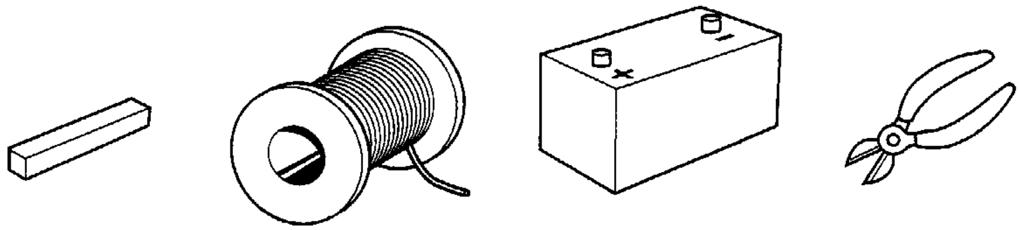
Core 1

You are given an iron bar, a reel of insulated wire, a battery and some wire cutters.



iron bar | reel of insulated wire | battery | wire cutters

(a) In the space below, describe how you would make an electromagnet. You may use a labelled diagram if it helps you to answer the question.

....

....

....[3]

(b) How would you check that your electromagnet actually works?

....

....

....[1]

Core 2

Fig. 1 shows one way of using water to generate electricity.

(a) Fill in the missing words in the boxes. [4]

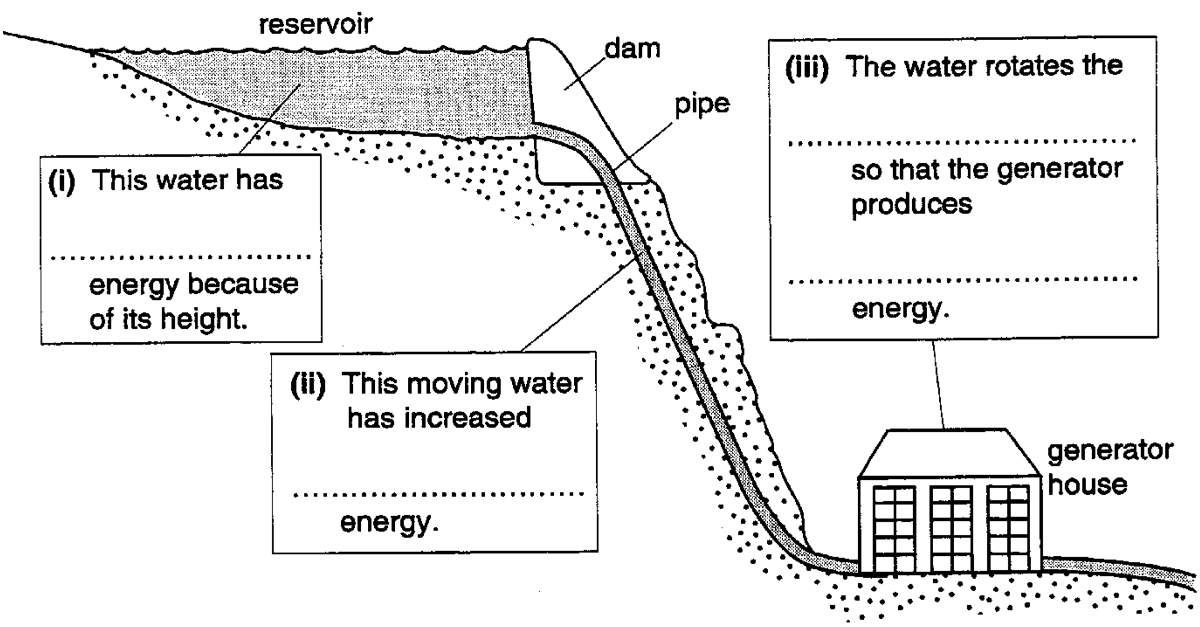


Fig. 1

(b) In other places, water is used in different ways to generate electricity.
State two of these ways.

1. ....

