

Candidate Marks Report

Series : 6 2026

This candidate's script has been assessed using On-Screen Marking. The marks are therefore not shown on the script itself, but are summarised in the table below.

Centre No :	PK470	Assessment Code :	5054
Candidate No :	58	Component Code :	22
Candidate Name :	HUZAIFA UMER,		

In the table below 'Total Mark' records the mark scored by this candidate.
'Max Mark' records the Maximum Mark available for the question.

Paper:	5054/22	
Paper	69 / 80	
Total:		
Question	Total / Max Mark Mark	
1a	2 / 2	
1b	3 / 3	
1c	2 / 2	
1d	2 / 2	
2a	2 / 2	
2b	2 / 2	
2c	3 / 3	
3ai	1 / 1	
3aii	1 / 1	
3b	1 / 1	
3ci	2 / 2	
3cii	2 / 2	
4a	2 / 2	
4b	2 / 2	
4ci	1 / 2	
4cii	0 / 2	
4d	2 / 2	
5ai	1 / 1	
5aii	1 / 2	
5aiii	0 / 2	
5b	2 / 2	
5c	2 / 2	
6a	2 / 2	
6bi	1 / 1	
6bii	1 / 1	
6ci	1 / 1	
6cii	2 / 2	
6d	3 / 3	
7ai	3 / 3	
7aii	1 / 1	
7bi	2 / 2	
7bii	1 / 1	

7biii	1	/ 2
8a	0	/ 2
8bi	0	/ 1
8bii	1	/ 1
8biii	1	/ 1
8biv	2	/ 2
8c	1	/ 1
8d	1	/ 2
9a	1	/ 1
9b	2	/ 2
9ci	1	/ 1
9cii	2	/ 2
9ciii	3	/ 3



Cambridge O Level

 CANDIDATE
NAME

Huzaiifa Umer

 CENTRE
NUMBER

P K 4 7 0

 CANDIDATE
NUMBER

0 0 5 8

PHYSICS
5054/22

Paper 2 Theory

May/June 2026
1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

Casio fx-991ES PLUS

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 m/s^2).

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [].

09 05

 This document has **20** pages. Any blank pages are indicated.

1 An athlete and a cyclist both travel along the same straight road in the same direction.

- The athlete and the cyclist start next to each other at time $t = 0$.
- The athlete runs at a steady speed of 8.0 m/s from $t = 0$ to $t = 6.0 \text{ s}$.
- The cyclist accelerates uniformly from rest at $t = 0$ to a speed of 18 m/s at $t = 6.0 \text{ s}$.

(a) On Figure 1.1, draw speed–time graphs for the runner and for the cyclist.

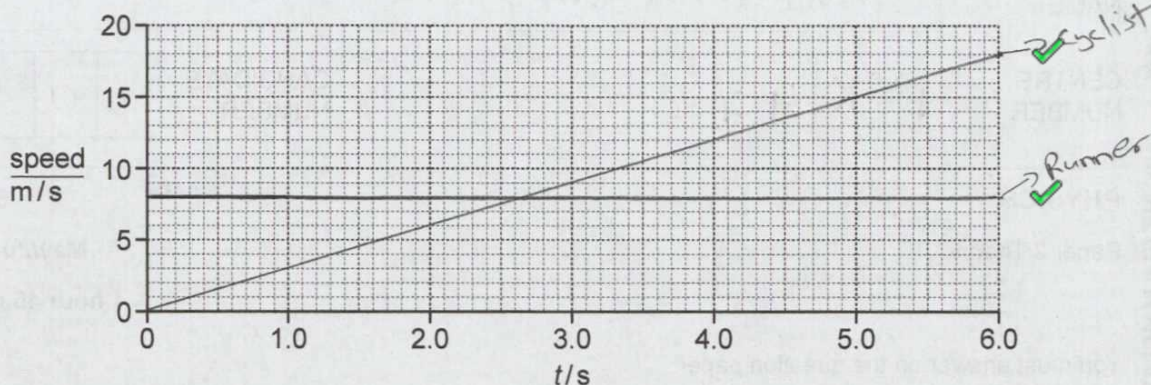


Figure 1.1

[2]

(b) Calculate the acceleration of the cyclist. Give the unit of your answer.

$$a = \frac{v - u}{t}$$

$$a = \frac{18 - 0}{6}$$

acceleration = 3 unit m s^{-2} [3]

(c) Show, by calculation, that the athlete has travelled a greater distance than the cyclist at $t = 5.0 \text{ s}$.

