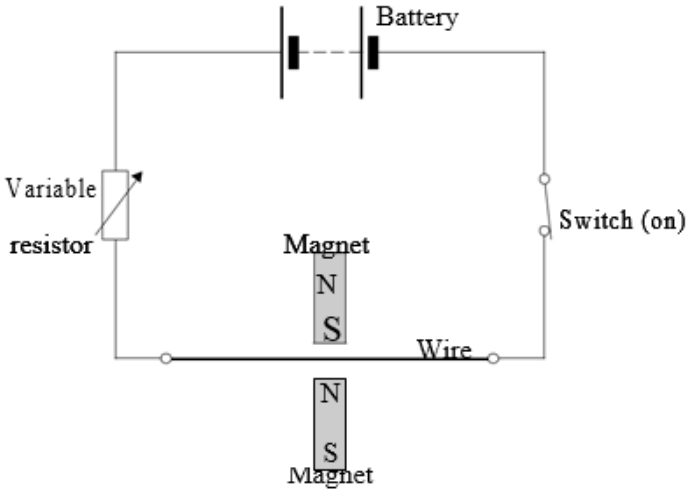
ELECTROMAGNETISM

Q1 .A student investigates the electromagnetic force acting on a wire which carries an electric current. The wire is in a magnetic field.

The diagram shows the circuit which the student uses.

(a) Draw an X on the diagram, with the centre of the X in the strongest part of the magnetic field.



(b) Give one change that she can make to the magnets to decrease the electromagnetic force on the wire.

_____

_____

(1 mark)

(c) The student wants to change the electromagnetic force on the wire without changing the magnets or moving their position.

(i) Give one way in which she can increase the electromagnetic force.

_____

_____

(1 mark)

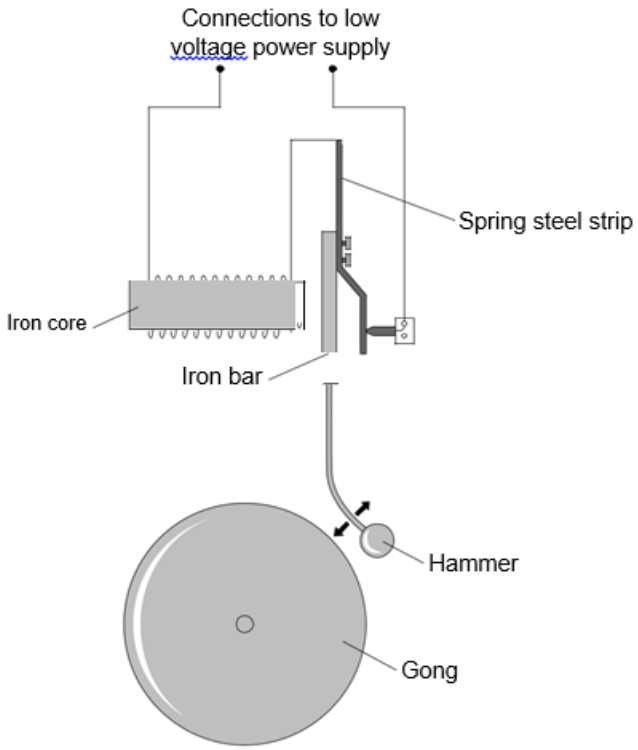
(ii) Give one way in which she can reverse the direction of the electromagnetic force.

_____

_____

(1 mark)

Q2 The diagram shows part of the inside of an electric bell.



Name the part of the bell which contains the iron core and attracts the iron bar.

_____

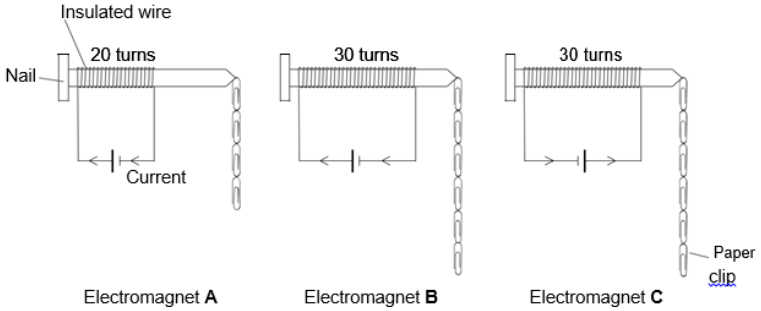
(1 mark)

Q3. A student is investigating the strength of electromagnets.

Figure 10 shows three electromagnets.

The student hung a line of paper clips from each electromagnet.

Figure 10



No more paper clips can be hung from the bottom of each line of paper clips.

(i) Complete the conclusion that the student should make from this investigation.

Increasing the number of turns of wire wrapped around the nail will _____ the strength of the electromagnet.

(1 mark)

(ii) Which two pairs of electromagnets should be compared to make this conclusion?

Pair1:Electromagnets _____ and _____

Pair 2: Electromagnets _____ and _____

(1 mark)

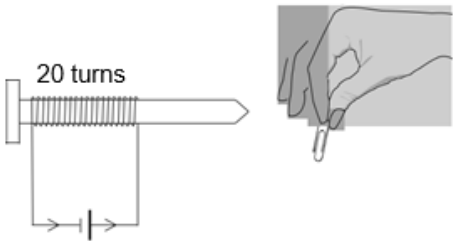
(iii) Suggest two variables that the student should control in this investigation.

_____

_____

(b) The cell in electromagnet A is swapped around to make the current flow in the opposite direction. This is shown in **Figure 11.**

Figure 11



What is the maximum number of paper clips that can now be hung in a line from this electromagnet?

Draw a ring around the correct answer

fewer than 4 **4** **more than 4**

Give one reason for your answer.

