Do not write outside the box

1 The photograph shows a crane lifting some scrap iron and steel. The crane uses an electromagnet to create a lifting force.

The specification mentions cranes but any use of electromagnets might be tested, often with some data or information.

1 (a) Give one advantage and one disadvantage of using an electromagnet in a crane.

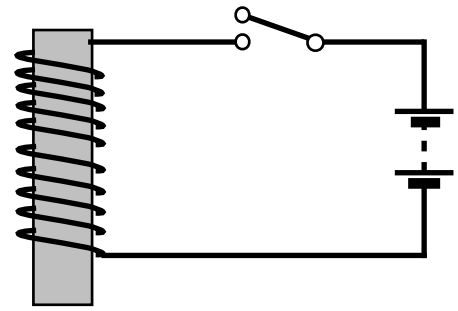
[2 marks]

Advantage Can be switched on an off or only attracts or collects iron and steel [1 mark]

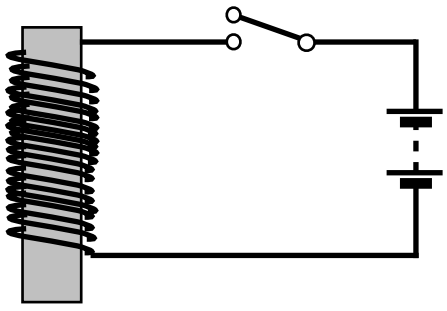
Disadvantage Requires energy or requires electricity to work or costs money [1 mark]

1 (b) Student did an investigation to see the effect of the number of coils on the strength of an electromagnet.

The student measured the number of paperclips that each of the two electromagnets could lift.



10 coils



20 coils

The results are shown in the table.

Number of coils	Number of paperclips lifted
10	12
20	25

1 (b) (i) The paperclips must all have the same mass.

Explain why.

[2 marks]

To make it a fair test or mass of clips is a control variable [1 mark]

To ensure that only the number of paper clips has an effect [1 mark]

1 (b) (ii) The student concluded that the higher the number of coils, the stronger the electromagnet.

Is this a valid conclusion?

Explain your answer.

Valid means that the experiment answers a question that was posed, by having reproducible results, done with correct methodology, like repeats or others reproducing the same results.

[2 marks]

if yes
The number of paper clips increased or (approximately) doubled [1 mark]
when the coils were increased or doubled [1 mark]

if no
not enough measurements or experiments or number of coils tested or not enough of a range of number of paper clips [1 mark]
Can't see a pattern or trend [1 mark]
Not enough repeats [1 mark]

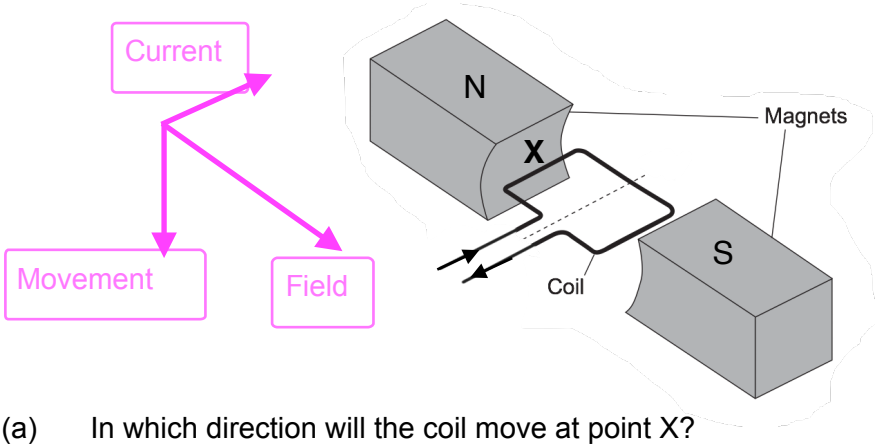
1 (b) (iii) How could the results of the experiment be useful to a manufacturer of electromagnets for cranes.

[1 mark]

Can decide on number of coils to put in the electromagnet [1 mark]

(Total 7 marks)

2 The diagram shows a simple motor. The magnet poles and direction of current are shown.



This uses flemming's left hand rule.

2 (a) In which direction will the coil move at point X?

[1 mark]

down or downward or anti-clockwise [1 mark]

Which two pieces of information are needed to determine the direction of movement at point X.

[2 marks]

1. Direction of the magnetic field [1 mark]

2. Direction of current flow. [1 mark]

2 (a) (i) The speed and direction of rotation can be changed. Give two ways in which speed of rotation of the motor can be increased.

[2 marks]

Higher current [1 mark]

Stronger magnetic field or stronger magnets [1 mark]

Increase number of coils [1 mark]

2 (a) (ii) How can the direction of rotation of the coil be reversed?

[1 mark]

Reverse magnetic field or changes the magnets around or change/swap poles of magnets [1 mark]

(Total 6 marks)