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.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

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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.



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.

View solution

time taken = ... 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.

View solution

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

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

View solution

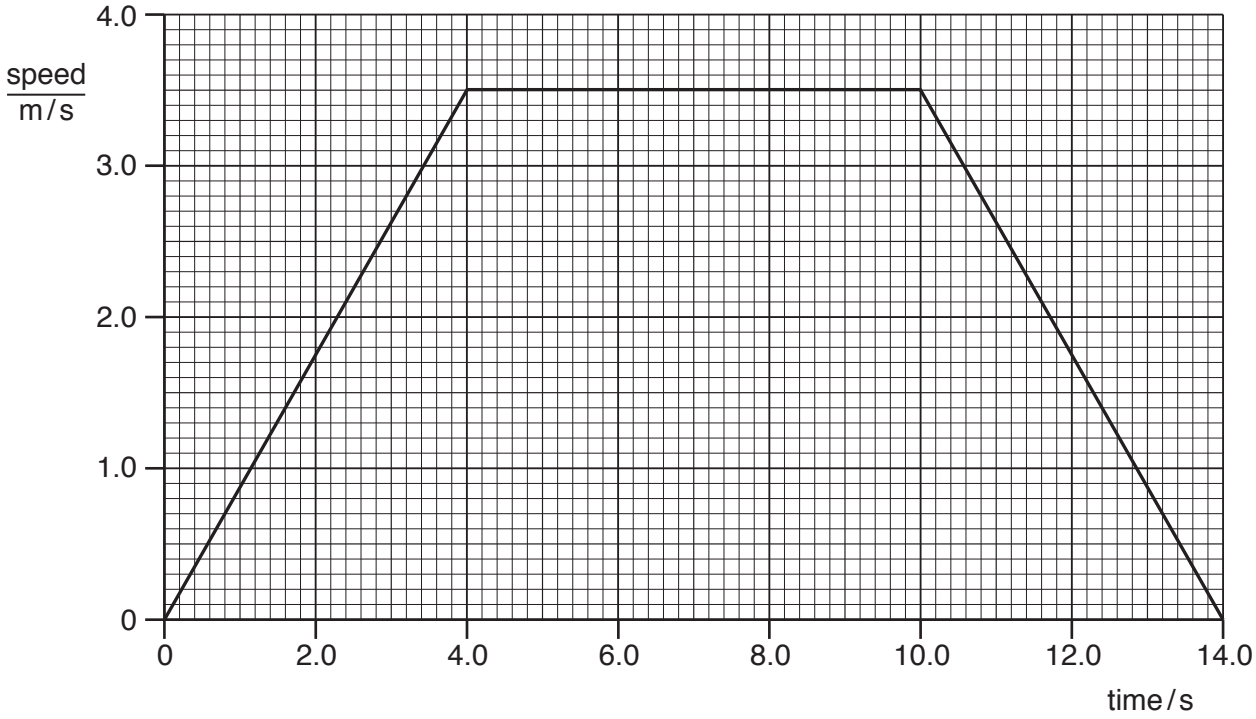

Fig. 1.2

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

distance = ... m [4]

[Total: 8]

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

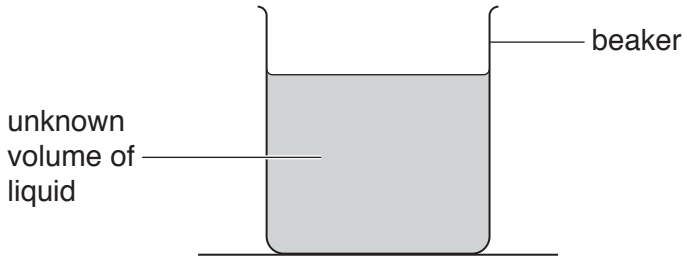

Fig. 2.1

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

View solution

Describe an experiment to determine the density of the liquid.

.....

.....

.....

.....

.....

.....

.....

.....[5]

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

View solution

.....[1]

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

View solution

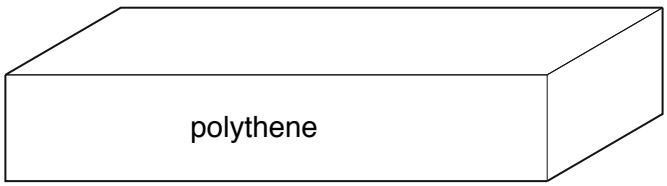

Fig. 2.2

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

.....[1]

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

Calculate the mass of the block.

