Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

PHYSICS **0625/31**

Paper 3 Theory (Core) **May/June 2018**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

1.

Model trains move along a track passing through two model stations. Students analyse the motion of a train. They start a digital timer as the train starts to move. They record the time that it enters Station A and the time it enters Station B.

Fig. 1.1 shows the time on entering Station A and the time on entering Station B.

1min = 60
+22
88s

2min = 120
+34
154s

time entering Station A

time entering Station B

Fig. 1.1

(a) Calculate the time taken from the train entering Station A to the train entering Station B. State your answer in seconds.

154 − 88 = 72s

time taken = ... 72 ..... s [1]

(b) A faster train takes 54 s to travel from Station A to Station B. The distance between the stations is 120 m.

Calculate the average speed of this train.

$$\text{Av. Speed} = \frac{\text{Total distance}}{\text{total time}}$$

$$= \frac{120\text{m}}{54\text{s}} = 2.222 \text{ m/s}$$

average speed = ... 2.2 ..... m/s [3]

(c) Fig. 1.2 shows the speed-time graph for a train travelling on a different part of the track.

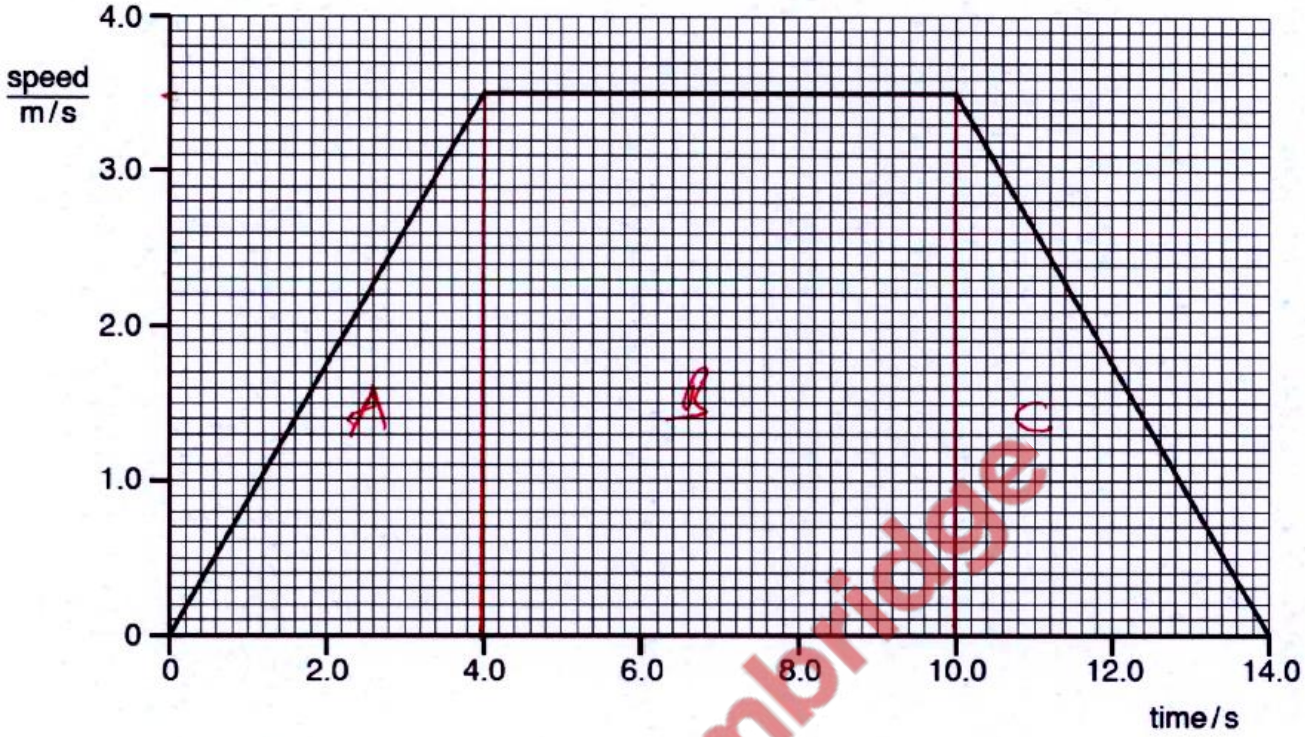


Fig. 1.2

Determine the total distance travelled by the train on this part of the track.