Distance by

Athlete till 5 seconds = 5×8
 $= 40 \text{ meters}$

Distance travelled by

cyclist till 5 seconds = $\frac{1}{2} (5 \times 15)$
 $= 37.5 \text{ meters}$

Hence Athlete travels more distance than the cyclist in first 5 seconds.

[2]

(d) State Newton's first law of motion, and explain how it applies to the motion of the athlete.

Newton's first law states ^{that} an object ^{remains in rest state} ~~moves at~~ moves at constant speed until a force acts on it and changes its motion. Here the athlete travels at constant speed because both the forward force and the backward forces are equal. And no external force changes the motion. [Total: 9]

- 2 A heavy stone is placed on a plank of wood to make a diving board as shown in Figure 2.1.

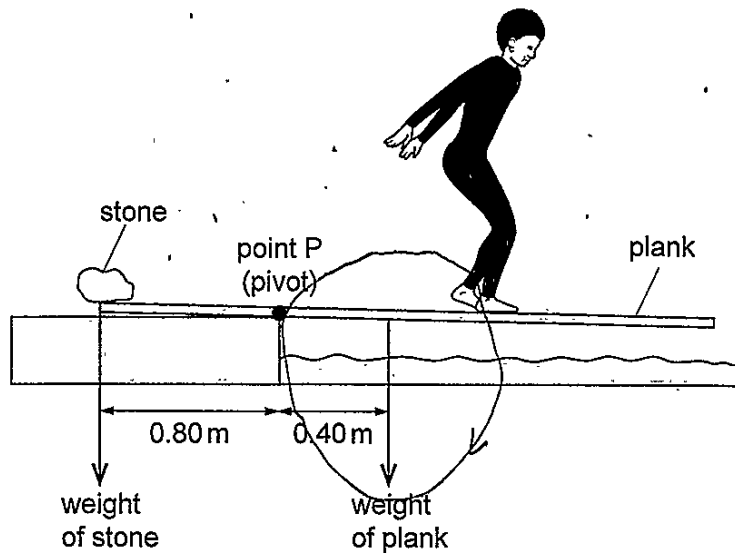


Figure 2.1

The point P is a pivot.

The weight of the stone is 650 N, and the weight of the plank is 200 N.

- (a) State the principle of moments.

The sum of clockwise moment is equal to the sum of anti-clockwise moment and the object remains in stationary position or rest state. [2]

- (b) Calculate the moment of the weight of the plank about P.

$$M = Fd$$

$$= (200)(0.40)$$

$$= 80$$

moment = 80 Nm [2]



(c) A student of mass 40 kg walks to the right along the plank until the plank tips into the water.

Calculate the horizontal distance between point P and the student when the plank tips into the water. let the distance be x

Sum of Clockwise moments = Sum of anti-clockwise moment

$$400x + 80 = (650)(0.80)$$

$$400x = 520 - 80$$

$$400x = 440$$

$$x = \frac{440}{400}$$

$$x = 1.1$$

distance = 1.1 m [3]

[Total: 7]

- 3 Figure 3.1 shows a dam used as part of a hydroelectric power station.

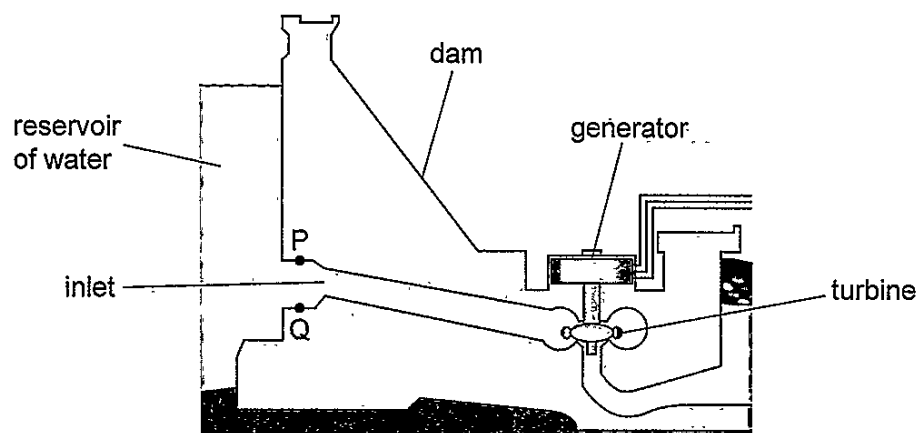


Figure 3. 1

Water flows to the turbine through an inlet in the dam. The inlet is shown in Figure 3.1.