_____

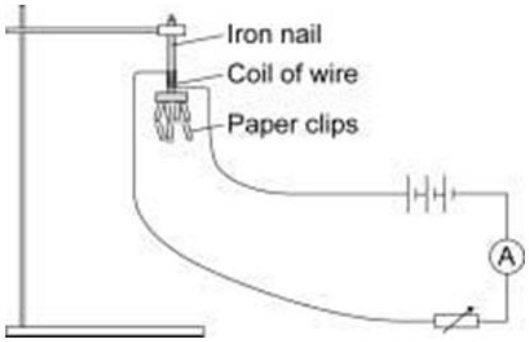
_____

(2 mark)

(c) Electromagnet A is changed to have only 10 turns of wire wrapped around the nail.
Suggest the maximum number of paper clips that could be hung in a line from the end of this electromagnet.

Maximum number of paper clips = _____

Q4. The diagram shows the equipment used by a student to investigate the strength of five different electromagnets.



The stronger the electromagnet, the more paper clips it will hold.

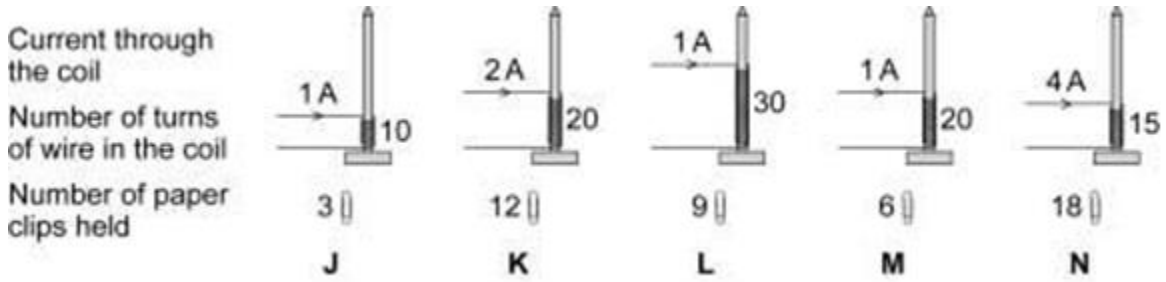
(a) Why is it important that the paper clips used in the investigation are all the same size?

_____

_____

(1 mark)

(b) The five electromagnets, J, K, L, M and N, used by the student are shown below. Each electromagnet was made by wrapping lengths of insulated wire around identical iron nails.



The student wants to find out how the strength of an electromagnet depends on the number of turns of wire in the coil.

Which electromagnets should the student compare in order to do this?

_____

(1 mark)

(c) The student concluded:

'The strength of an electromagnet is always directly proportional to the number of turns on the coil.'

(c) (i) Explain how the data from the investigation supports the student's conclusion.

_____

_____

_____

_____

(2 marks)

(c) (ii) The student makes one more electromagnet by winding 100 turns onto a nail.

Before testing the electromagnet, the student predicted the number of paper clips that the electromagnet would hold when the current is 1 amp.

How many paper clips should the student predict that the electromagnet would hold?
Show clearly how you work out your answer.

_____

_____

Number of paper clips = _____

(2 marks)

(c) (iii) When the student tested the electromagnet it held 20 paper clips. This is not what the student predicted.

Explain what the student should do when new data does not seem to support the prediction that was made.

_____

_____

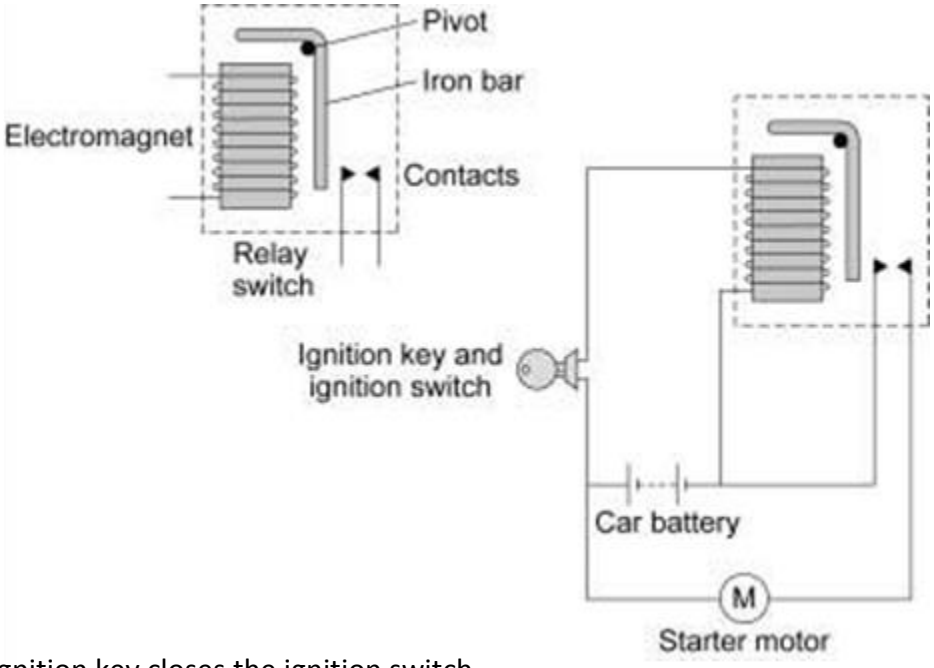
_____

_____

(3 marks)

Q5. *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The diagrams show a relay switch and how it is used in a car ignition circuit.



Turning the ignition key closes the ignition switch.

Explain how this causes the starter motor to operate.

(6 marks)

Total: 27 marks