New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Double Award Science: Physics

Unit P1

Higher Tier

[GSD32]

GSD32

WEDNESDAY 29 FEBRUARY 2012
9.30 am–10.30 am

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

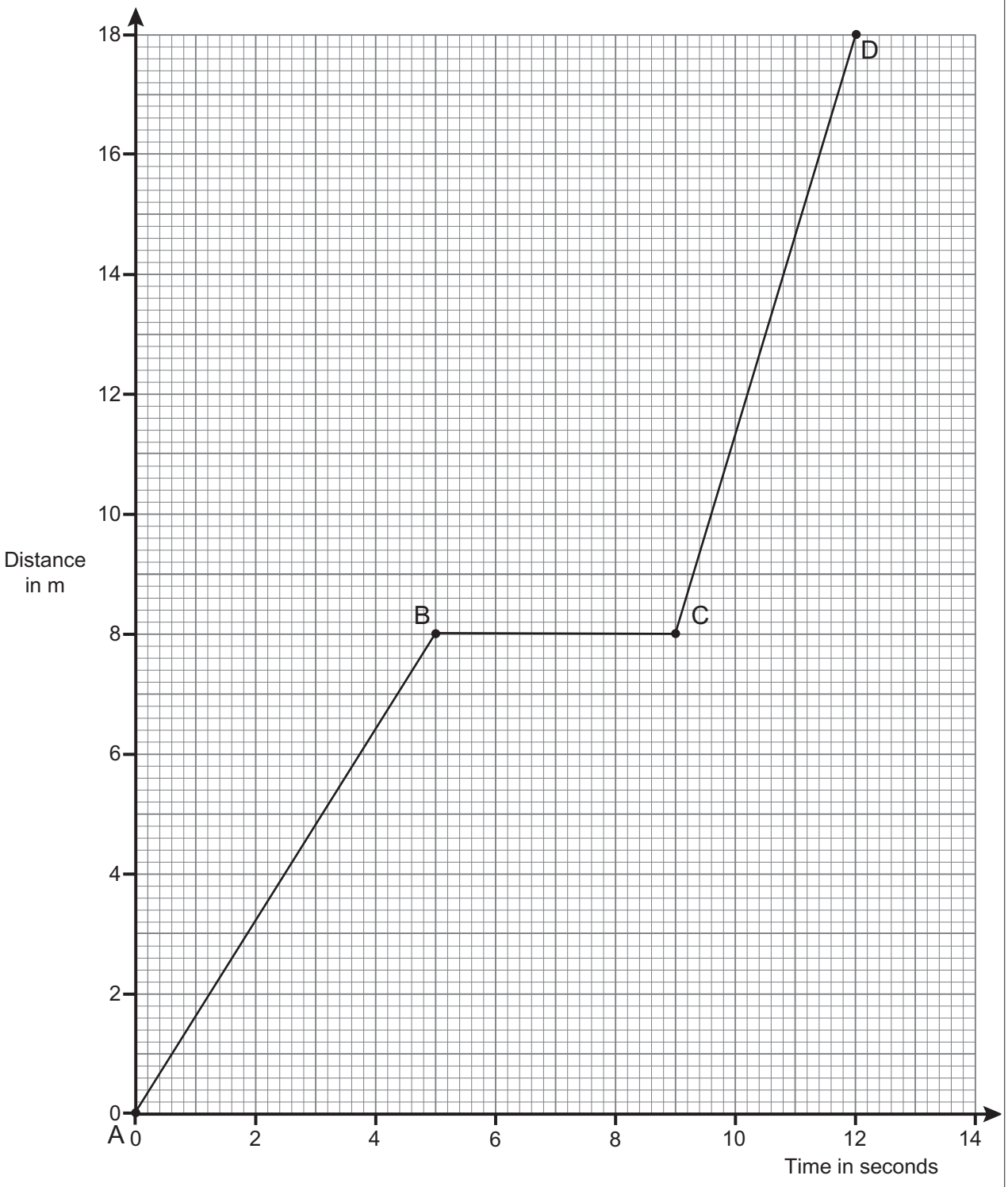
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all ten** questions.

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	

1 A distance-time graph for a cyclist is shown below.



Examiner Only	
Marks	Remark

(a) (i) Describe the motion of the cyclist during BC.

_____ [1]

(ii) What feature of the graph tells you that the speed is greatest during CD?

_____ [1]

(b) State the distance travelled during the first seven seconds.

Distance = _____ m [1]

(c) Use the graph to calculate the average speed of the cyclist over the entire journey.