View solution

mass = ... kg [3]

[Total: 10]

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

View solution

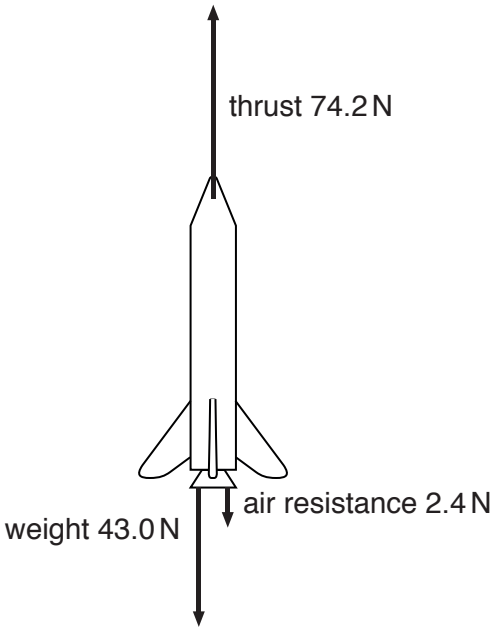

Fig. 3.1

Calculate the resultant force on the rocket.

resultant force = ... N

direction = ...[3]

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

View solution

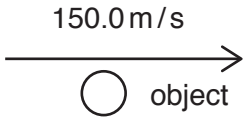

Fig. 3.2

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]

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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.

View solution

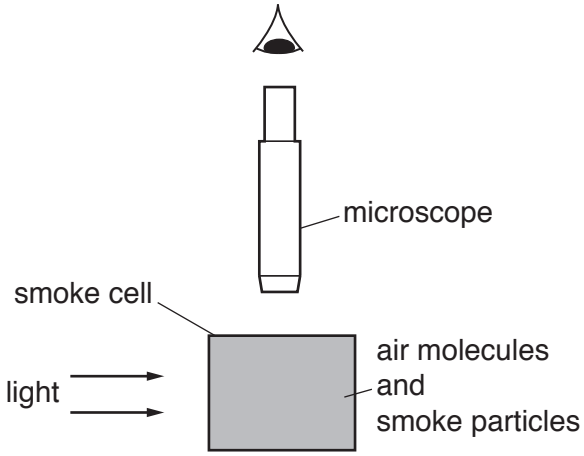

Fig. 4.1

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

.....

.....

.....

.....

.....

.....[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 .....

explanation .....

.....

.....

[3]

[Total: 7]

View solution

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

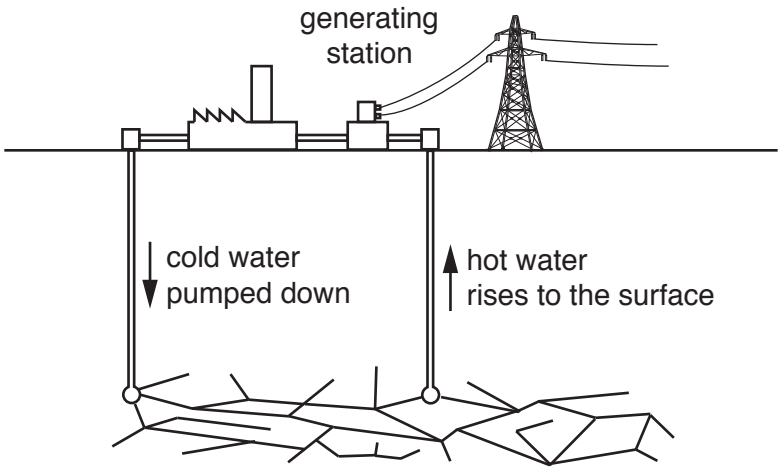

Fig. 5.1

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

View solution

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.

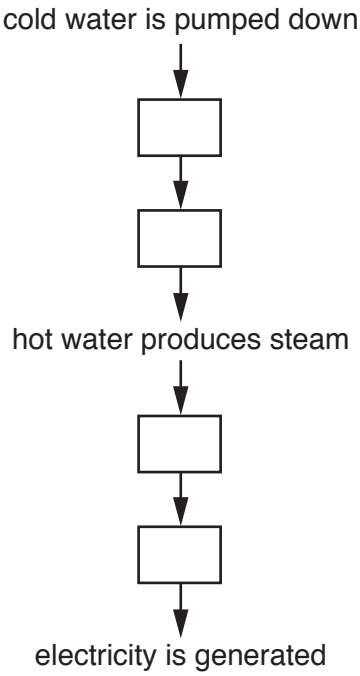

Fig. 5.2

[3]

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(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 .....

