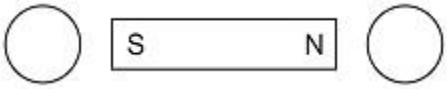
Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Q1.

(a) **Figure 1** shows a bar magnet.

Each circle represents a compass.

Figure 1



Draw an arrow inside each circle to show the direction that each compass would point.

(1)

(b) **Figure 2** shows part of a coat.

The coat has two magnets hidden inside the material.

Figure 3 shows how the magnets are used to fasten the coat.

Figure 2

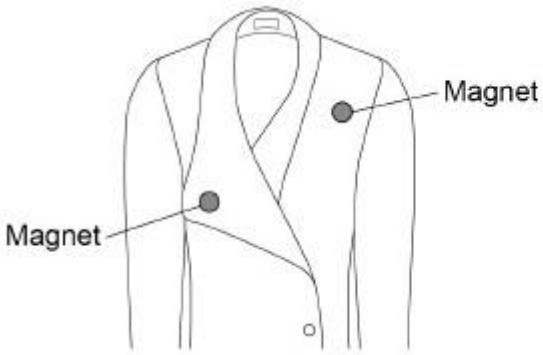


Figure 3

Explain why the magnets inside the coat must **not** have two south poles facing each other.

_____

_____

_____

_____

(2)

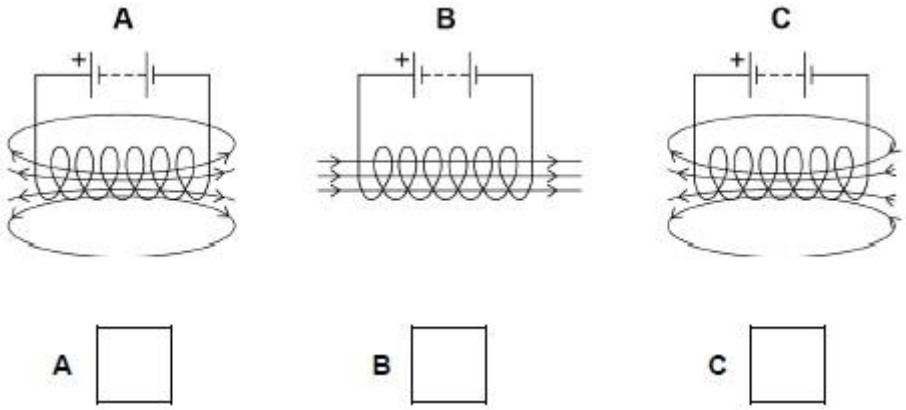
A coil of wire is connected to a battery.

The current in the coil produces a magnetic field.

(c) Which diagram in **Figure 4** shows the magnetic field produced by the current in the coil?

Tick (✓) **one** box.

Figure 4



A ☐ B ☐ C ☐

(1)

(d) A solid rod is placed inside the coil.

Which type of rod would make the magnetic field of the coil stronger?

Tick (✓) **one** box.

Glass rod ☐

Plastic rod ☐

Steel rod ☐

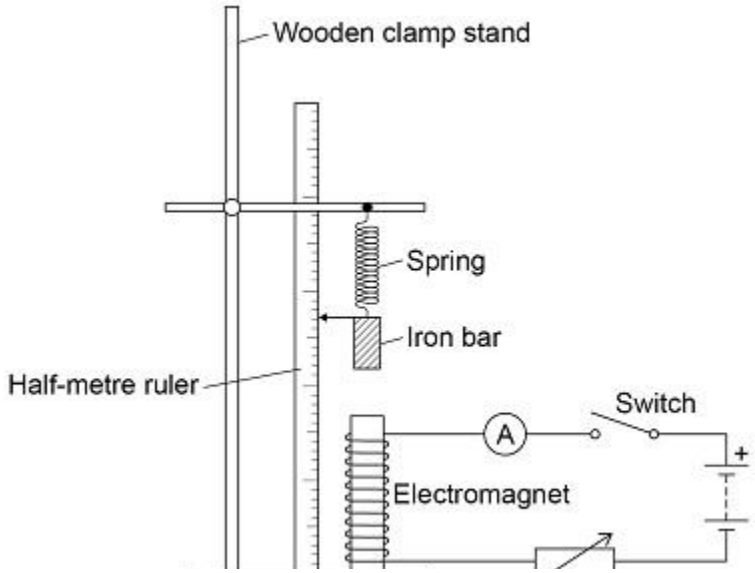
Wooden rod ☐

(1)

A student investigated how the strength of an electromagnet varies with the current in the coil of the electromagnet.

Figure 5 shows the equipment the student used.

Figure 5



(e) Why does the spring get longer when the electromagnet is switched on?