You are advised to show your working out.

Average speed = _____ m/s [3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

2 A lorry of mass 7500 kg travelling at a velocity 20 m/s decelerates to 0 m/s.

(i) Write down the formula for kinetic energy in the box.

[1]

(ii) Calculate the kinetic energy lost by the lorry as it brakes.

You are advised to show your working out.

Kinetic energy lost = _____ J [2]

(iii) State the work done by the brakes of the lorry.

Work done = _____ J [1]

The lorry comes to rest in 20 s.

(iv) Calculate the power of the brakes.

You are advised to show your working out.

Power = _____ W [3]

(v) State the power of the brakes in kilowatts (kW).

Power = _____ kW [1]

3 A star's energy is generated by the process of nuclear fusion.

Describe, in detail, what happens in nuclear fusion.

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

Examiner Only

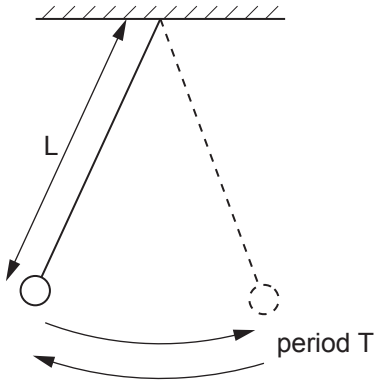
Marks	Remark

[6]

Examiner Only	
Marks	Remark

4 The period of a pendulum is the time it takes to swing to the right and back again. Maureen thinks that the period T of a simple pendulum depends on the length L of the string according to the formula:

$$T^2 = k\,L$$



She obtains a set of results and these are shown below.

L in m	0.2	0.3	0.4	0.6	0.7
T in s	0.9	1.1	1.3	1.6	1.7
T^2 in s^2	0.8		1.7		2.9

(a) Complete the table by entering the other values of T^2, rounded to one decimal place. [2]

(b) Choose a suitable scale and plot a graph of T^2 on the vertical axis against L on the horizontal axis. [4]

(c) **(i)** Draw the line of best fit. [2]

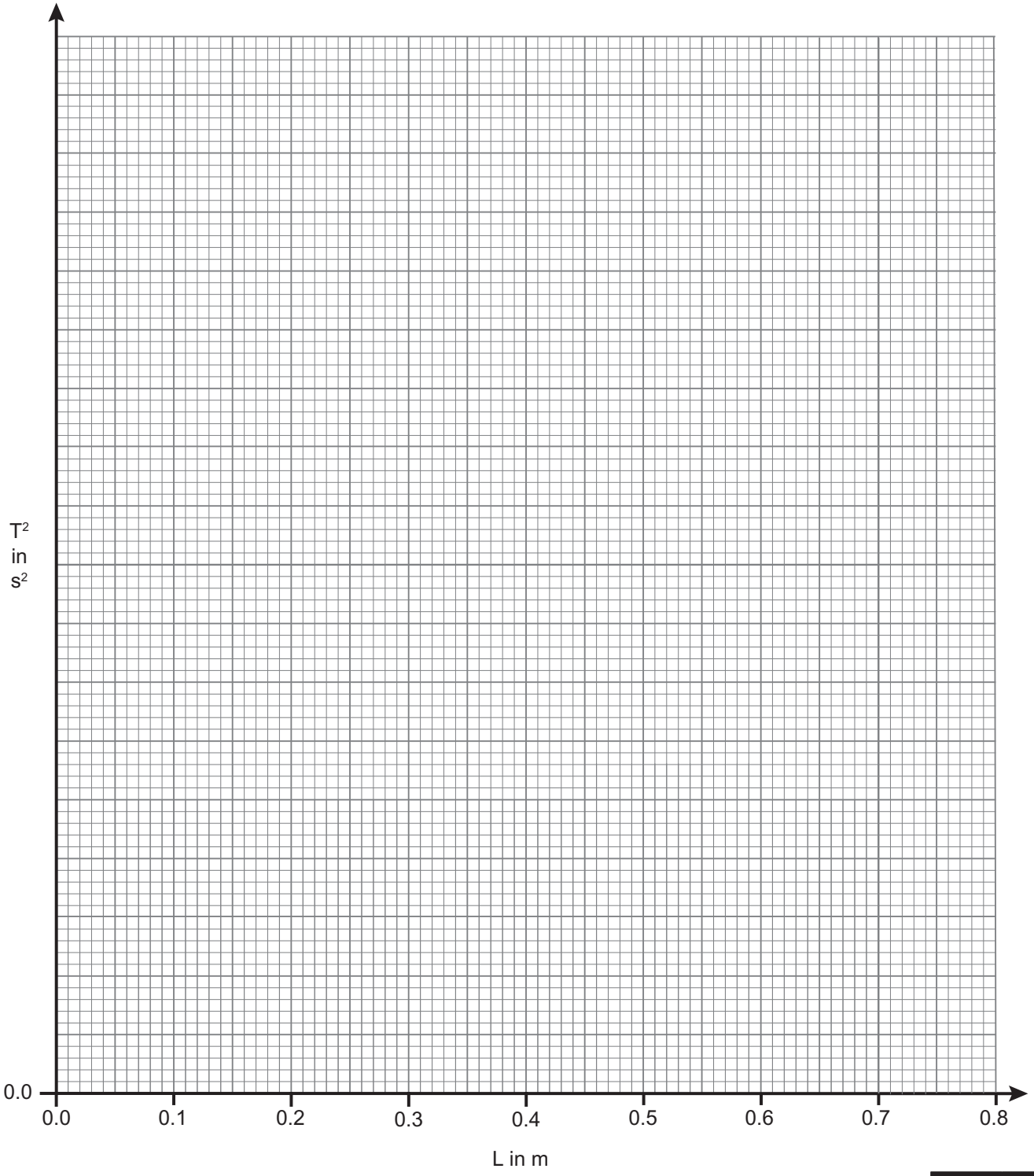
(ii) Does the graph support Maureen's theory?