Points P and Q are on the horizontal surfaces next to the inlet.

- (a) (i) State **two** factors that determine the size of the pressure at P.

$\rightarrow$ Force $\rightarrow$ Density
 $\rightarrow$ Contact area $\rightarrow$ Depth ✓ [1]

- (ii) The pressure in the water causes a force on the horizontal surfaces at P and Q.

State the directions of the forces due to the water on the surfaces at P and Q.

direction at P Upward
 direction at Q Downward ✓ [1]

- (b) This hydroelectric energy resource is a renewable source of energy.

State the name of one other renewable energy source.

Wind ~~power~~ energy ✓ [1]



(c) The power output from the generator is 2.5 MW. $= 2.5 \times 10^6$

(i) Calculate the energy **output** from the generator in 30 minutes.

$$E = Pt$$

$$E = (2.5 \times 10^6) (30) (60)$$

$$E = 4.50 \times 10^9$$

energy output = 4.50×10^9 J [2]

(ii) The efficiency of the energy transfer in the generator is 95%.

Calculate the power **input** to the generator.

$$\text{eff} = \frac{\text{output}}{\text{input}} \times 100$$

$$\frac{95}{100} = \frac{2.5}{\text{input}}$$

power input = 2.63 MW [2]

[Total: 7]

$$\text{input} = \frac{2.5}{0.95}$$

$$\text{input} = 2.63$$

- 4 Figure 4.1 shows a travel mug used to keep a liquid hot.

Inside the mug, there are metal walls with a vacuum between the walls.

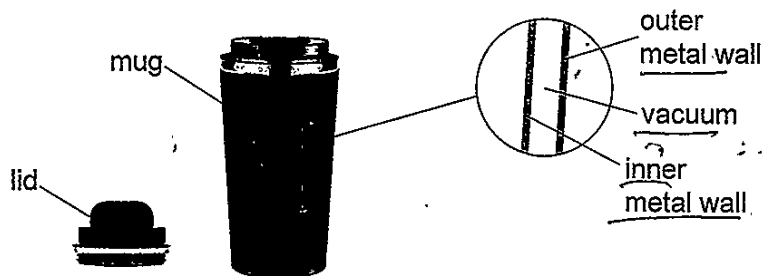


Figure 4.1

The mug contains 250 g of water, initially at 90 °C. Over 6.0 hours, the water cools to 75 °C.

The specific heat capacity of water is 4.2 J/(g °C).

- (a) State what is meant by 'specific heat capacity'.

Amount of Thermal energy required to raise the temperature of a unit mass of a substance by 1 kelvin.

- (b) Calculate the thermal energy transferred from the water over 6.0 hours.

$$\Delta T = 90 - 75 = 15$$

$$c = \frac{Q}{m \Delta T}$$

$$(c)(m)(\Delta T) = Q$$

$$(4.2)(250)(15) = Q$$

$$15750 = Q$$

thermal energy = 15750 J [2]

- (c) (i) Explain how the vacuum between the walls reduces the transfer of thermal energy.

Vacuum prohibits transfer of Thermal energy as there is no medium in vacuum which can transfer energy. Neither air is present that conducts heat.

- (ii) Suggest and explain the best colour and texture for the surface of the walls.

The colour of mug should be black and the texture should be dull. As this combination absorbs maximum thermal energy keeping the liquid hot.

(d) Explain why the water cools faster when the lid is removed.

As the lid is removed, the cold air allows particles on the top surface to become cooler. They come close together sinking downwards while less dense particles sink upwards, causing a convectional current which speeds up the process of cooling. [2]

[Total: 10]

Answer of

of (d) part is

written here: As lid is removed, more energetic molecules of water evaporate from the surface leaving behind less energetic molecules which decreases the temperature of liquid more quickly.