2. ....[2]

Core 3

A student wraps a length of fine wire around a wood block and hangs the block between the poles of a magnet, as shown in Fig. 2

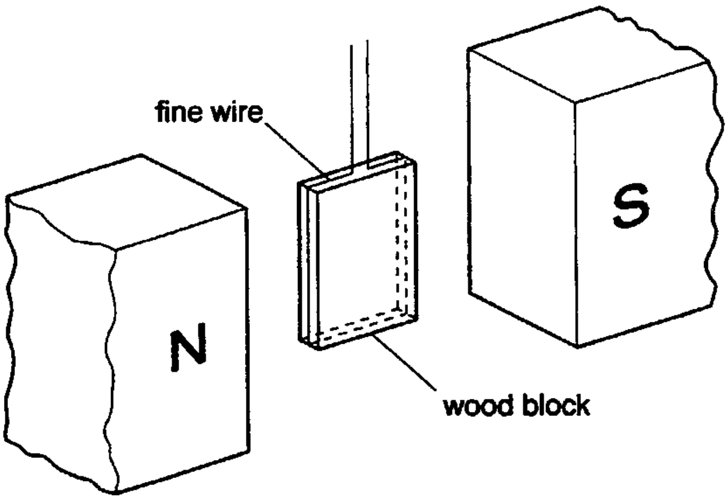


Fig. 2

(a) What is seen to happen when the student passes a current through the fine wire?

.... [1]

(b) Why does this happen?

....

.... [2]

(c) Name a device which makes use of this effect.

.... [1]

Alternative to Practical 1

When investigating the magnetic field due to a bar magnet, a student places the magnet on a sheet of paper as shown in Fig. 3 , on page 5. The edge of the paper is placed so that it is parallel to the direction of the Earth's magnetic field. The bar magnet is then placed as shown so that it is at right angles to the direction of the Earth's magnetic field. (In Fig. 3 , the lines OX and OY are perpendicular to each other.) A small plotting compass is used to investigate the magnetic field.

(a) It is found that there are positions where the small magnet in the **plotting compass** points so that it is parallel to the line OX. Some of these positions are located and are labelled A, B, C, D, E, F, G and H, as shown on Fig. 3 . The positions shown in Fig. 3 also lie on straight lines that come from the centre of the bar magnet.

Describe how you would locate the position labelled A. Your answer should explain

(i) what you would do to help you judge when the small magnet in the plotting compass is parallel to OX,

how you would ensure that the small magnet of the plotting compass is not sticking,

(iii) what you would do so as to mark the point A on the radial line,

(iv) how you would avoid making a parallax error when locating the point A.

....

....

....

....

....

....

....

....[5]