- distance travelled = area under the graph.
- divide the graph into recognisable shape

$A = \frac{1}{2} \times 4 \times 3.5 = 7.0\,m.$

$B = 6 \times 3.5 = 21\,m.$

$C = \frac{1}{2} \times 4 \times 3.5 = 7.0\,m$

35m

35.

distance = ... m [4]

[Total: 8]

2.

A 250 cm^3 beaker containing some liquid is shown in Fig. 2.1.

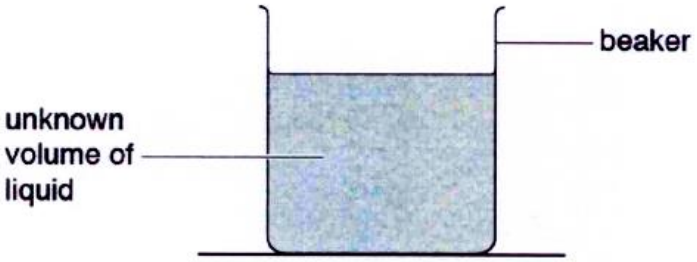


Fig. 2.1

$\rho = \frac{m}{V}$.

(a) (i) A student has a measuring cylinder and a balance.

Describe an experiment to determine the density of the liquid.

- measure mass of empty measuring cylinde
- Add a given volume of liquid into the measuring cylinder and note the volume
- Measure mass of m/ cylinder and liquid
- Calculate mass of liquid by subtracting mass of empty from mass of cylinder with
- Use the equation $\rho = m/V$ to calculate density of liquid. [5]

(ii) Suggest the unit of density used by the student.

g/cm^3. [1]

(b) Fig. 2.2 shows a block of polythene.

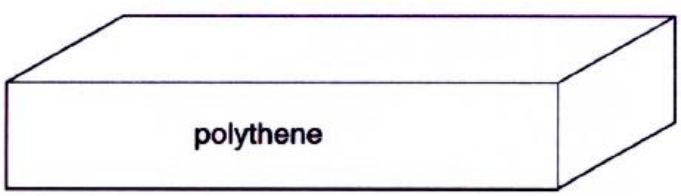


Fig. 2.2

(i) Polythene floats in water. Explain why polythene floats.

polythene is less dense than water. [1]

(ii) The weight of the polythene block is 0.84 N.

Calculate the mass of the block.

$W = mg$.

$m = \frac{W}{g} = \frac{0.84\,N}{10\,N/kg} = 0.084\,kg$

mass = 0.084 kg [3]

[Total: 10]

3.

(a) Fig. 3.1 shows the vertical forces on a rocket.

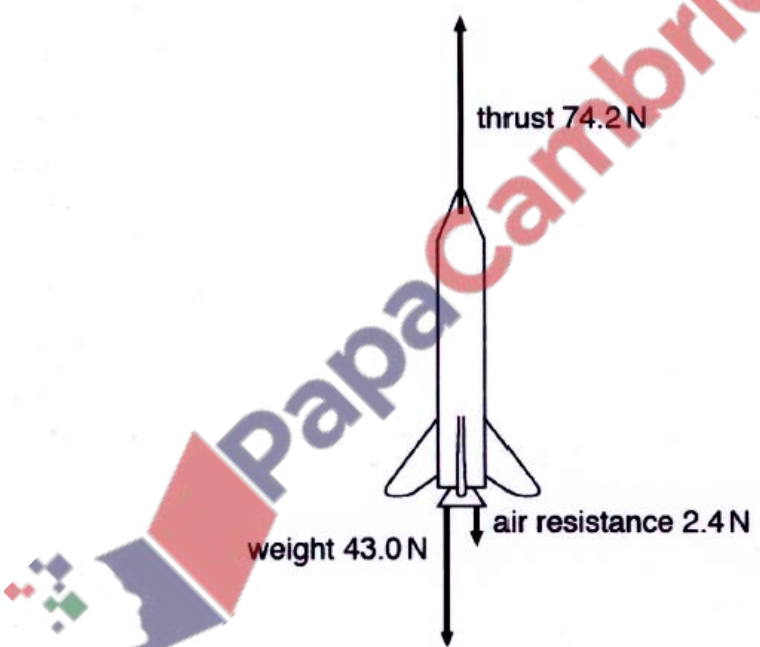


Fig. 3.1

Calculate the resultant force on the rocket.

