



General Certificate of Secondary Education
2017–2018

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--

Double Award Science: Physics

Unit P1
Higher Tier



[GSD32]

FRIDAY 23 FEBRUARY 2018, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all eight** questions.

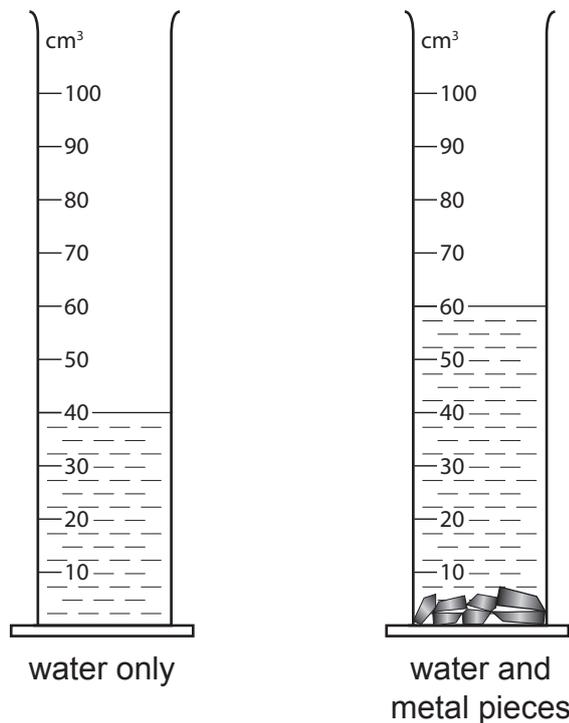
INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Questions **1(a)** and **8**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	

Total Marks	
--------------------	--

Water was poured into a measuring cylinder, up to the mark shown. Metal pieces of total mass 50 g were dropped into the water and the level rose.



(b) (i) What is the volume of the metal pieces?

$$\text{Volume} = \text{_____ cm}^3 \text{ [1]}$$

(ii) Calculate the density of the metal.

You are advised to show your working out.

$$\text{Density} = \text{_____ g/cm}^3 \text{ [2]}$$

Examiner Only	
Marks	Remark

- 2 (a) An atom is made up of protons, neutrons and electrons.
Complete the table below to show the relative electrical charge and the location of each particle.
Two of the boxes have already been done for you.

Particle	Relative electrical charge	Location in the atom
Proton	+1	in the nucleus
Neutron		
Electron		

[4]

- (b) Historically, two theories have been put forward to describe atomic structure.

Give the name of:

- (i) the current theory

_____ [1]

- (ii) the older theory

_____ [1]

Examiner Only	
Marks	Remark
○	○

Nuclear reactors are used in power stations to release energy through nuclear fission.



© Dale_Stagg / iStock / Thinkstock

(c) (i) Name two fuels commonly used in fission nuclear reactors.

1. _____

2. _____

[2]

(ii) Give the name of the particle which must be absorbed by a nucleus to start nuclear fission.

Particle = _____ [1]

(iii) Give one way a worker in a nuclear power station can reduce the dangers of radiation.

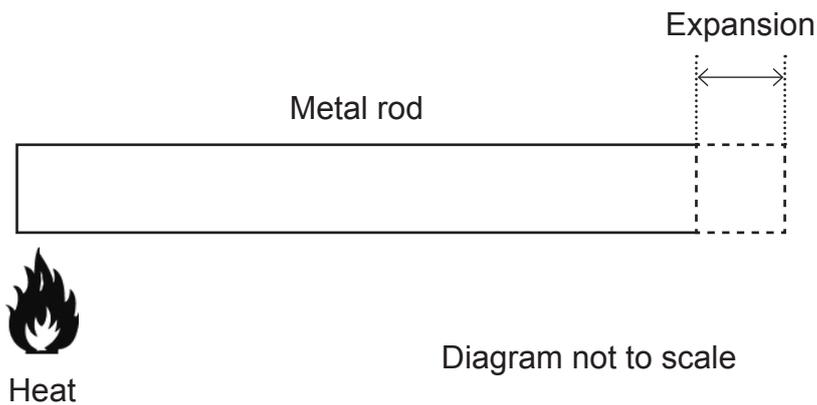
_____ [1]

Examiner Only

Marks

Remark

- 3 A student carries out an investigation into the expansion of a metal rod as it is heated.



He measures the expansion. He predicts that the expansion of the metal rod is proportional to the temperature rise of the metal rod.