- 5 A student uses a glass block and two identical glass prisms to demonstrate the action of a converging lens.

Figure 5.1 shows three parallel rays of red light incident on the glass block and the two prisms.

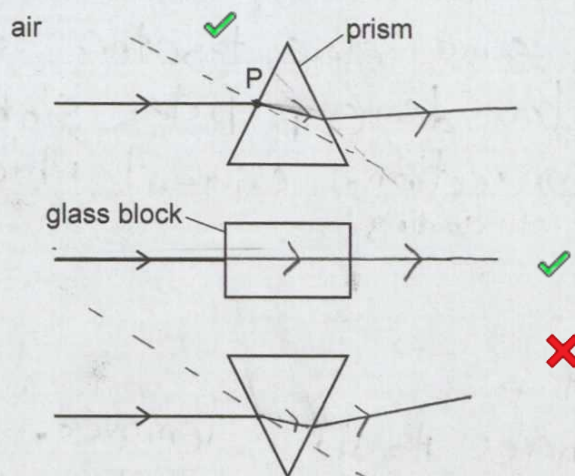


Figure 5.1

- (a) (i) On Figure 5.1, draw and label the normal to the prism at point P. [1]
- (ii) Complete Figure 5.1 to show how the rays of light travel through and out of both prisms and the glass block. [2]
- (iii) The action of a diverging lens is also demonstrated using the two identical glass prisms and the glass block.

On Figure 5.2, draw the prisms arranged so that they demonstrate the action of a diverging lens.

Show the rays of light travelling through the prisms and the glass block.

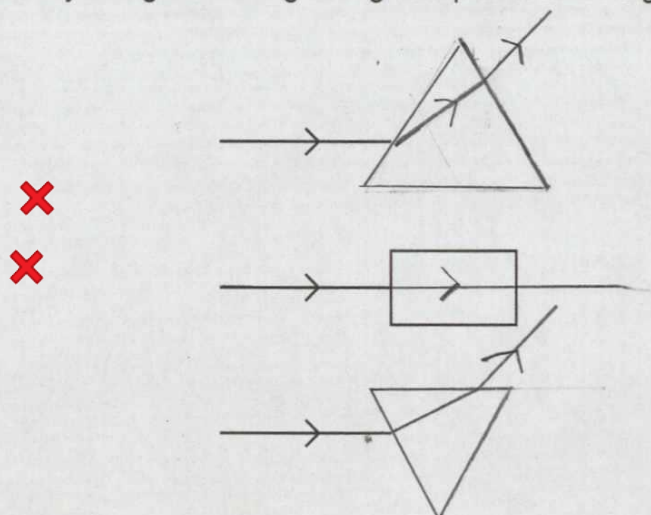


Figure 5.2

[2]

- (b) Figure 5.3 shows a converging lens, an object and two rays of light from the top of the object. The principal focus (focal point) on each side of the lens is labelled F.

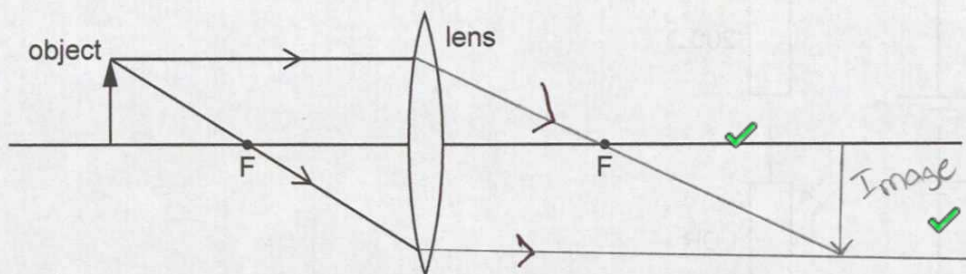


Figure 5.3

Continue the paths of both rays to show where the image of the object is formed. Draw and label the image. [2]

- (c) Figure 5.4 shows the electromagnetic spectrum.

radio waves	microwaves	infrared	visible light	ultraviolet	X-rays	gamma rays
-------------	------------	----------	---------------	-------------	--------	------------

Figure 5.4

State **two** properties of electromagnetic waves that change from one end of the spectrum to the other end, and describe how these properties change from one end to the other.