R.F = up force − down force

$= 74.2 - (43 + 2.4)$

$= 74.2 - 45.4$

$= 28.8\,N$

resultant force = 28.8 N

direction = upwards. [3]

(b) Fig. 3.2 shows the speed and direction of motion of an object at a point in time.

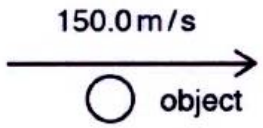


Fig. 3.2

The resultant force on the object is zero for 10 seconds.

Deduce the speed and direction of motion after 5 seconds. Indicate the speed and direction of the object by drawing a **labelled** arrow next to the object in Fig. 3.3.

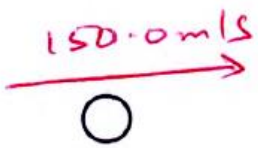


Fig. 3.3

[1]

[Total: 4]

- If R.F is zero, the object continues at constant speed in the same direction

4.

(a) Fig. 4.1 shows a smoke cell. The cell contains smoke particles and air molecules. It is lit from the side. A student views the motion of smoke particles in the cell by using a microscope.

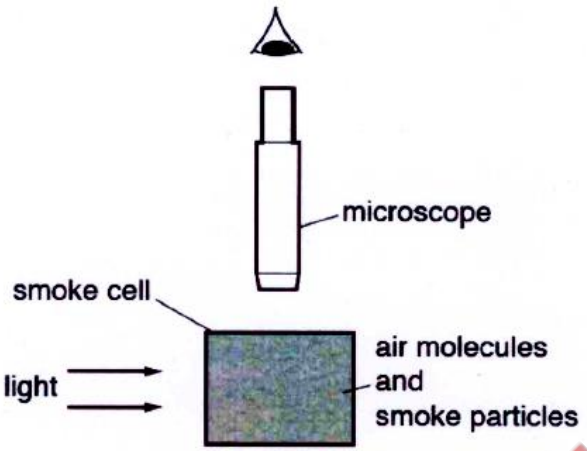


Fig. 4.1

Describe and explain what the student sees when viewing the smoke particles through the microscope.

- Specs of light which is reflected by the smoke particles
- The smoke particles moving randomly.
- This is because fast moving air molecules collide with smoke particle causing them to move.
- This produces Brownian motion. [4]

(b) Drops of water on a warm surface disappear after a short time. State the term used to describe this process. Explain the process, using your ideas about molecules.

name of process evaporation

explanation high energy moving molecules with greater K.E escape from the surface of water.

[3]

[Total: 7]

5.

Fig. 5.1 shows a geothermal power station. It generates electricity.

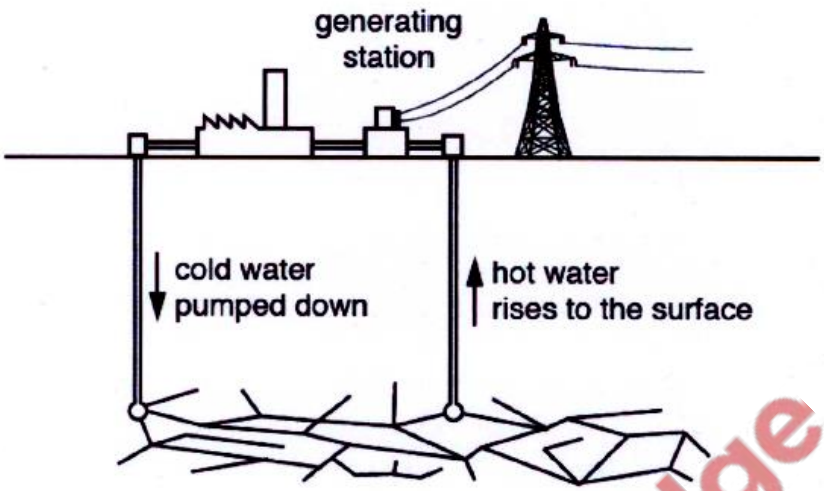


Fig. 5.1

(a) In a geothermal power station, the process of generating electricity includes seven stages. Four of the stages are shown below.