Alternative to Practical 1

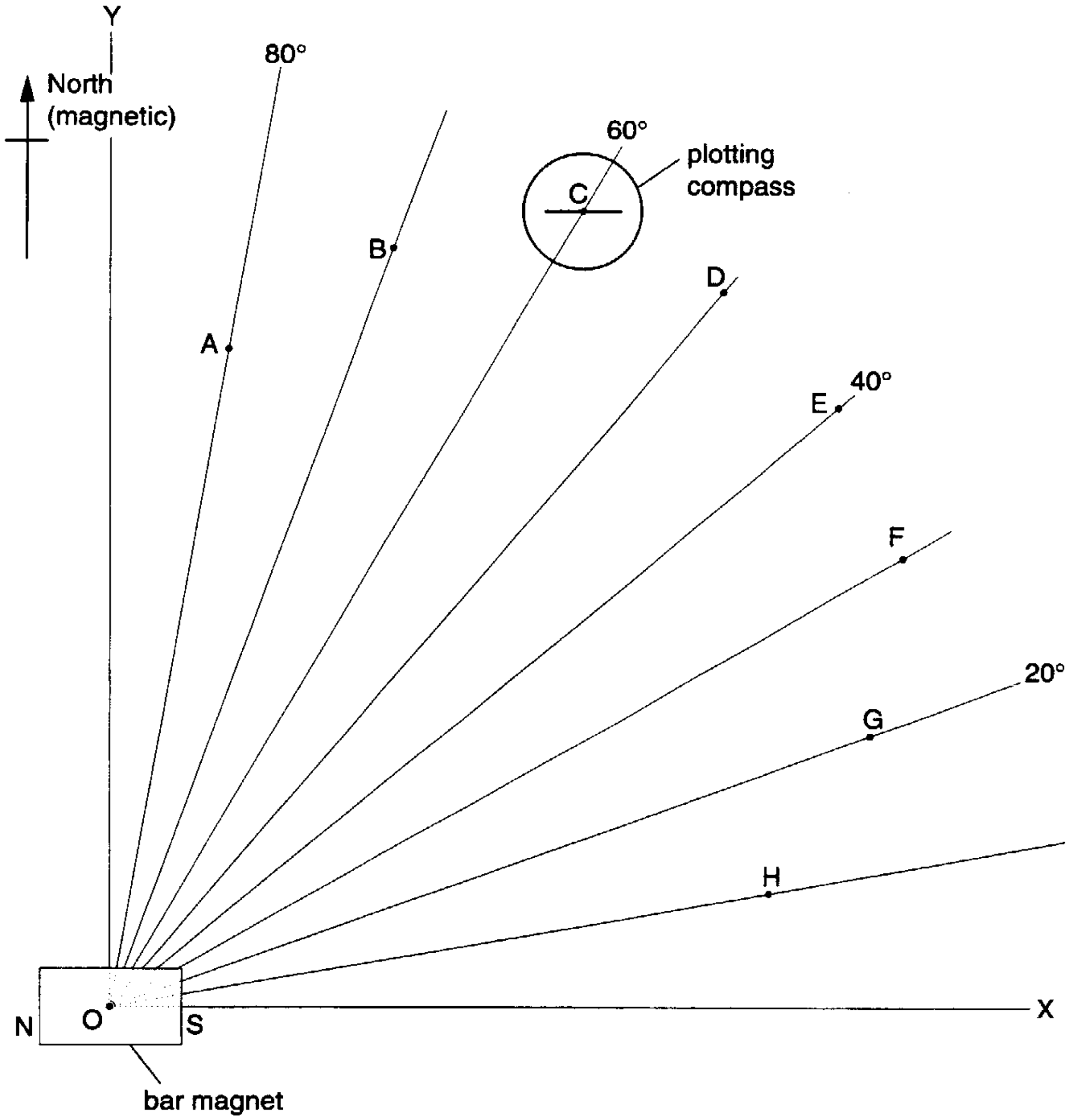


Fig 3

(b) The plotting compass is at point C as shown in Fig 3

(i) Mark the plotting compass in such a way as to show which end of the small magnet of the plotting compass is a North pole.

(ii) The compass is at point C. It is then moved along the radial line so that it is closer to the bar magnet. Describe and explain what happens to the small magnet of the plotting compass.

....

....

....

....[3]

Extension 1

Fig. 4 shows a transformer.

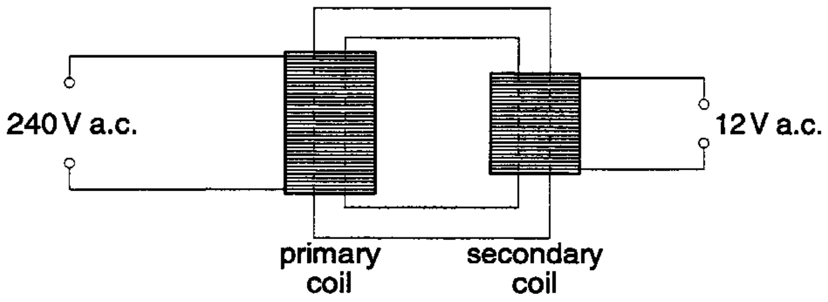


Fig. 4

(a) Explain why there is an e.m.f. across the secondary coil even though there is no electrical connection between the primary and secondary coils.

....

....

....

....

....[3]

(b) When the transformer is in use, the current in the secondary circuit is 3.2 A. The transformer may be considered 100% efficient.