1. Wavelength decreases as we move from left to right side of the spectrum.
2. Frequency increases as we move from left to right side of the spectrum.

[2]

[Total: 9]

- 6 Figure 6.1 shows a light-dependent resistor (LDR) connected in series with a fixed resistor of resistance 200Ω and a battery.

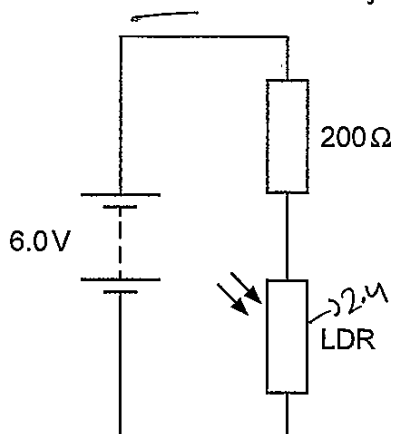


Figure 6.1

The electromotive force (e.m.f.) of the battery is 6.0V.

The potential difference (p.d.) across the LDR is 2.4V.

- (a) Both e.m.f. and p.d. are measured in volts.

The definitions of e.m.f. and p.d both involve the work done per unit charge.

State how the definitions of e.m.f. and p.d are **different** from each other.

As e.m.f. is calculated by the work done ^{to drive} per unit charge ^{through the} of the whole circuit, while p.d. is only work done ^{to drive a} per unit charge through an electrical component or two specific points. [2]

- (b) (i) State the equation that relates resistance, current and voltage.

$$V = IR$$

[1]

- (ii) Compare the current in the fixed resistor with the current in the LDR.

~~Both are equal~~ Current would be equal in both components. [1]

(c) Calculate:

(i) the p.d. across the fixed resistor

$$6 = \text{p.d.} + 2.4$$

$$6 - 2.4 = \text{p.d.}$$

$$3.6 = \text{p.d.}$$

p.d. = 3.6 V [1]

(ii) the resistance of the LDR.

$$V = IR$$

$$\frac{3.6}{200} = I$$

$$0.018 \text{ A} = I$$

$$V = IR$$

$$\frac{2.4}{0.018} = R$$

$$133 \Omega = R$$

resistance = 133 Ω [2]

(d) The brightness of the light shining on the LDR increases.

Using words or phrases from the list below, complete Table 6.1 to show the effect of this increase in brightness.

You may use each word or phrase once, more than once or not all.

increases

stays the same

decreases

Table 6.1

	effect of increase in brightness
resistance of LDR	Decreases ✓
current in LDR	Increases ✓
current in fixed resistor	stays the same increases ✓
p.d. across the fixed resistor	Increases ✓
p.d. across the LDR	decreases ✓

[3]

[Total: 10]

- 7 (a) A solenoid is wound through holes in a piece of cardboard. There is a current in the solenoid.

Figure 7.1 shows the arrangement.

The direction of the current is shown by the arrows.

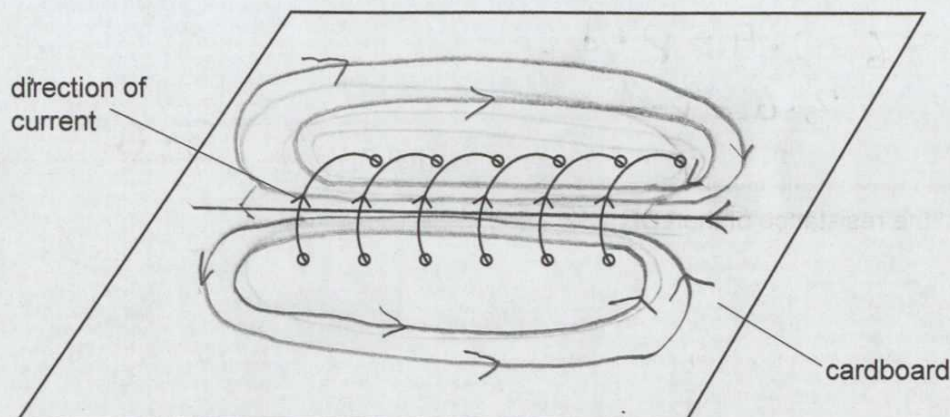


Figure 7.1

- (i) The current in the solenoid creates a magnetic field in and around the solenoid.

