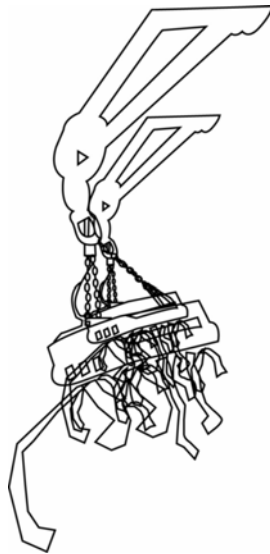


(a) A large electromagnet is used in a scrap yard to move old cars.



(i) Name a suitable material for the electromagnet.

..... [1]

(ii) Explain your choice.

.....
..... [2]

(b) A car of mass 1600 kg can be just be lifted.
What is the least force that the electromagnet must use to lift the car?
(1 g = 10 N/kg)

.....
.....
..... [2]

Describe a simple electric motor.
Include a simple diagram in your answer.

.....

.....

.....

.....

.....

.....

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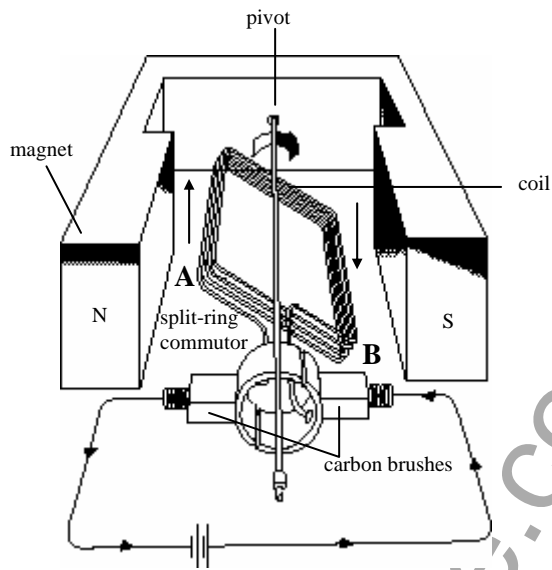
.....

.....

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[7]

(a) An electric motor is connected to the external circuit via a split ring commutator.



Explain the purpose of this.

.....
..... [3]

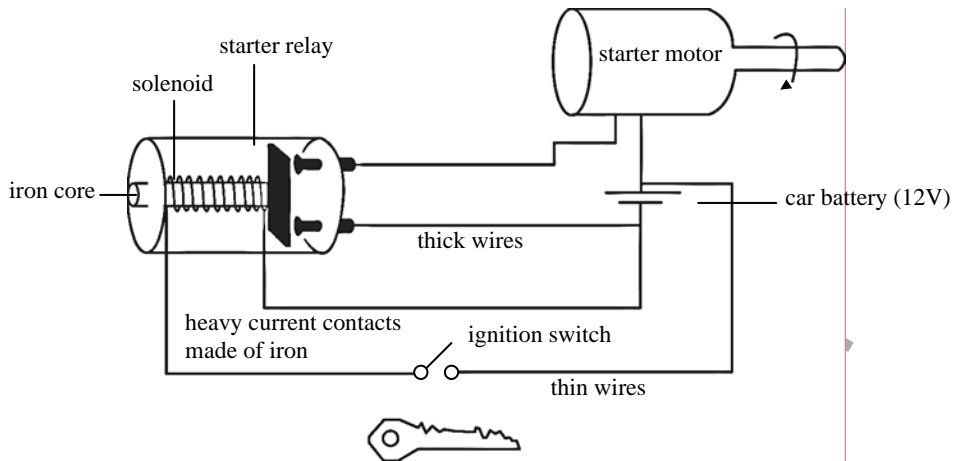
(b)(i) How could the motor be used as a generator ?

..... [1]

(ii) The current produced would be a varying direct current (dc).
What changes would be needed for the generator to produce an alternating current (ac) instead ?

.....
..... [2]

(a) The diagram shows a relay circuit used in a car starter motor.



What happens when the ignition is switched on ?

.....

.....

..... [3]

(b) Why is the battery always connected to the starter motor with very thick cables ?

