New Specification

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Double Award Science: Physics

Unit P1

Higher Tier

[GSD32]

GSD32

MONDAY 14 NOVEMBER 2011
1.30 pm–2.30 pm

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 ten** questions.

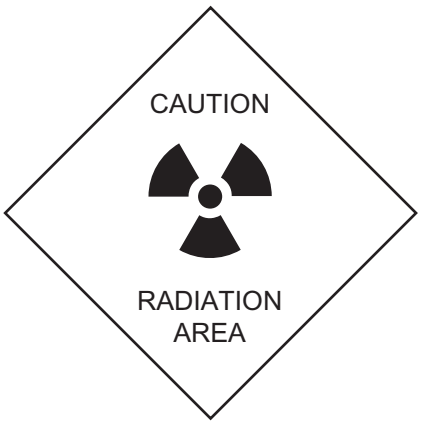
INFORMATION FOR CANDIDATES

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 requiring extended answers**.

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

Examiner Only	
Marks	Remark

1 Certain substances such as uranium are said to be radioactive.



(a) (i) What does the word “radioactive” mean?

_____

_____ [2]

In the study of radioactivity we learn of three different types of radiation.

(ii) Identify these radiations from the information given below.

This type of radiation is an electromagnetic wave.

Type of radiation _____ [1]

This type of radiation is a particle made up from four smaller particles.

Type of radiation _____ [1]

This type of radiation is a single particle.

Type of radiation _____ [1]

We are all exposed to a certain minimum amount of radiation called “background radiation”.

(b) Give two sources of background radiation.

1. _____

2. _____ [2]

People who work in nuclear power stations must take certain precautions to minimise the amount of radiation they receive.

(c) (i) Why must they keep the radiation they receive to a minimum?

_____ [1]

(ii) Give two methods that they can use to keep the radiation to a minimum.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

2 Nuclear fission reactors make use of a fuel called uranium. Uranium may be written in the following way:

$$^{235}_{92}U$$

(a) (i) What is the number 92 called?

_____ [1]

(ii) What information about the uranium nucleus is given by the number 92?

_____ [1]

(iii) What is the number 235 called?

_____ [1]

(iv) What information about the uranium nucleus is given by the number 235?

_____ [1]

(b) Some scientists believe that we should make greater use of nuclear fission.

Describe what happens in the fission of $^{235}_{92}U$ in a nuclear reactor.

In this question you will be assessed on your written communication skills including the use of specialist terms.

_____

_____

_____

_____

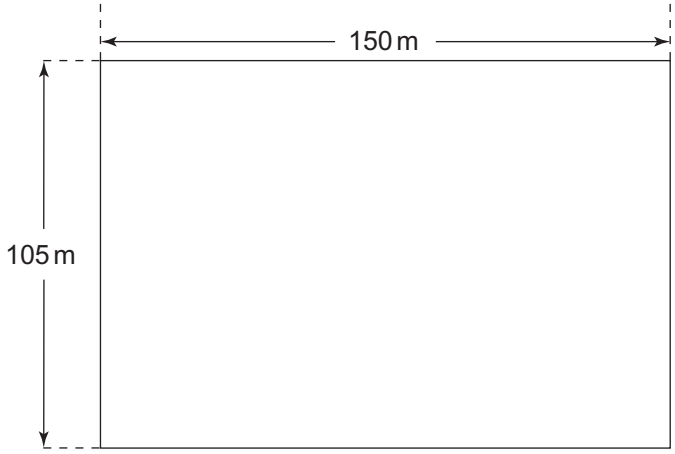
_____

_____

_____

_____ [6]

3 Kevin runs around a rectangular track of length 150 m and breadth 105 m, as shown in the diagram below.



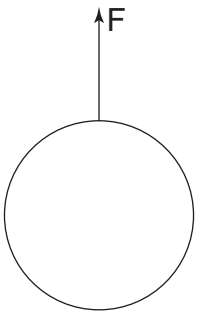
If his average speed is 3 m/s, how long does it take him to run once around the track?

You are advised to show your working out.

Time = _____ s [5]

Examiner Only	
Marks	Remark

4 When an object falls through the air a drag force, F, acts on the object.



The size of the drag force, F, depends on the speed, v, of the falling object.

A scientist suggests a theory that the drag force is proportional to the square of the velocity. Another way of writing this relationship is:

$$F = kv^2 \qquad \textbf{Equation 4.1}$$

where k is a constant.

He obtains a set of results and these are shown.