P steam turns a turbine

Q hot underground rocks heat the cold water

R the turbine spins a generator

S hot water rises to the surface

The flow chart in Fig. 5.2 shows the seven stages, but it is incomplete. Complete the flow chart by adding the letters P, Q, R and S in the correct sequence.

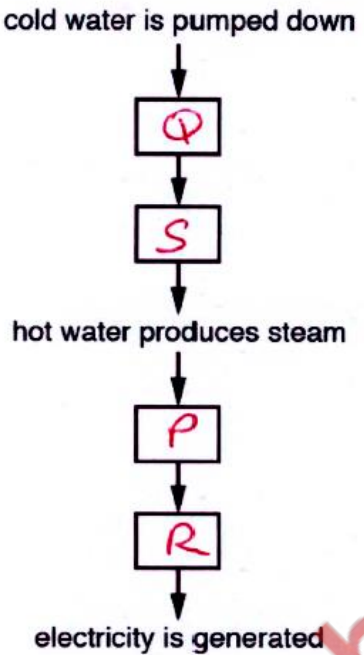


Fig. 5.2

[3]

(b) The cost of electrical energy obtained from a geothermal power station is similar to the cost of electrical energy obtained from wind turbines.

Describe one advantage and one disadvantage of using a geothermal power station to generate electricity compared with using wind turbines.

advantage electricity supply is continuous from geothermal while supply from wind turbines depends on wind flow.

disadvantage only found in certain areas, but wind is every where.

[2]

[Total: 5]

6.

A student constructs a device for absorbing thermal energy from the Sun. Fig. 6.1 shows the device.

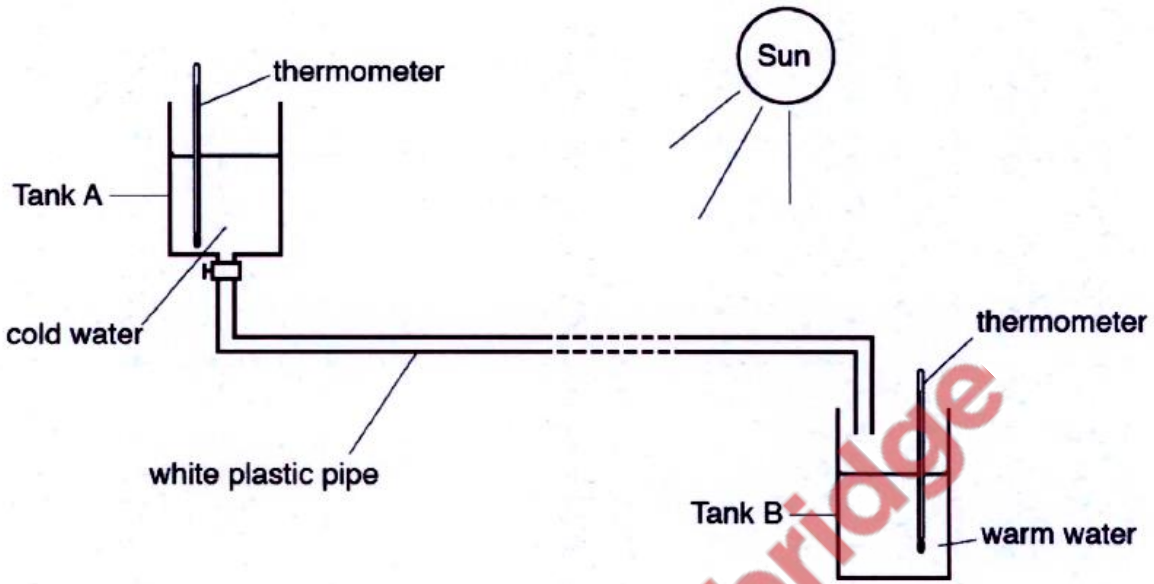
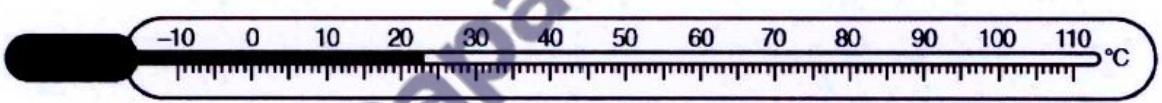