Explain your answer.

_____

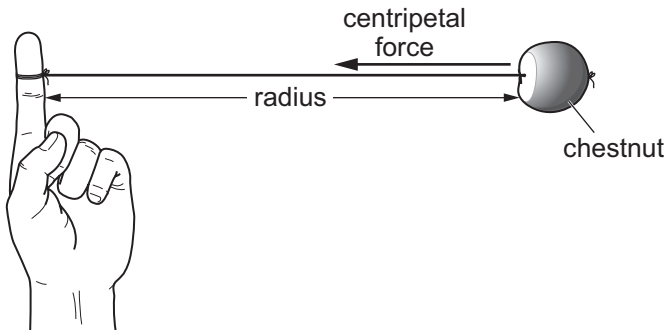
_____

_____ [2]



Examiner Only	
Marks	Remark

5



When a chestnut is whirled in a circle, the tension in the string provides the centripetal force.

(a) Complete the following sentences to describe the relationships between the centripetal force, the radius of the string and the speed of the chestnut.

(i) As the speed ___increases___, the centripetal force

_____ . [1]

(ii) As the radius _____, the centripetal force

___increases___. [1]

(b) Explain why the speed of the chestnut remains the same, but the velocity of the chestnut changes.

_____

_____ [1]

(c) The mass of the chestnut is 0.2 kg and its momentum is 2.4 kg m/s at a certain instant in its rotation. Find the velocity of the chestnut.

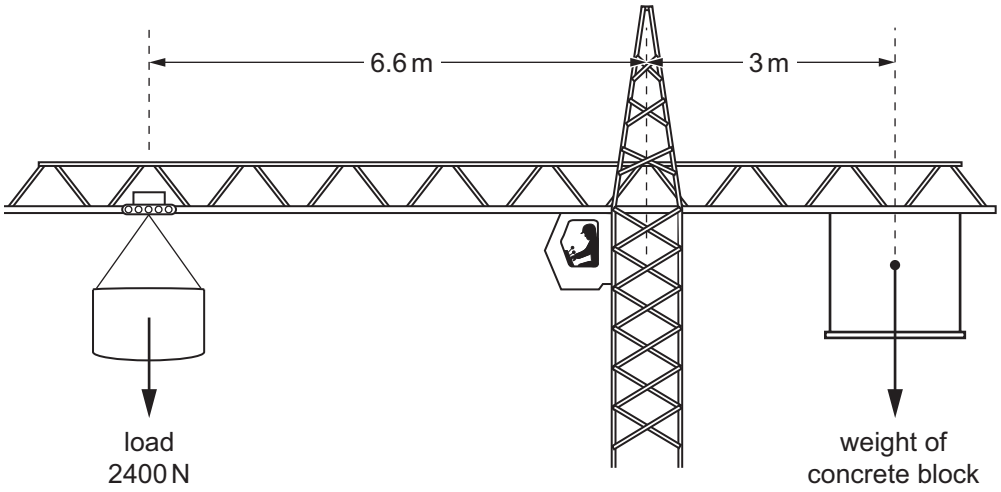
You are advised to show your working out.