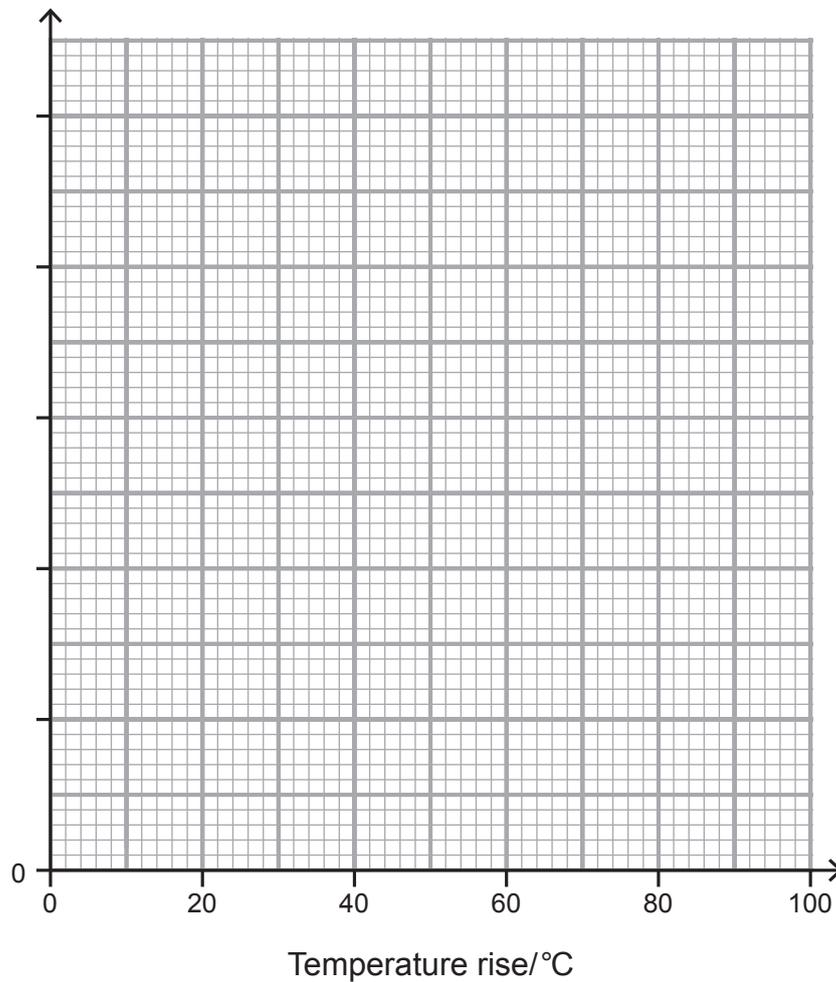
The data he obtains is shown in the table below.

Temperature rise/°C	0	20	40	60	80	100
Expansion/mm	0.0	0.5	1.0	1.5	2.0	2.5

You are asked to plot a graph of Expansion (vertical axis) against Temperature rise.

- (i) Choose a scale for the vertical axis and label it. [2]
- (ii) Plot a graph of Expansion versus Temperature rise. [2]
- (iii) Draw the line of best fit. [1]

Examiner Only	
Marks	Remark
○	○



Examiner Only	
Marks	Remark

(iv) Does the graph support the student's prediction?

YES or NO

Circle the correct answer.

Explain your answer.

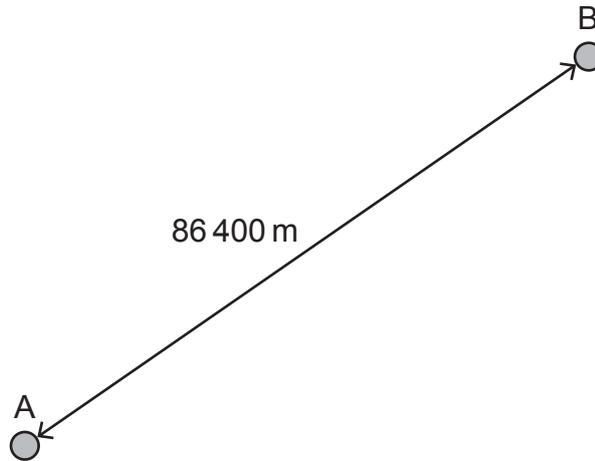
_____ [2]

(v) The length of the rod at 0°C is 800 mm.
Find the length of the metal rod when the temperature rise is 56°C .
Give your answer correct to one decimal place.

You are advised to show your working out.

Length = _____ mm [3]

- 4 A train travels from city A to city B **and back again**.
The distance between the two railway stations is 86 400 m and the round trip takes 3 hours.



- (i) Calculate the average speed of the train in **m/s**.

You are advised to show your working out.