On Figure 7.1, draw the arrangement of the magnetic field lines on the surface of the cardboard.

Mark the direction of the magnetic field on the lines.

[3]

- (ii) The current in the solenoid increases.

State how the arrangement of the magnetic field lines in Figure 7.1 changes.

more magnetic field lines are produced.



[1]

- (b) Another solenoid is wrapped around a plastic tube.

A coil connected to a lamp is wrapped loosely around the other end of the tube as shown in Figure 7.2.

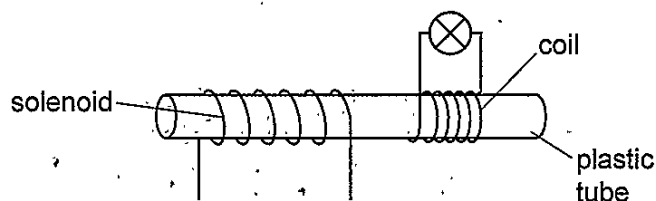


Figure 7.2

A direct current (d.c.) supply is connected to the solenoid and switched on.

There is a brief pulse of current in the coil as the d.c. supply is switched on.

The lamp emits a brief flash of light, and the coil moves slightly to the right, away from the solenoid.

- (i) Explain why a current is produced in the coil when the d.c. supply is switched on.

As d.c. supply is switched on, magnetic field lines are produced, when they go through the coil it induces current in it. [2]
causing the lamp to flash briefly.

- (ii) State one way in which the size of the current produced in the coil can be increased.

✓ Increase number of turns in the coil. [1]

- (iii) Explain why the coil moves away from the solenoid when the d.c. supply is first switched on.

As according to Lenz's law the current induced always opposes the change which produced it. Hence the coil moves away from solenoid that ~~produces~~ induced current in it. [2]

[Total: 9]

- 8 The isotope iodine-131 is used in the treatment of cancer.

During treatment, iodine-131 is absorbed by the cancer cells. Beta particles emitted from iodine-131 destroy the cancer cells.

- (a) Iodine-131 is more suitable for the treatment of cancer than a radioactive source which emits only gamma radiation.

Explain ~~two~~ properties of beta particles that make iodine-131 the more suitable source.

- 1 less ionisation power, so they damage less cells via ionisation.
- 2 Good ~~penetration~~ power. Penetrate easily through body killing the cancerous cells.

[2]

- (b) Figure 8.1 shows the apparatus used by a scientist to measure the half-life of a radioactive isotope.

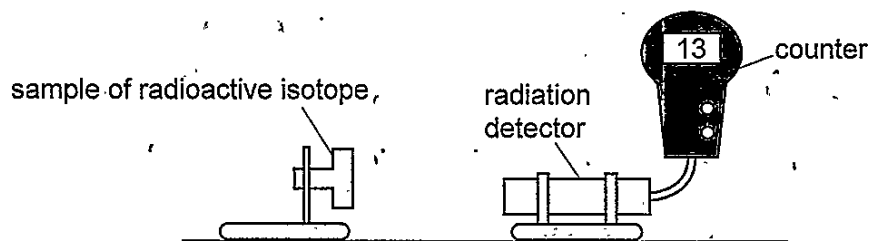


Figure 8.1

The scientist first measures the background radiation without the sample of radioactive isotope present.

The counter is set to zero, and the counter and radiation detector then used to record the background count for one minute. The procedure is repeated twice.

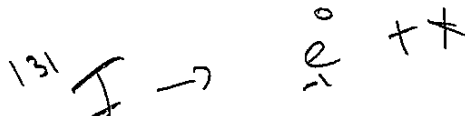
The scientist's results are shown in Table 8.1.

Table 8.1

background count in one minute	8	13	9
--------------------------------	---	----	---

- (i) State the name of a suitable radiation detector to use with the counter.

~~Spark~~ counter [1]



- (ii) The apparatus is not moved between the readings.

State why the three readings in Table 8.1 are different.