.....

disadvantage .....

.....

[2]

[Total: 5]

View solution

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

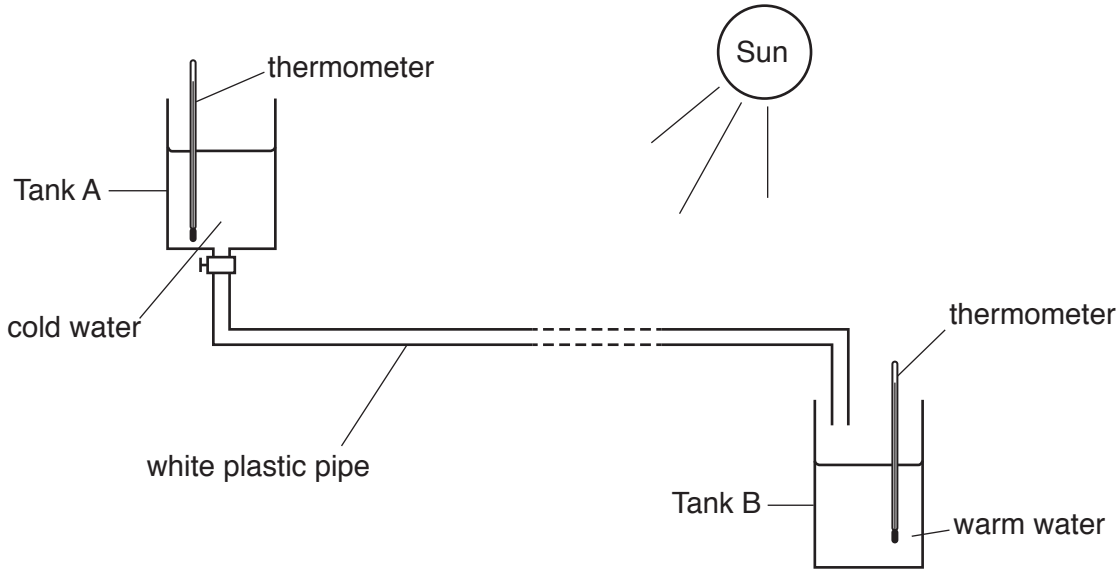
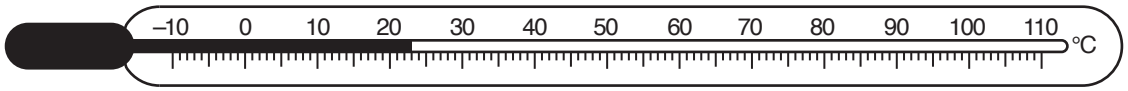


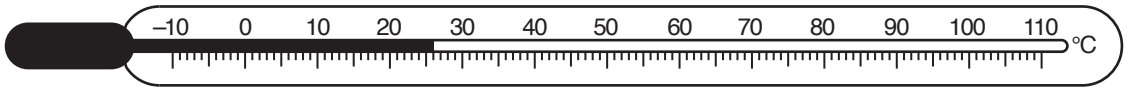
Fig. 6.1

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.

View solution

temperature rise = ... °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 .....

.....

2 .....

.....

3 .....

.....

[3]

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

View solution

.....

.....[2]

[Total: 6]

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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.

View solution

violet	indigo		green		orange	red

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.

View solution

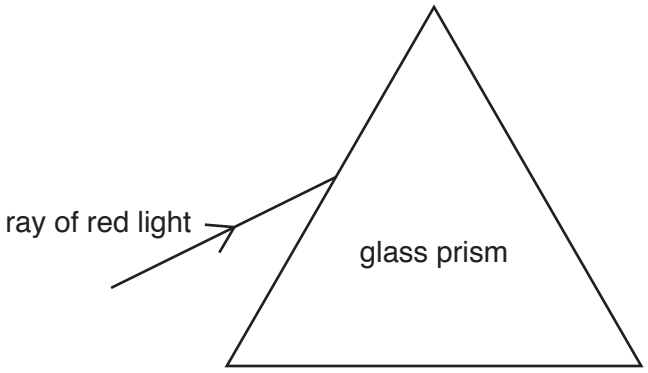

Fig. 7.2

(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.

