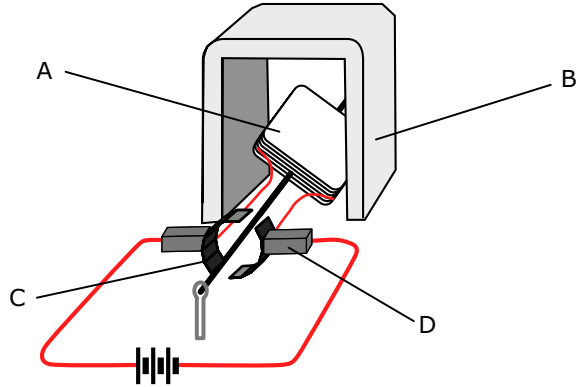


GCSE Electromagnets

Name & Set

1 (a) The diagram shows a simple electric motor.



(i) Draw an arrow to show which way the current moves around the circuit.

(ii) Which way do electrons move around the circuit. Explain why the electrons move in this direction.

[2]

(iii) Which one of the parts, A, B, C, or D, is a permanent magnet?

[1]

(iv) Which one of the parts, A, B, C, or D, is an electromagnet?

[1]

(v) The coil, A, is made of several turns of insulated wire.

[a] Explain the advantage of using several turns rather than just one.

[2]

[b] Why is insulated wire used?

[1]

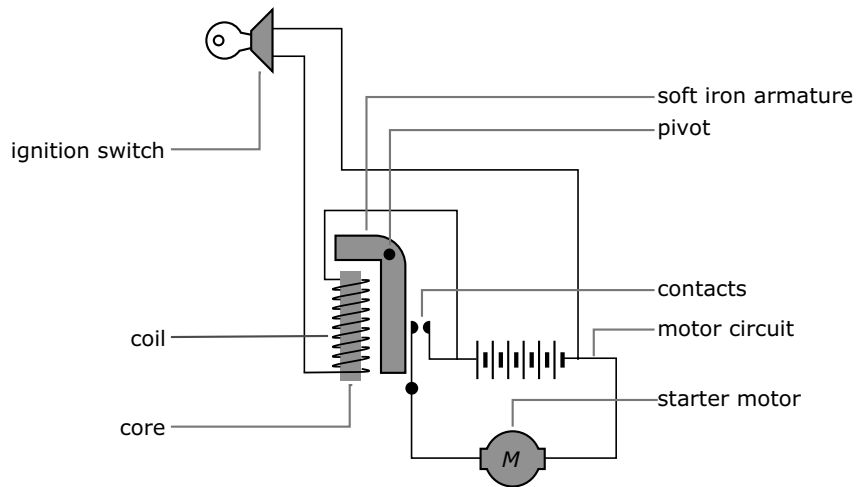
(v) Suppose the battery is now connected the other way round. What effect, if any, does this have on the motor?

[1]

(vi) The battery is now reduced by one cell. What effect, if any, does this have on the motor?

[1]

(b) The diagram shows the ignition system for a car.



Explain, step by step, how the system causes the starter motor to switch on. The explanation has been started for you.

When the ignition switch is turned on _____

[5]

2 Electromagnets are often used in scrap yards to move scrap metal about.

(a) Name one metal that *cannot* be lifted by an electromagnet.

_____ [1]

(b) The crane lifts a load of scrap metal to a height of 2 metres (m) in 3 seconds (s).
The metal weighs 4500 newtons (N).

(i) What is the force of gravity on this scrap metal?

_____ [1]

(ii) Calculate the useful work done in lifting this scrap metal.

Include in your answer the equation you are going to use. Show clearly how you get to your final answer and give the unit.

_____ [3]

(iii) Calculate the useful power output of the crane when it lifts this scrap metal.

Include in your answer the equation you are going to use. Show clearly how you get to your final answer and give the unit.

_____ [3]

(iv) The crane must be more powerful, when it lifts this load of scrap metal, than the answer you have calculated in part (iii). Explain why.

_____ [2]

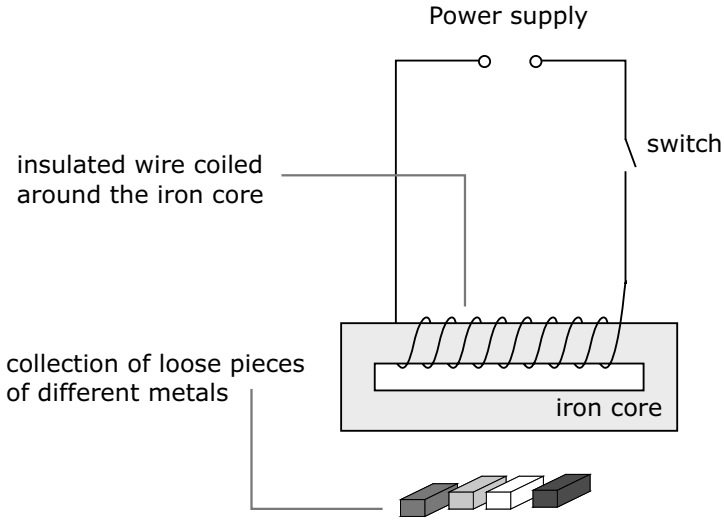
(v) A few minutes later the crane drops the load of scrap metal in another part of the scrap-yard. Complete the following boxes to give the energy transfer which takes place as the scrap metal falls and before it lands.