Because background radiations are emitted randomly. [1]

- (iii) Calculate the average background count rate.

$$\frac{8+13+9}{3} = Av$$

$$10 = Av$$

background count rate = 10 counts/min [1]

- (iv) The measured count rate C from the sample includes the background count rate.

The initial value of C is 90 counts/min.

Calculate the value of C after one half-life.

$$90 - 10 = 80$$

$$\frac{80}{2} = 40$$

$$40 + 10 = 50$$

$C = 50$ counts/min [2]

- (c) A doctor has the choice of either using iodine-131 with a half-life of 8.0 days or an isotope with a half-life of 8.0 years for the treatment of a cancer. The isotope is also a beta-particle emitter.

Suggest why iodine-131 is the better isotope to use.

Because it has a shorter half-life, and won't damage any cells by remaining in the body for long time. [1]

- (d) When emitting a beta particle, a nucleus of iodine-131 changes to a nucleus of xenon-131.

Describe how a nucleus of xenon-131 differs from a nucleus of iodine-131.

Xenon has one more proton in its nucleus than the iodine-131, as well as (one more electron/revolving its orbit.) has a greater positive charge on its nucleus. [2]

[Total: 10]

[Turn over]

- 9 Figure 9.1 shows the Sun and the orbits of three planets in the Solar System.

NOT TO SCALE

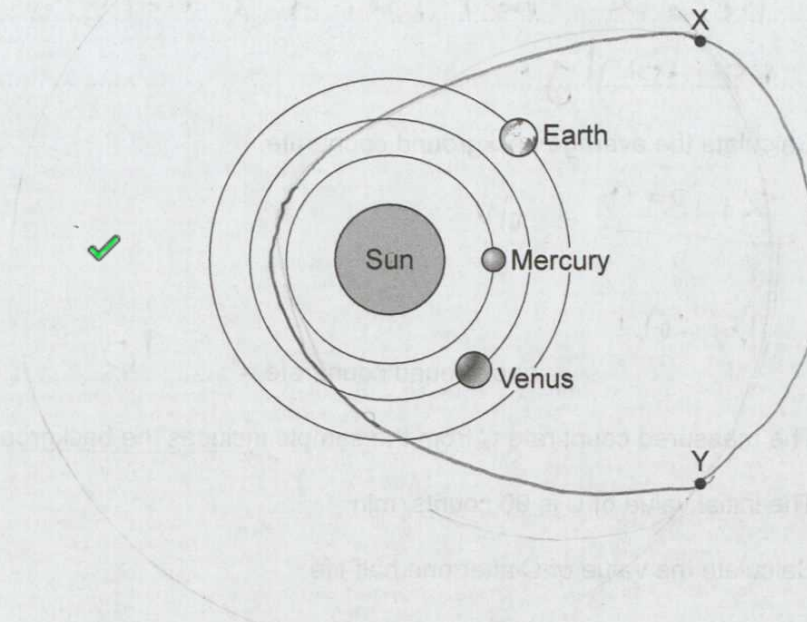


Figure 9.1

Halley's comet orbits around the Sun.

The orbit of Halley's comet passes through points X and Y and is closest to the Sun between the orbits of Mercury and Venus.

- (a) On Figure 9.1 draw the orbit of Halley's comet.

[1]

- (b) State **two** reasons why Mercury takes a shorter time to orbit the Sun than Earth.

As it ~~has~~ Mercury has to ~~cover~~ shorter orbital distance due to which it take shorter time than ~~Earth~~ to orbit Sun. moreover, it also has greater orbital speed than Earth ^[2] because it is more closer to Sun than Earth.

(c) The Sun is a stable star.

(i) State the name of the process that causes the release of energy in the Sun.

Nuclear fusion [1]

(ii) Explain, using ideas about forces, why the Sun is stable.

Because the inward ~~force~~ gravitational forces of attraction of Sun are equal to the outward forces of radiation due to high temperature and pressure. Hence it's a stable star. [2]

(iii) Describe what will happen to the Sun when it stops being a stable star.

It will use up all its hydrogen. When hydrogen runs out, it will expand forming a red giant which will then form a planetary nebula forming a white dwarf in the middle. [3]

[Total: 9]



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