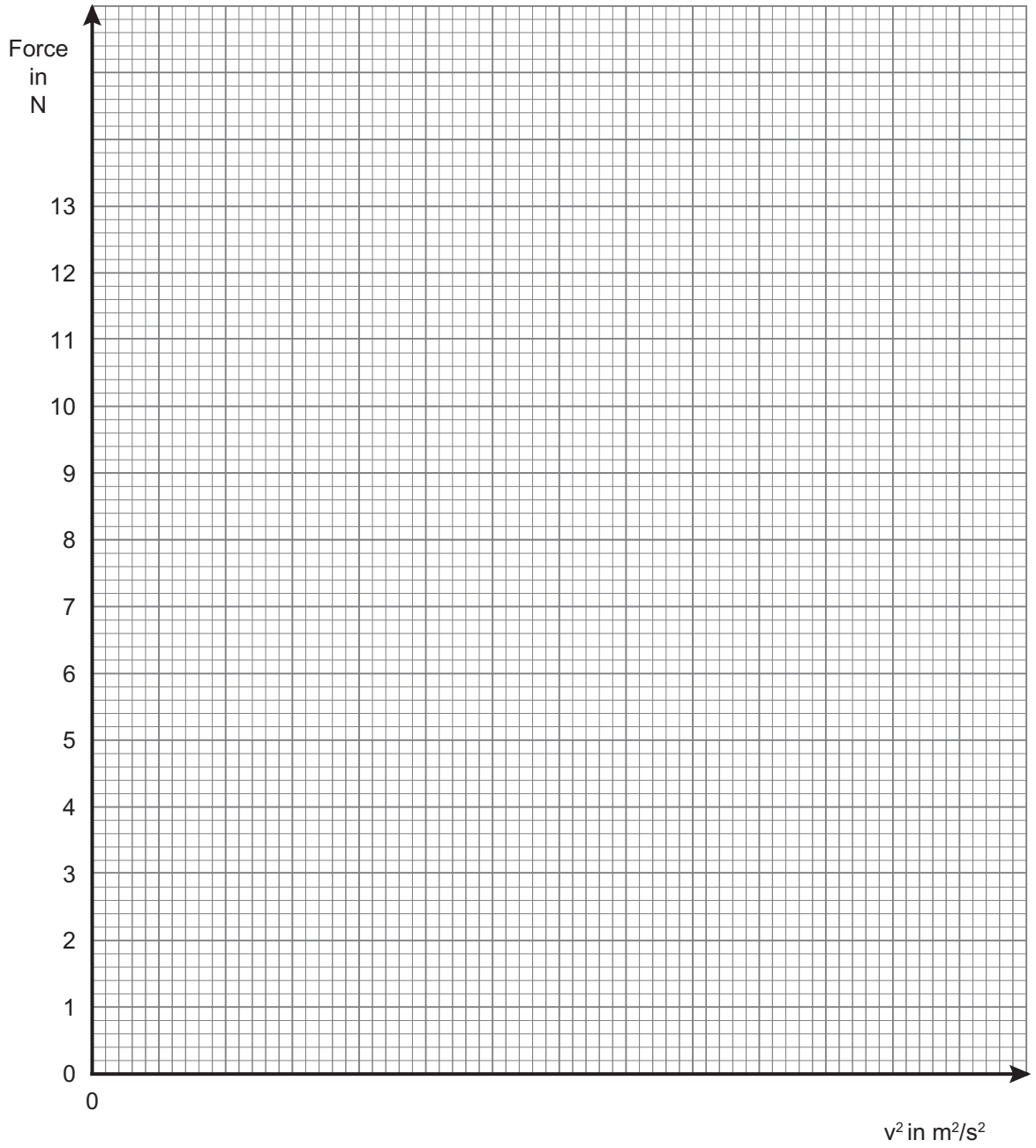
F in N	0.5	2.0	4.5	8.0	12.5
v in m/s	1	2	3	4	5
v^2 in m^2/s^2					

(i) Complete the table by entering the values of v^2. [2]

(ii) Choose a suitable scale for the horizontal axis and plot a graph of F against v^2. [3]

Examiner Only

Marks	Remark



Examiner Only	
Marks	Remark

(iii) Draw the best fit line. [1]

(iv) Does your graph support the theory described by **Equation 4.1**? Explain your answer.

_____

_____ [3]

(v) How would you find the value of k from the graph?

_____ [1]

5 When the forward force on a car of mass 1200 kg is 1600 N, its acceleration is 1.2 m/s^2. Calculate the force of friction acting on the car.

You are advised to show your working out.

Force of friction = _____ N [4]

Examiner Only	
Marks	Remark

6 A helicopter accelerates vertically from an initial upwards velocity of 2 m/s to a final upwards velocity of 24 m/s. If its acceleration is 5.5 m/s^2, calculate the time taken.