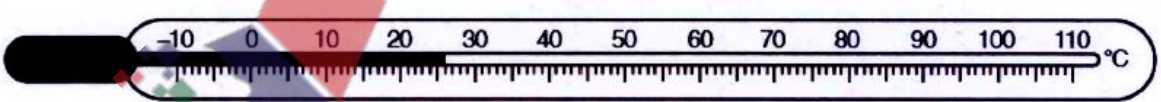
Fig. 6.1

The student places the white plastic pipe in sunlight. The cold water flows slowly from Tank A to Tank B. Energy from the Sun heats the water in the pipe.

Fig. 6.2 shows the temperatures in Tank A and Tank B.



Thermometer showing temperature in Tank A.



Thermometer showing temperature in Tank B.

Fig. 6.2

(a) Determine the rise in temperature of the water.

26 – 23 = 3 °C

temperature rise = ... 3 ..... °C [1]

(b) The student wants to increase the thermal energy absorbed by the water in the pipe. Suggest three improvements he can make to increase the thermal energy absorbed.

1 Use metal pipe

2 paint the pipe black.

3 use pipe with greater surface area.

[3]

(c) Describe how the thermal energy is transferred from the Sun to the water inside the pipe.

- through infra-red through radiation in air
- then conducted through pipe

[2]

[Total: 6]

7.

The spectrum of white light is made up of seven colours.

(a) Fig. 7.1 shows a partially-completed spectrum. Two labels are missing.

violet	indigo	Blue	green	Yellow	orange	red

ROYGBIV

Fig. 7.1

(i) On Fig. 7.1, write the name of the missing colour in each blank space. **[2]**

(ii) On Fig. 7.1, indicate the direction of **increasing** wavelength for the spectrum. Draw an arrow in the box below the spectrum of colours. **[1]**

(b) A ray of red light strikes one face of a triangular glass prism as shown in Fig. 7.2.

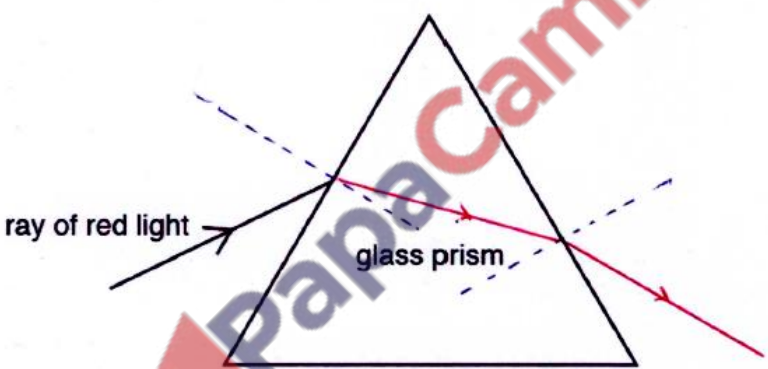


Fig. 7.2

(i) On Fig. 7.2, draw the path of the ray as it travels through the glass prism and enters the air. **[2]**

(ii) State the term used to describe what happens to the ray of red light as it enters and leaves the prism.

refraction

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

(bending of light as it enters one medium from another at an angle)

[Total: 6]

8.

This question is about measuring the speed of sound in air.

A student stands in front of a large wall. She hits a drum and hears an echo. Fig. 8.1 shows the position of the student and the wall.

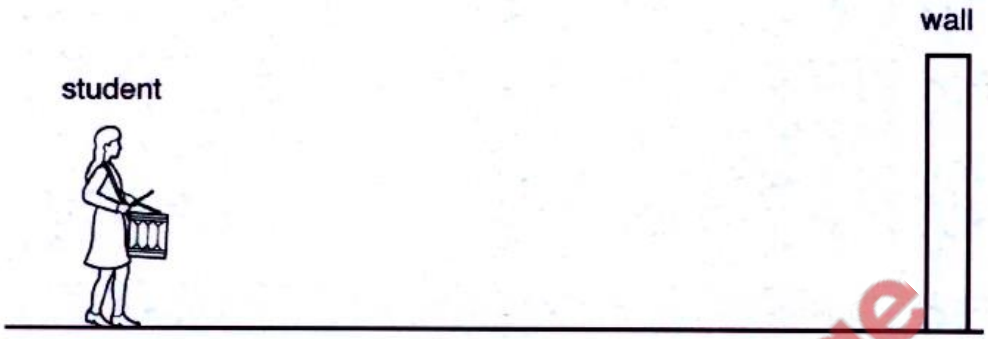


Fig. 8.1

(a) **(i)** State the name of a piece of equipment for measuring the distance from the student to the wall.

tape measure [1]

(ii) Explain how sound forms an echo.