$$\text{Average speed} = \text{_____ m/s [4]}$$

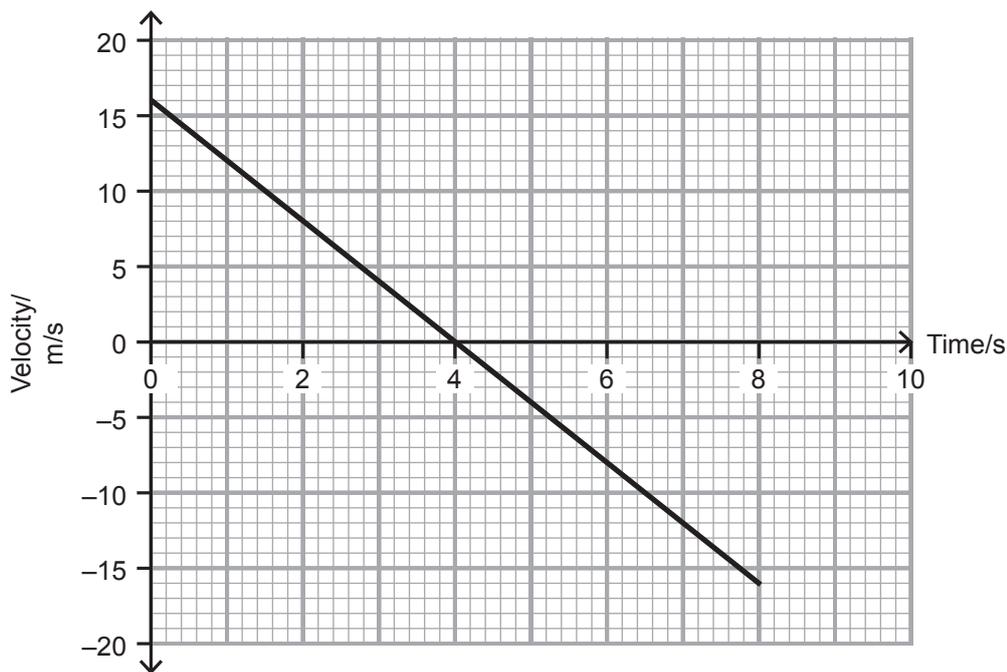
- (ii) What is the average velocity for the round trip?

$$\text{Average velocity} = \text{_____ m/s [1]}$$

Examiner Only	
Marks	Remark
○	○

BLANK PAGE
(Questions continue overleaf)

- 5 A ball is thrown vertically upwards on the planet Mars. The velocity–time graph of the ball’s motion is shown below.



The ball is thrown vertically upwards with an initial velocity of 16 m/s. When the ball falls back to the surface it hits the ground with a velocity of -16 m/s.

- (i) Why is the velocity negative in the second part of the graph?

Answer _____ [1]

- (ii) How far does the ball travel in the first 4 seconds of its motion?

You are advised to show your working out.

Distance = _____ m [3]

Examiner Only	
Marks	Remark
○	○

(iii) Use the graph to calculate the acceleration due to gravity on Mars.

You are advised to show your working out.

Acceleration = _____ m/s² [3]

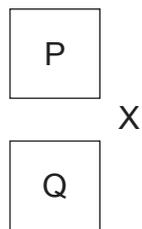
(iv) The force causing this acceleration is 18 N and there are no resistive forces acting on the ball.
Calculate the mass of the ball.

You are advised to show your working out.

Mass of ball = _____ kg [3]

Examiner Only	
Marks	Remark

- 6 A nucleus, X, may be represented as shown below. The two numbers, P and Q, give information about the nucleus.



- (a) (i) What are the two quantities, P and Q called?

P _____ Q _____ [2]

A **neutral** atom of iron, Fe, has 26 electrons and 30 neutrons.

- (ii) Complete the diagram below by inserting the correct values for the iron nucleus.

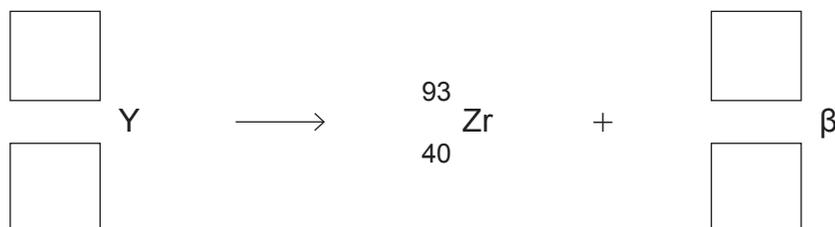


[2]

When a nucleus is unstable it can emit radiation in an attempt to become more stable.

The nucleus Y is unstable and decays to zirconium (Zr) by emitting a beta particle.

- (b) (i) Complete the decay equation below.



[4]

- (ii) What do you understand by the term 'half-life'?

_____ [2]

Examiner Only	
Marks	Remark
○	○

- (iii) A radioactive isotope of half-life 30 seconds has an initial activity of 512 counts per second. Calculate how long it takes the activity of the sample to decrease to 32 counts per second.

You are advised to show your working out.

Time = _____ s [3]

Examiner Only	
Marks	Remark

- 7 A skier of mass 70 kg skis from rest down a hillside of vertical height 25 m.



© sportpoint/ iStock / Thinkstock

- (i) Calculate the gravitational potential energy of the skier at the top of the slope.

You are advised to show your working out.

Gravitational potential energy = _____ J [3]

At the bottom of the slope the skier has a velocity of 20 m/s. The skier loses some energy as heat and sound as he travels down the slope.

- (ii) Use your answer to part (i) to calculate the total amount of energy lost as heat and sound.

You are advised to show your working out.

Energy lost = _____ J [4]

Examiner Only	
Marks	Remark
○	○

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA
will be happy to rectify any omissions of acknowledgement in future if notified.