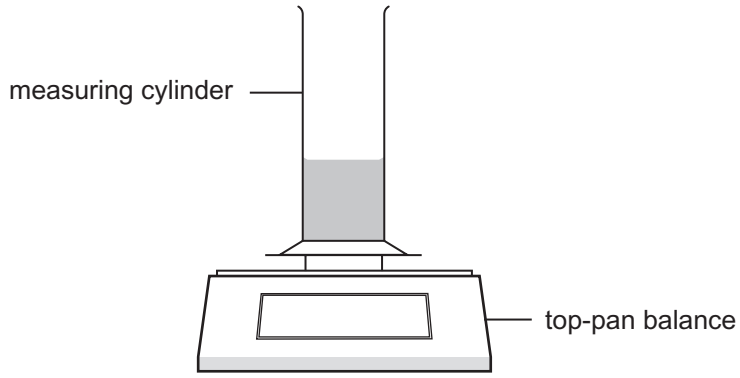
You are advised to show your working out.

Time = _____ s [4]

Examiner Only	
Marks	Remark

7 Patricia wants to find the density of a liquid.

She puts some of the liquid into a measuring cyclinder and records the volume of the liquid. She then places the measuring cylinder of liquid on a top-pan balance to find the total mass of the measuring cylinder plus liquid.



She repeats this procedure for different amounts of liquid. Her results are recorded below.

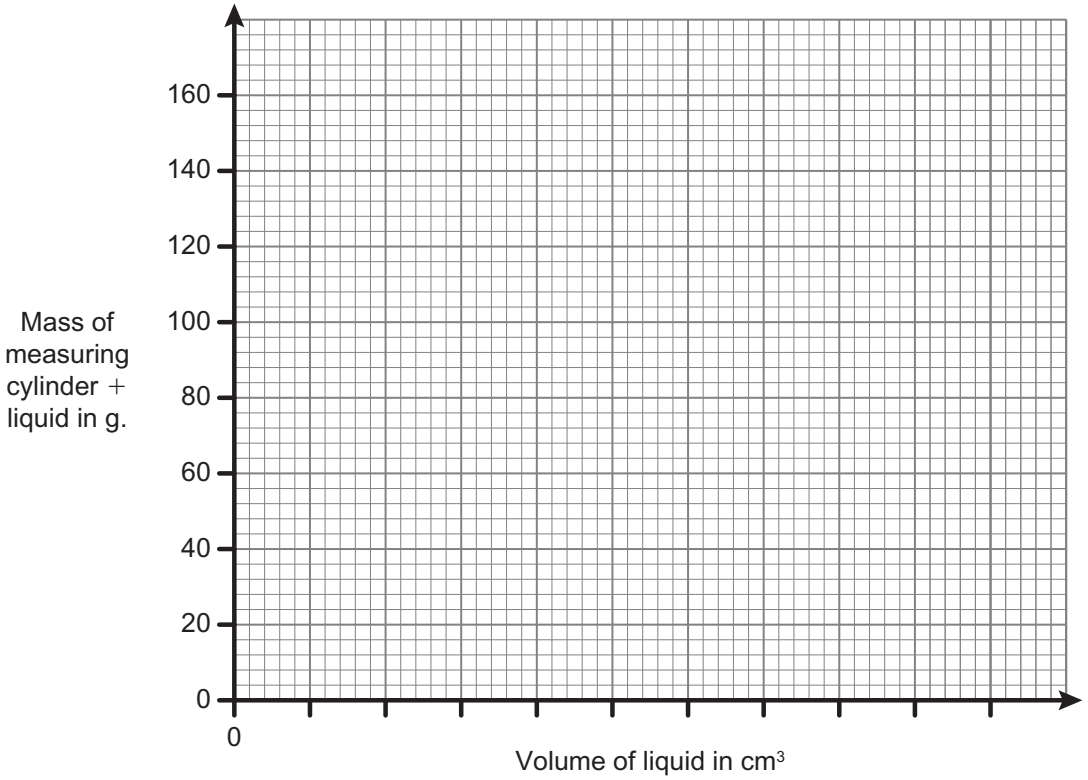
Mass of measuring cylinder + liquid in g	80	100	120	140	160
Volume of liquid in cm^3	20	40	60	80	100

(a) (i) On the grid on the opposite page, choose a suitable scale for the horizontal axis. Plot a graph of "Mass of measuring cylinder + liquid" against "Volume of liquid". [3]

(ii) Draw the best fit line. [1]

Examiner Only

Marks	Remark



(iii) Use your graph to find the mass of the measuring cylinder.