- Sound is reflected off the barrier and returns along original path. [1]

(b) The student hits her drum repeatedly once per second. She walks away from the wall and listens for the echo. When the student is 170 m from the wall she hears the echo from one beat of the drum at the same time as the next beat of the drum.

Use this information to determine the speed of sound. State the unit.

- distance travelled by sound = 170 × 2 = 340m.
- Time taken = 1.0s.

$$\text{Speed} = \frac{\text{distance}}{\text{time}} = \frac{340\text{m}}{1\text{s}} = 340\text{m/s}$$

speed = 340 m/s. [4]

[Total: 6]

9.

Fig. 9.1 shows a partially-labelled diagram of the electromagnetic spectrum.

Fig. 9.1

(a) **(i)** On Fig. 9.1, add the names of the missing radiations at **A** and at **B**. [2]

(ii) Indicate the radiation that has the lowest frequency. On Fig. 9.1, draw a ring around the radiation. [1]

(b) State two safety precautions when handling sources that emit gamma radiation.

1 - Limit time of exposure

2 - Use long tongs

3 - Use lead apron

4. point source away from you.

[2]

[Total: 5]

10.

Fig. 10.1 shows a circuit for determining the resistance of a component.

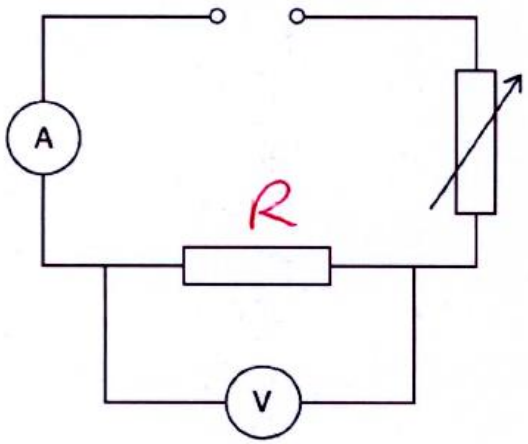


Fig. 10.1

(a) On Fig. 10.1, label the fixed resistor, by writing the letter R. [1]

(b) Two components in Fig. 10.1 measure electrical quantities.

Identify the quantity that each component measures.

Write each quantity and the unit of each quantity in the correct place in Table 10.1.

component	quantity	unit
A	current	A
V	p.d	V

Table 10.1

[4]

(c) A student uses the circuit in Fig. 10.1 to determine the resistance of wires made from the same material.

State how the resistance of a wire is related to its length and its diameter.

length - directly proportional to resistance.
- Long wire gives more resistance

diameter inversely proportional
- thin wire (small diameter) provides more resistance.

[2]

[Total: 7]

11.

Fig. 11.1 shows a vertical conductor passing through a horizontal piece of card.

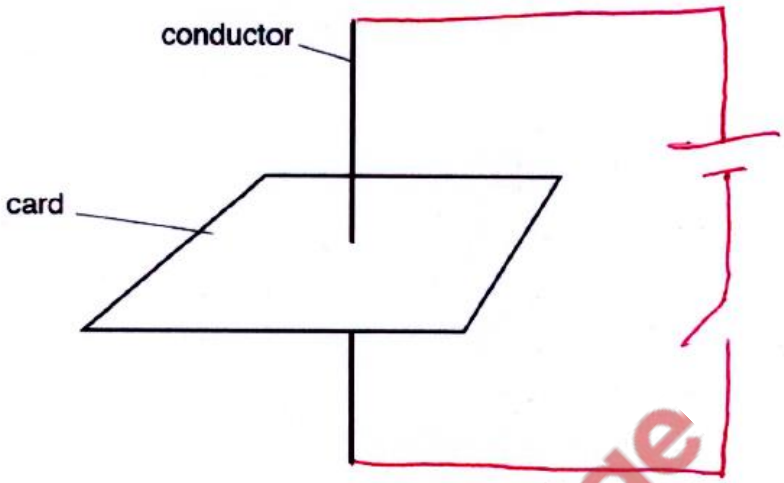


Fig. 11.1

(a) (i) On Fig. 11.1, draw a cell and a switch in series with the conductor to form a complete circuit.