.....[1]

[Total: 6]

View solution

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

View solution

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

.....[1]

(ii) Explain how sound forms an echo.

View solution

.....

.....[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.

View solution

speed = ... [4]

[Total: 6]

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

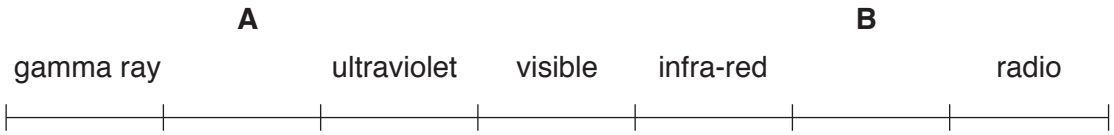

Fig. 9.1

View solution

(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.

View solution

1 .....

2 .....

[2]

[Total: 5]

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

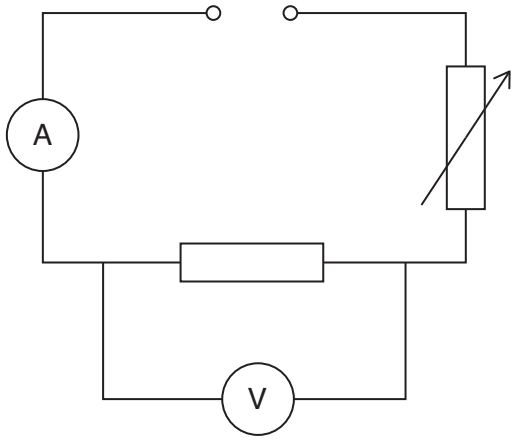

Fig. 10.1

View solution

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

View solution

(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		
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.

View solution

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

length .....

.....

diameter .....

.....

[2]

[Total: 7]

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

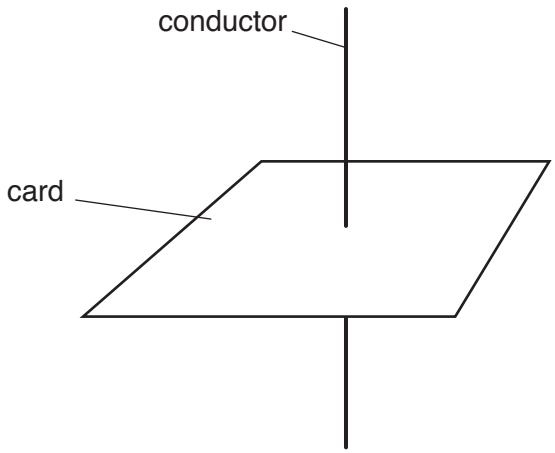

Fig. 11.1

(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.

.....

.....[2]

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

.....[1]

View solution

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(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.

View solution

.....

.....

.....

.....

.....

.....

.....[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. View solution

.....[1]

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

.....[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.

View solution

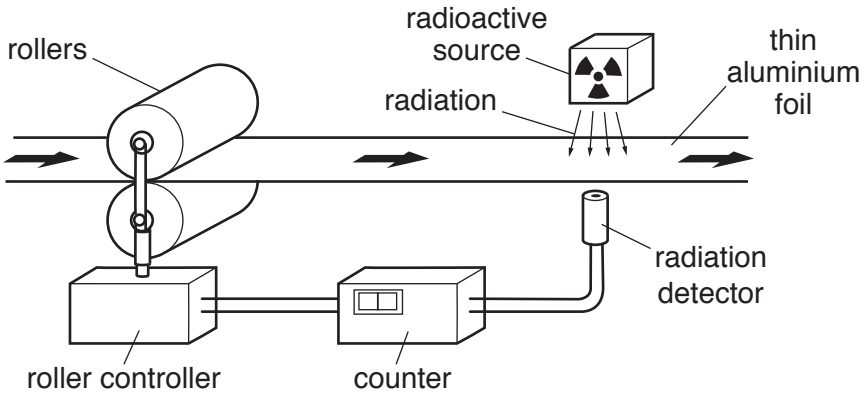

Fig. 12.1

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

type of radiation .....

explanation .....

.....

.....

.....

[2]

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

.....[1]

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

.....[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.

.....[1]

[Total: 7]

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