Mass of measuring cylinder = _____ g [1]

(iv) **Use your graph** to find the density of the liquid. Remember to include the units.

You are advised to show your working out.

Density of liquid = _____ [4]

If a less dense liquid had been used in this experiment how would this affect

(b) **(i)** the value of the intercept on the vertical axis?

_____ [1]

(ii) the slope of the line?

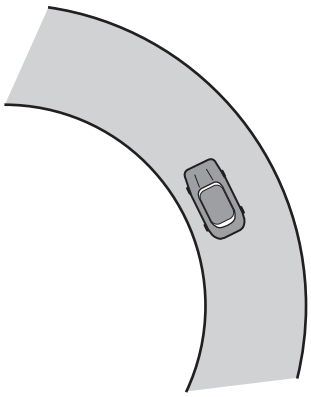
_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

8 The diagram shows a plan view (bird's eye view) of a car on a circular track.



(a) (i) State the direction of the centripetal force on the car.

_____ [1]

(ii) What practical effect does this force have on the motion of the car?

_____ [1]

The car now travels at a higher speed.

(iii) How will this affect the size of the centripetal force?

Underline the correct answer.

INCREASES STAYS THE SAME DECREASES [1]

The car now moves to the outside of the track but moves at the same speed.

(iv) How will this affect the size of the centripetal force?

Underline the correct answer.

INCREASES STAYS THE SAME DECREASES [1]

A moving car has momentum.

(b) Information about this car is given in the box.

Weight = 15 000 N Mass = 1500 kg Kinetic energy = 363 000 J Velocity = 22 m/s

Calculate the momentum of the car.
Remember to include the units.

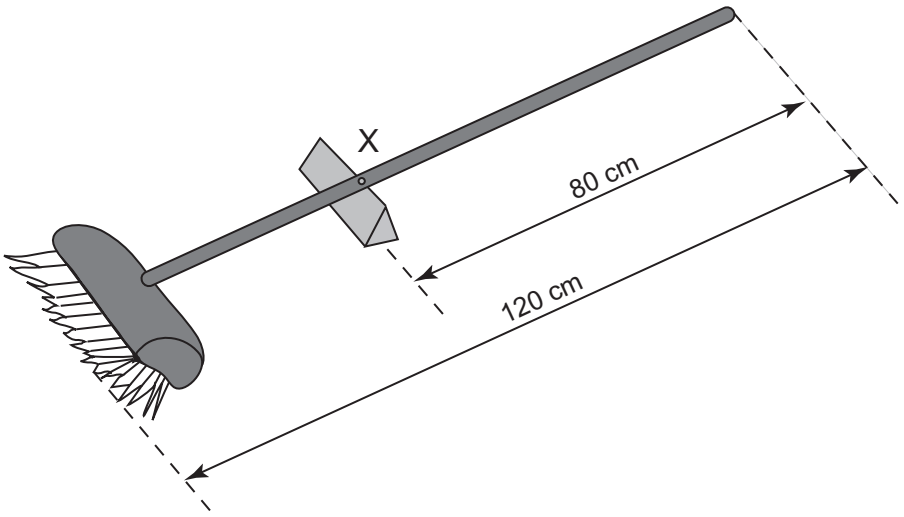
Show clearly your working out.

Momentum = _____ [4]

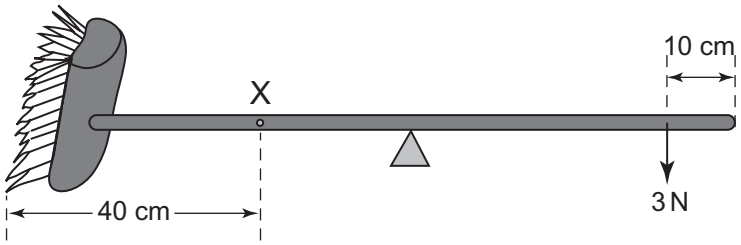
Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

9 A brush, 120 cm in length, is placed on top of pivot and is found to balance at a point X which is 80 cm from one end as shown.



The brush is moved so that its **mid-point** is on the pivot. The brush is now kept in a horizontal position by a 3 N force acting a distance of 10 cm from the end.



Use the principle of moments to calculate the weight of the brush.

You are advised to show your working out.

Weight of brush = _____ N [4]

10 An archer shoots an arrow vertically into the air. The arrow has a mass of 200 g and its initial kinetic energy is 50 J.

Later in its upward flight the kinetic energy of the arrow is only 20 J.

Calculate the height of the arrow when its kinetic energy is 20 J. Assume no energy losses.

You are advised to show your working out.

Height of arrow = _____ m [4]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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