_____

_____

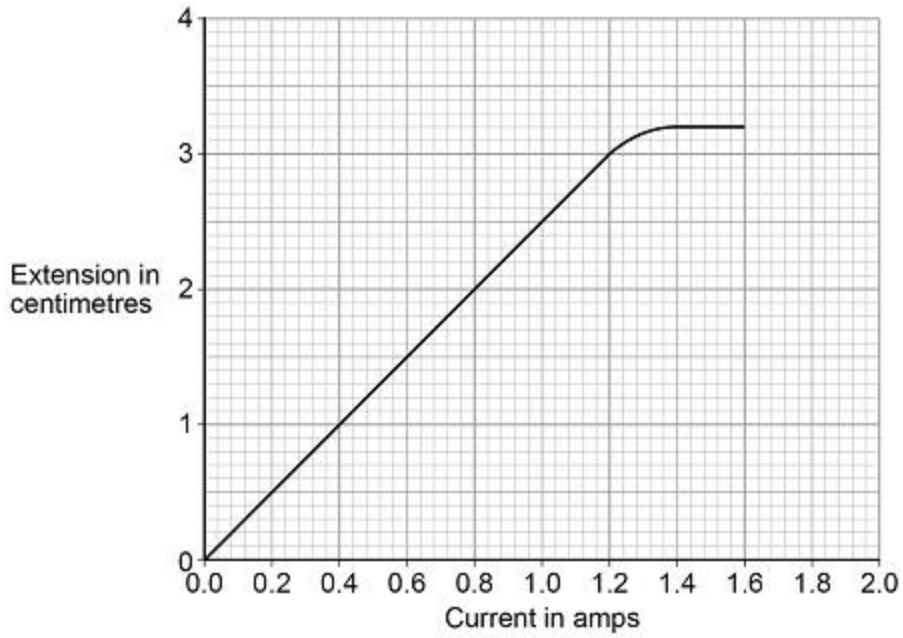
_____

(1)

The student measured how much further the spring extended with different values of current in the coil.

Figure 6 shows the results.

Figure 6



(f) The current in the coil is increased from 0.6 A to 1.2 A

Determine the increase in the extension of the spring.

_____

Increase in the extension = _____ cm

(1)

(g) Calculate the increase in the force on the spring when the current in the coil increased from 0.6 A to 1.2 A

Spring constant = 0.18 N/cm

Use the equation:

force = spring constant × extension

_____

_____

Increase in the force = _____ N

(2)

(h) Describe what happened to the strength of the electromagnet as the current in the coil increased from 1.2 A to 1.6 A

_____

_____

_____

_____

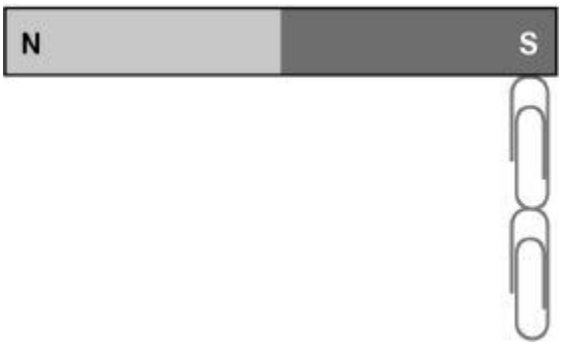
(2)

(Total 11 marks)

Q2.

Figure 1 shows two paper clips hanging from a bar magnet.

Figure 1



The paper clips have become magnetised.

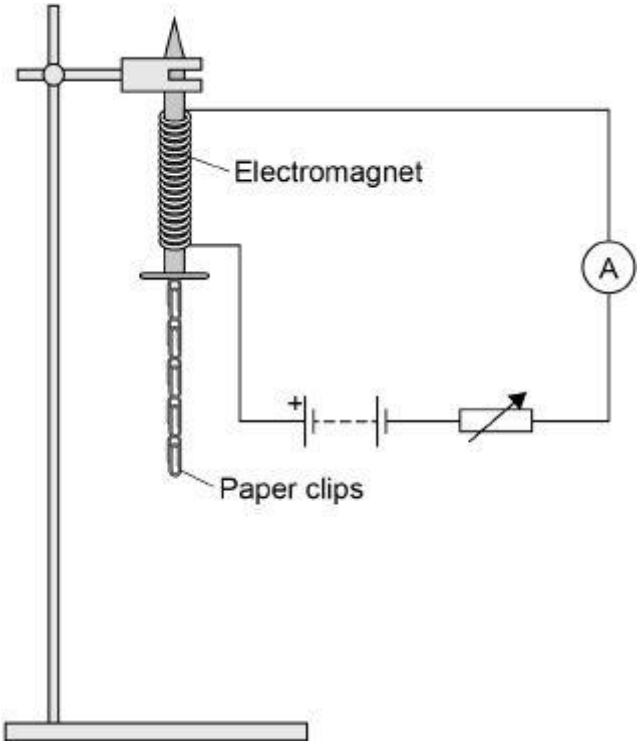
(a) Label the north and south poles of both paper clips.

(1)

A student investigated how the number of turns of wire on an electromagnet affects the strength of the electromagnet.

Figure 2 shows the equipment used by the student. Throughout the investigation the student kept the current through the wire constant.

Figure 2



(b) The student measured the strength of the electromagnet by counting the number of paper clips the electromagnet could hold.

Explain why it was important that the paper clips were all the same size.

_____

_____

_____

_____

(2)

The table below shows the student's results.

Number of turns of wire on the electromagnet	Number of paper clips held
10	3
20	6
30	9
40	12

(c) Describe the pattern shown in the table.

_____

_____

_____

_____

(2)

(d) The student then used 50 turns of wire on the electromagnet.

The electromagnet picked up 18 paper clips. This was more paper clips than the student had expected.

Which **one** is the most likely cause of this result?

Tick **one** box.

The paper clips used with 50 turns were larger than the others.	☐
There were less than 50 turns of wire on the electromagnet.	☐
Some of the paper clips were already magnetised.	☐

(1)

(e) The student repeated the measurement for 50 turns of wire three more times.

This gave her the following set of results.

18 16 14 15

Explain what the student should now do with the **four** results for 50 turns of wire.

_____

_____

_____

_____

_____

_____

(3)

(f) The student wrote the hypothesis:

'Increasing the current through the wire will make the electromagnet stronger.'

Describe how the student should change the investigation to test this hypothesis.

_____

_____

_____

_____

_____

(3)
(Total 12 marks)