..... [1]

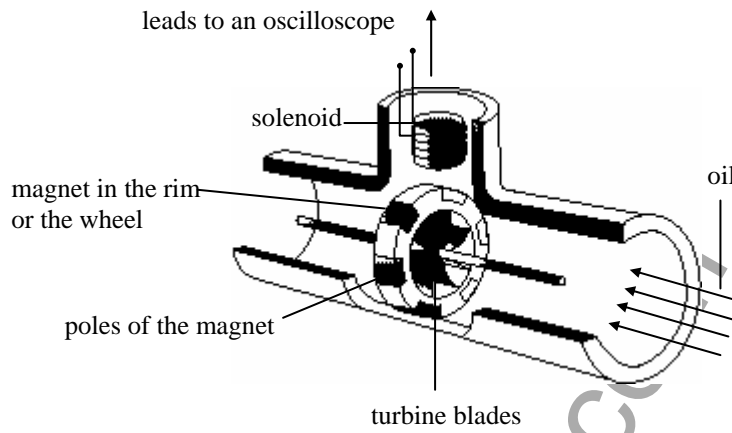
(c) Draw a circuit diagram showing the battery connections.

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[3]

(a) The diagram below shows a device that could be used for measuring the rate at which water flows through a pipe.

An electromagnetic flow meter



Explain why a reading is obtained on the meter when the water flows in the pipe.

.....

.....

.....

.....

..... [4]

(b) State the effect on the meter of

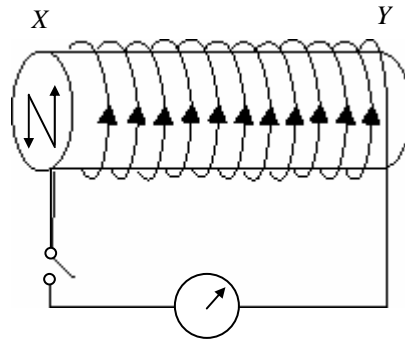
(i) increasing the flow rate of the water

..... [1]

(ii) making the water flow in the opposite direction

..... [1]

- (a) To avoid cutting through cables, a gas company uses a device to detect their position before digging holes. The magnetic field produced by the cable induces a voltage across the coil. This is registered on a meter attached to the device.



The device cannot detect cables that carry a steady direct current. Explain the reason for this.

.....
.....
..... [2]

- (b) Why is it better to use the coil vertically than horizontally?

.....
..... [2]

- (c) State two ways in which you could get a larger reading on the meter.

1. [1]
2. [1]

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(a) The heating effect of an electric current is given by

$$H = I^2R$$

where I = current, R = resistance.

If the power generated from a power station is 150 kW at a voltage of 275 kV, calculate the current in the cable.

.....
.....
.....
..... [4]

(b)(i) The resistance of the cable is 0.01 Ω per km.
Calculate the total resistance of a 200 km length of the cable.

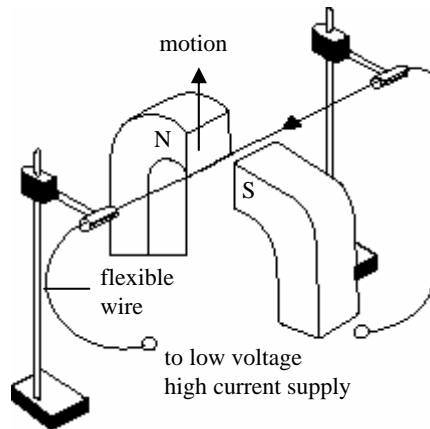
.....
.....
..... [2]

(ii) Find the power loss in the cable over 200 km.

.....
.....
..... [2]

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(a) A wire is positioned between two magnets. The wire is connected to a battery.



Describe what happens.

.....
..... [2]

(b)(i) The connections are reversed.
Describe what happens now.

.....
..... [2]

(ii) The battery is replaced by a power supply that gives an alternating current.
What is observed ?

..... [1]

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(a) Chloe makes an electromagnet by coiling a length of wire around a pencil. What must she do to make it work ?