[2]

_____ energy

_____ energy

(c) The drawing shows one type of electromagnet.
Describe, stage by stage, what happens when the switch is closed.

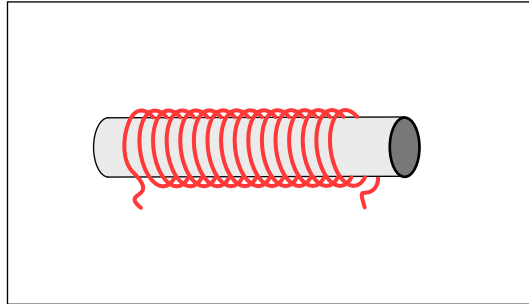


[4]

4 (a) The diagram shows a solenoid. What happens when a current flows through the solenoid?

_____ [1]

(i) Show what you would see if you sprinkled iron filings around the solenoid as a current flowed through it.

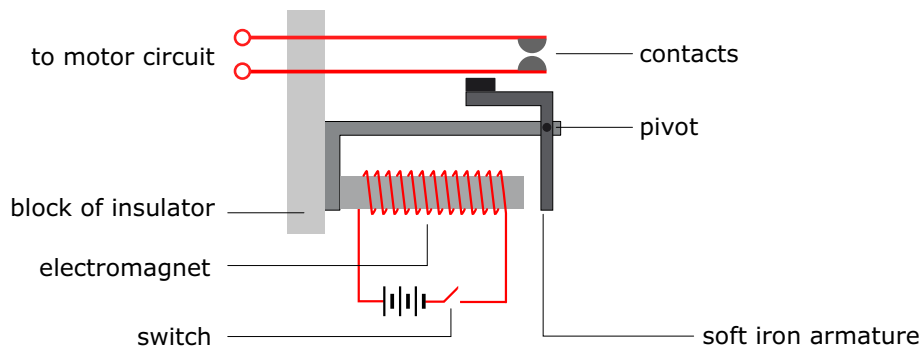


(ii) State two ways of increasing the effect that is produced when a current flows through the solenoid

1. _____ [1]

2. _____ [1]

(b) The diagram below shows a relay that is used to switch on a motor circuit.



(i) Explain how closing switch causes the motor circuit to operate.

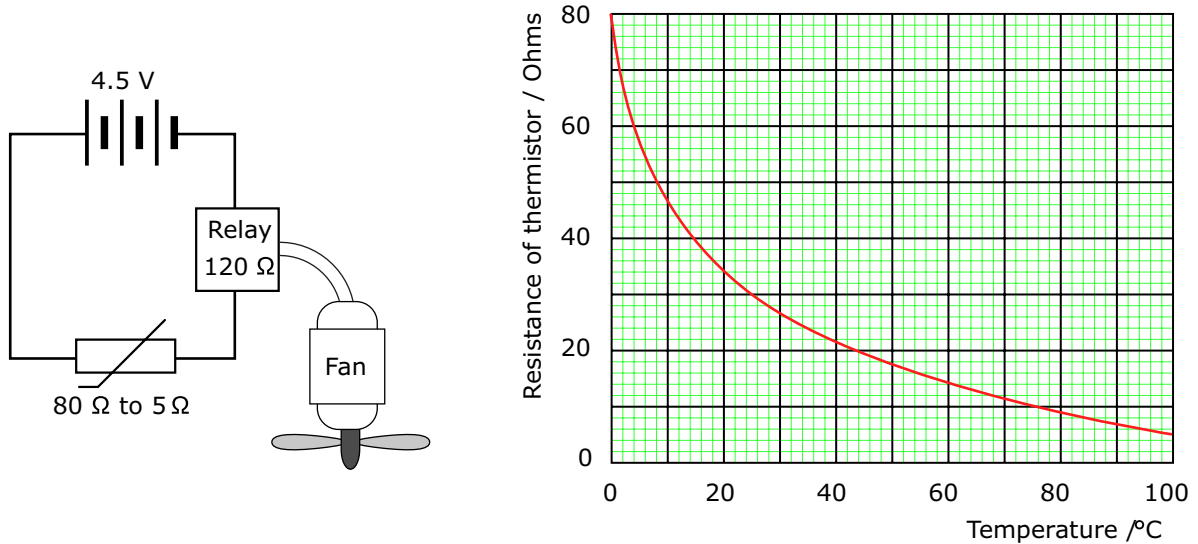
_____ [4]

(ii) Why must the armature be made of soft iron rather than steel?

_____ [2]

(c) The diagram below shows a thermistor used in a relay control circuit. The relay turns on an electric roof fan when the air reaches a predetermined temperature.

Changes in air temperature affect the resistance of the thermistor as shown in the graph below right.



The thermistor has a resistance of 80 Ω at 0 °C and 5 Ω at 100 °C.

The battery gives a constant voltage of 4.5 V and the relay resistance is 120 Ω

(i) What is the resistance of the circuit at 0 °C?

_____ [1]

(ii) Calculate the current in the circuit at 0 °C.

_____ [2]

(iii) Calculate the current in the circuit at 100 °C .

_____ [1]

(iv) The relay works when the current reaches 0.03 Amps. What is the resistance of the circuit (relay + thermistor) when this current flows?

_____ [2]

(v) At what temperature will the fan begin to work?

_____ [3]