strength of an electromagnet.
She used the reading on the newton meter to measure the force of the magnet on the iron disc.




(a) Explain why the reading on the newton meter increases when a current passes through the coil.

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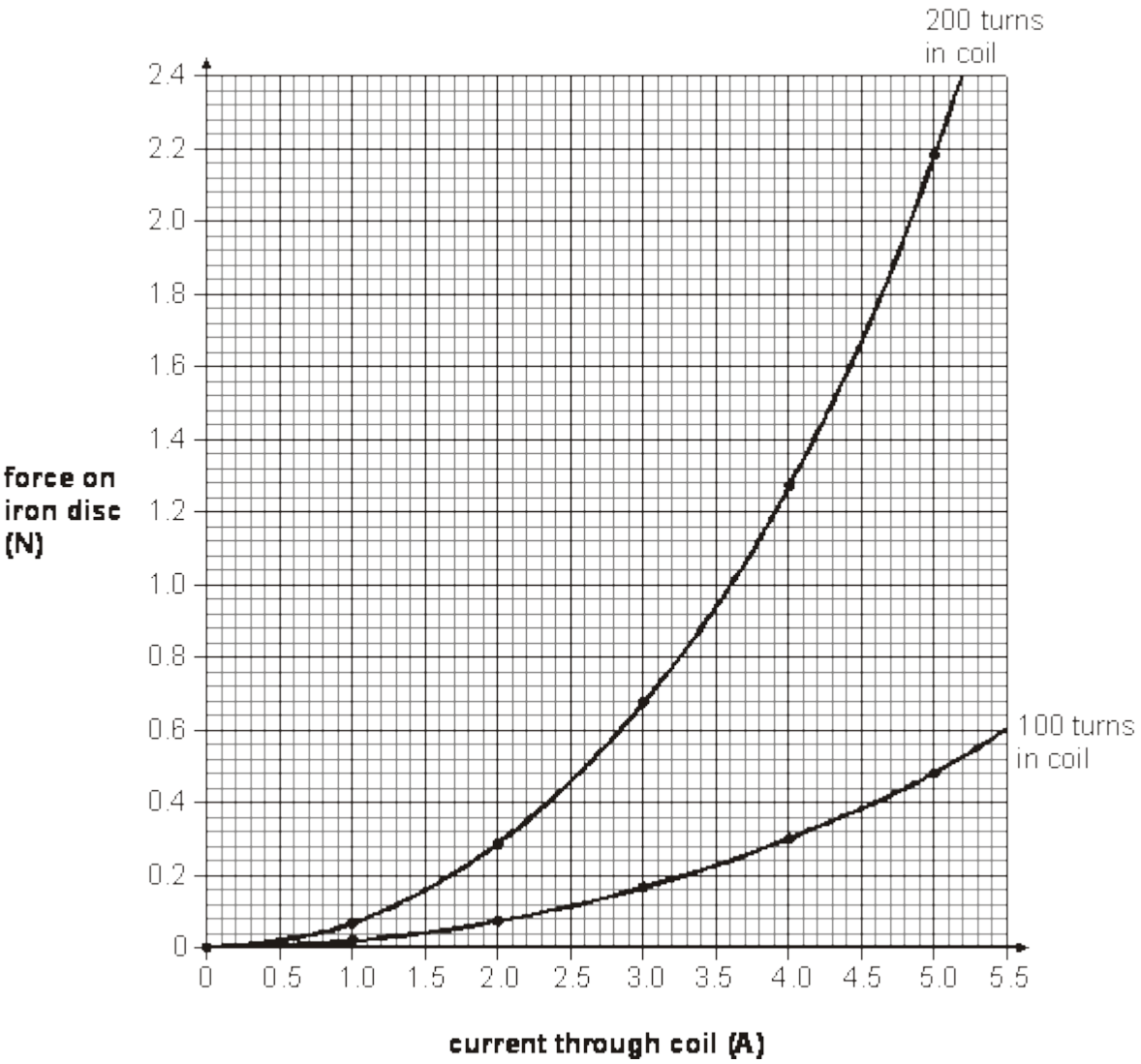
2 marks

(b) When a current passes through the coil, some of the electrical energy is changed to thermal energy.
What would happen to the coil if the current passing through it was too large?

.....

1 mark

(c) Mary made two electromagnets, one with 100 turns of wire in the coil and one with 200 turns.
She varied the current through the coil of each electromagnet.
She measured the force of each electromagnet on the iron disc.
The graph shows her results.




Write **two** conclusions that Mary could make from these results.

1. .....

.....

2. .....

.....

2 marks
maximum 5 marks