Use the correct circuit symbols. [2]

(ii) A student sprinkles iron filings onto the card and closes the switch. There is a current in the conductor. Describe the pattern of the magnetic field seen.

- Field is circular around the conductor.

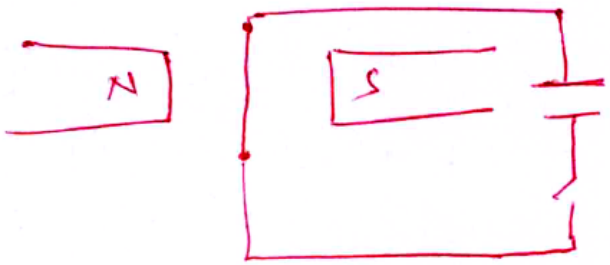
.....[2]

(iii) The student reverses the direction of the current in the conductor. State the effect, if any, on the pattern he sees.

No change on the circular arrangement of the iron filling around the conductor.

.....[1]

(b) Describe an experiment to show that a force acts on a current-carrying conductor in a magnetic field. Show how to arrange the equipment. Include a diagram in your answer.



- Place a conductor between the poles of magnet
- Switch the current to flow through the conductor.
- The wire/conduct is seen to move since a force acts on it according to Flemings left hand rule.

.....[4]

[Total: 9]

12.

Radioactive decay may include the emission of:

α-radiation
β-radiation
γ-radiation

(a) **(i)** From the list, state the type of radiation which has the **greatest** ionising effect.

α - radiation ..... [1]

(ii) From the list, state the type of radiation which has the **lowest** penetrating ability.

α - radiation ..... [1]

(b) In a factory, rollers press aluminium metal to make thin foil sheets. An automatic system for controlling the thickness of the foil uses a radioactive source. The automatic system changes the gap between the top and bottom roller. Fig. 12.1 shows the equipment.

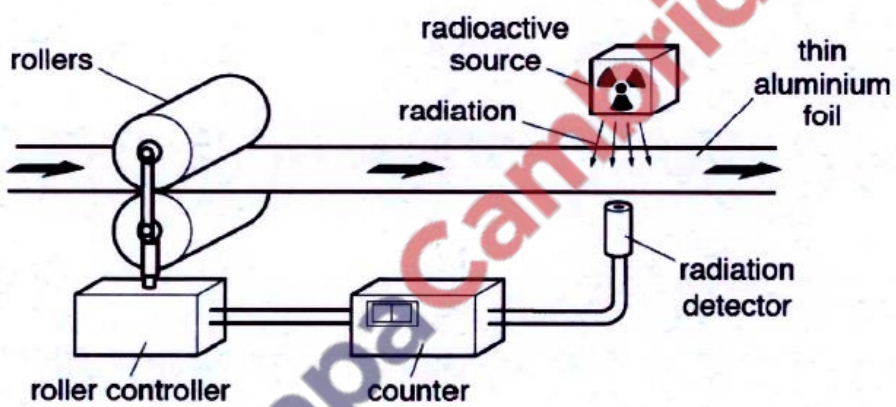


Fig. 12.1

(i) Use your ideas about the properties of radiation to suggest and explain the type of radiation used.

type of radiation ..... beta radiation .....

explanation ..... the amount of beta radiation from source to detector will be affected by the thickness of the metal. .....

[2]

(ii) The aluminium foil passing the radiation detector is too thin. Describe how this fault affects the reading on the counter.

Counter reading will be higher [1]

(iii) Suggest how the fault in (b)(ii) is corrected. State what happens to the rollers.

- rollers move apart to provide less force. [1]

(iv) The source used is strontium-90. A nucleus of strontium-90 can be described as $^{90}_{38}Sr$. State the number of protons in a nucleus of strontium-90.

38 (atomic Number) [1]

[Total: 7]