Calculate the current in the primary coil.

current = ... [3]

Extension 2

A student is given a battery, a switch, two insulated thick copper leads and a coil of resistance wire. On Fig. 5 only the coil is drawn in.

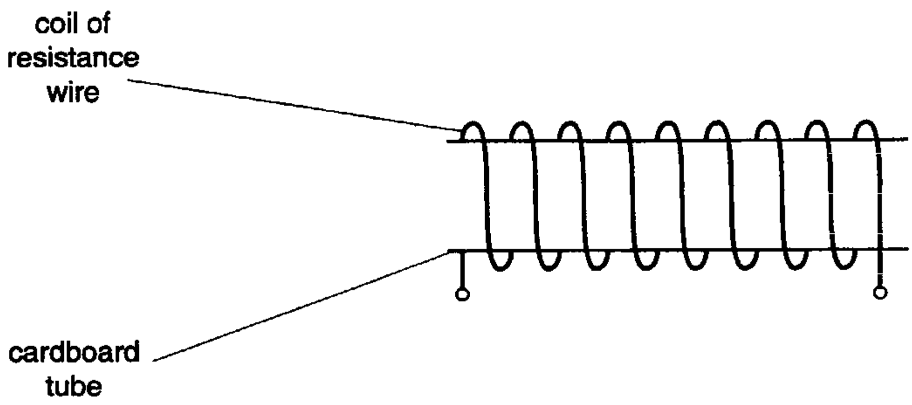


Fig. 5

(a) The student set up the apparatus to make a current flow through the coil.
Using standard symbols for components, complete a circuit diagram on Fig. 5 . Also on Fig.5 .1, draw the magnetic field lines in and around the coil, with arrows to indicate the direction of the lines. [4]

(b) A charge of 16 C flows through the coil in 40 s.

Calculate the current in the coil.

current = ... [2]

Extension 2

(c) The potential difference across the coil is 1.2 V.

(i) Calculate the energy released as heat in the coil in 40 s.

energy = ...

(ii) Calculate the resistance of the coil.

resistance =.. [4]

(d) The battery supplies 24 J of energy to drive 16 C of charge around the circuit.
Define the e.m.f. of this battery.

....

....[2]

Core 1

a wind the wire round the iron bar
connect both ends of the coil to the battery
strip the ends of the wire

or these points shown in a diagram

b attracts / picks up iron filings, steel paper clips etc
deflects a compass needle
repels another magnet
induces an emf if moves into a wire coil

Core 2

a(i) potential / position/ gravitational

(ii) kinetic / motion / movement

(iii) turbine / coils / blades rotor
electrical

b any two from
- waves
- tides
- steam
- geothermal

Core 3

a the coil turns

b current carrying coil in magnetic field experiences turning effect

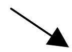
c electric motor
galvanometer

Alternative to Practical 1

a	move the centre of the compass along the line from the magnet

(i)	judge that the small magnet is parallel using .g. lined paper, ruler and set square etc
(ii)	tap the compass to prevent sticking
(iii)	mark either end of the needle as near as possible to the compass then mark A between
(iv)	look directly down on to the compass so the centre is on the line

b
(i)	N pole should be marked at the right hand end

(ii)	the needle moves gradually to a direction of approximately 

Extension 1

a any three from

- primary current creates magnetic field
- field is constantly changing
- the field in the core links into the secondary coil
- there is a changing field in or through the secondary coil
- a current is induced in the secondary coil

b $V_P I_P = V_S I_S$

$240 \times I_P = 12 \times 3.2$

$I_P = 0.16$ A

Extension 2

a a circuit with a battery symbol and switch

straight lines of magnetic force inside the coil extending to loops either side showing arrows pointing in direction which is correct with current flow

b current = charge/time
= 16 / 40
= 0.4 A

c(i) energy released = V x I x t

= 1.2 x 0.4 x 40

= 19.2 J

(ii) resistance = 1.2 / 0.4

= 3 Ω

d emf = joules/coulombs

= 24 / 16

= 1.5 V