..... [1]

(b)(i) Chloe is given some paper clips and asked to test the strength of her electromagnet.
How could she do this ?

.....
..... [2]

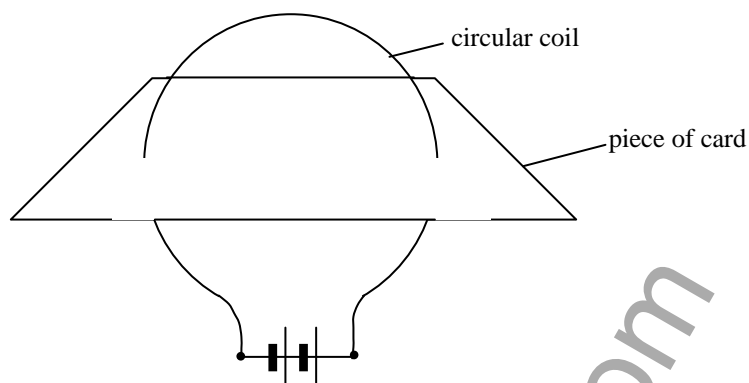
(ii) State two ways in which Chloe could increase the strength of her electromagnet.

1. [1]

2. [1]

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(a) A coil of wire is attached to a battery. An electric current flows through it.



The coil acts like a bar magnet.
Draw the magnetic field pattern around it.

[2]

(b) (i) A compass needle held near to the left-hand end points away from the coil.
What does this tell you ?

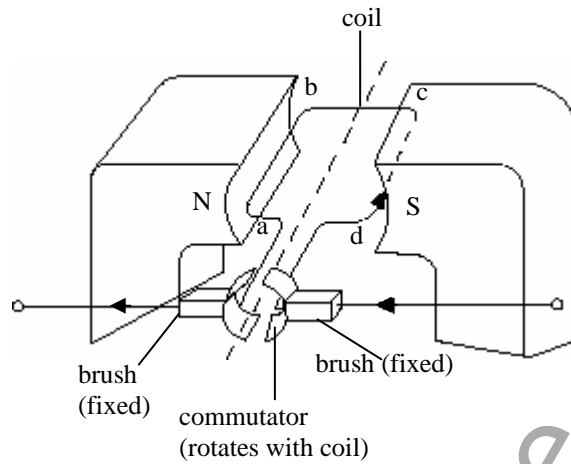
..... [1]

(ii) Show the direction of the magnetic field lines on your diagram.

[1]

(a) A simplified electric motor consists of a coil of wire connected to a battery and positioned between two magnets (see diagram).

simple d.c. motor



(i) Use Fleming's left-hand rule to predict the direction of the force on each arm of the coil.

.....
 [2]

(ii) State the direction of motion of the coil.

..... [1]

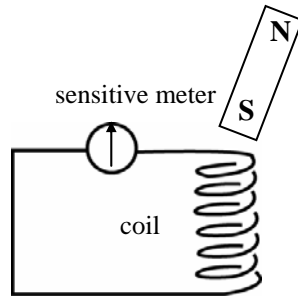
(b)(i) After half a turn the coil will stop.
 What piece of equipment do you need to use to keep the coil moving ?

..... [1]

(ii) What does the piece of apparatus do ?

.....
 [2]

(a) The diagram shows a coil of wire connected to a sensitive ammeter. A bar magnet is moved towards the coil.



What is observed on the ammeter?

..... [1]

(b) What is observed if:

(i) the magnet is removed from the coil?

..... [1]

(ii) the magnet and coil move in the same direction at the same speed?

..... [1]

(c) (i) What name is given to the phenomenon referred to in (b)?

..... [1]

(ii) State three factors which determine the size of the current produced.

1. [1]

2. [1]

3. [1]

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(a) Some bicycles are fitted with a dynamo.
What is the purpose of a dynamo ?

..... [1]

(b) It is not a good idea to have only lights which are powered by a dynamo.
Why not ?

.....
.....
..... [2]

(c) A bicycle dynamo has a coil that is stationary, whilst the magnet turns inside it when you turn the pedals.

(i) How does this differ from a simple ac generator ?

.....
..... [1]

(ii) What advantage does the dynamo arrangement have ?

.....
.....
..... [2]

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(a) The National Grid is made up of a network of cables transmitting electricity from power stations across the country.

A typical power station generates electricity at 25000 V.
The electricity is actually transmitted at 400 000 V.

(i) How is this achieved ?

.....
..... [2]

(ii) Why is this done ?

.....
.....
..... [3]

(b)(i) Why might you see a notice warning that it is dangerous to fly kites near to overhead voltage cables ?

.....
..... [2]

(ii) Why is it safe for a bird to perch on an overhead voltage cable ?

.....
.....
..... [2]

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(a) From what material is the core of a transformer made ?

..... [1]

(b) What is the purpose of the core ?

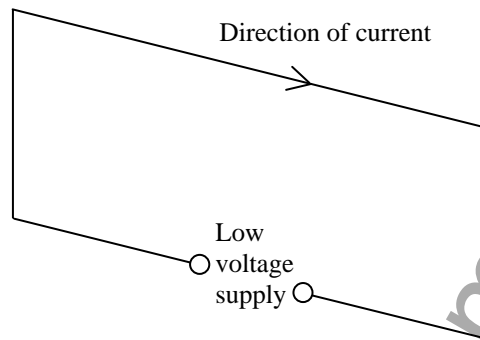
..... [1]

(c) A transformer will only work on ac and not on dc.
Explain why.

.....
.....
.....
..... [3]

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(a) A wire is connected to a low voltage supply. A current flows as shown and a magnetic field is produced.



State two ways in which the magnetic field could be detected.

1. [2]

2. [2]

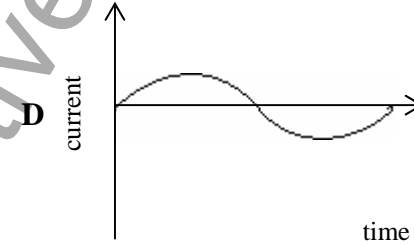
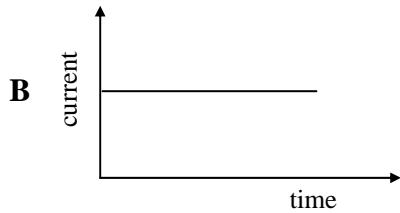
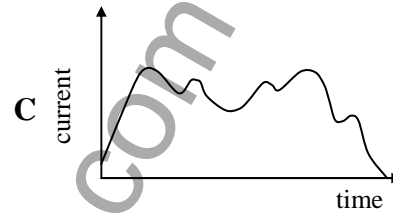
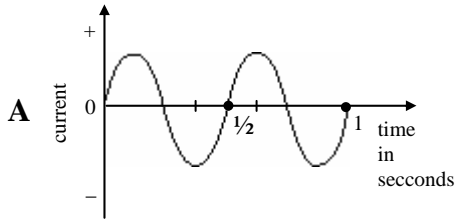
(b) Make a sketch of the magnetic field pattern.
Show the direction of the magnetic field.

[2]

(a) What is meant by an alternating current ?

.....
..... [2]

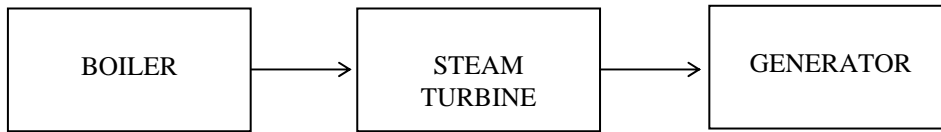
(b) Which of the following graphs show an alternating current ?



..... [2]

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Below is a block diagram of a fossil fuel power station.



(a)(i) What is meant by a fossil fuel?

..... [1]

(ii) Name two commonly used fossil fuels

.....
..... [2]

(b) Explain how the power station works

.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [6]

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(a) Name three machines, which make use of motors.

.....
.....
..... [3]

(b) Electric motors make use of carbon brushes.
What two properties of carbon make it a good material to use?

.....
..... [2]

(c) State one way in which a motor can be made more powerful.

.....
..... [2]

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