Velocity = _____ m/s [3]

Examiner Only

Marks	Remark

6 The diagram shows a crane on a building site.



The load weighs 2400 N. Use the Principle of Moments to calculate the weight of the concrete block.

You are advised to show your working out.

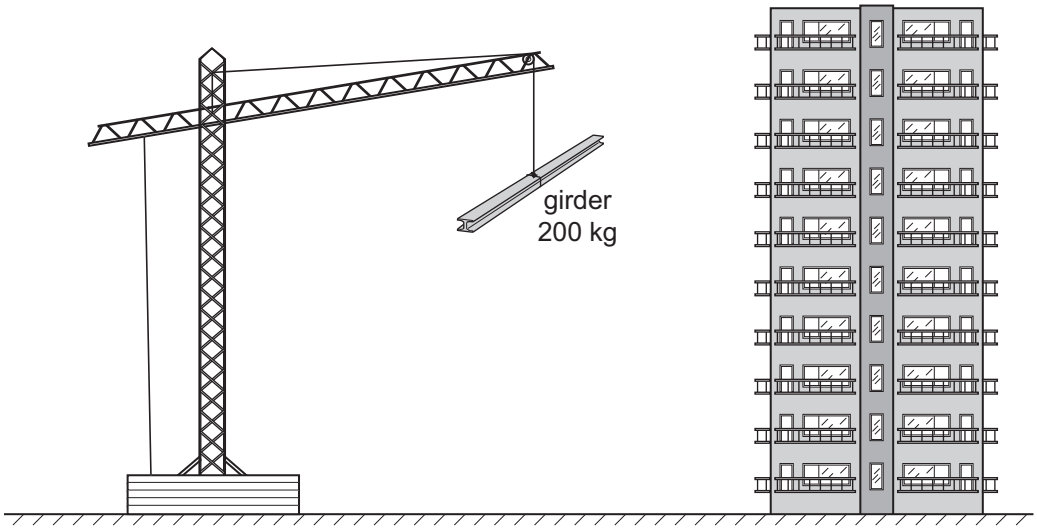
Weight = _____ N [4]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

7 A crane is used to lift a steel girder of mass 200 kg to the top of a high building.



When it is lifted by the crane, the girder accelerates from 0.1 m/s to a speed of 0.7 m/s in the first 3 seconds. It then rises at a steady speed.

(i) Calculate the acceleration of the girder.

You are advised to show your working out.

Acceleration = _____ m/s^2 [3]

(ii) Use your answer to **(i)** to calculate the resultant force acting on the girder.

You are advised to show your working out.

Resultant force = _____ N [3]

8 There is a radioactive isotope of carbon known as $^{14}_{6}C$

Examiner Only

Marks | Remark

(i) Explain fully what is meant by the word radioactive.

_____

_____ [2]

(ii) Explain what is meant by isotopes in terms of the particles in the nucleus.

_____

_____ [2]

(iii) Complete the table below to show the numbers of the particles in the **nucleus** of $^{14}_{6}C$

Particle	Number
Electrons	
Neutrons	
Protons	

[3]

The nucleus of $^{14}_{6}C$ emits beta (β) particles and gamma (γ) radiation.

(iv) What are beta particles?

_____ [1]

(v) What is gamma radiation?

_____ [1]

Examiner Only	
Marks	Remark

9 One of the earliest models for the structure of the atom was the plum-pudding model.

(a) Describe the Plum Pudding model.

_____

_____

_____ [2]

(b) What does the Rutherford-Bohr model tell us about:

(i) the electrons in an atom?

_____ [1]

(ii) the size of the nucleus of an atom?

_____ [1]

(iii) the mass of the nucleus of an atom?

_____ [1]

Examiner Only	
Marks	Remark

10 (a) Explain what is meant by half-life.

_____

_____ [2]

(b) (i) A certain radioactive material has a half-life of 20 minutes.

What fraction of that material would be present 1 hour later?

You are advised to show your working out.

Fraction = _____ [2]

(ii) A detector of radiation is placed close to a radioactive source that has a very long half-life. In four consecutive 10-second intervals, the following numbers of counts were recorded:

502 497 501 499

Why were the four counts different?

_____ [1]

(c) The isotope of thorium is unstable and disintegrates by alpha decay. Complete the decay equation for this by writing the appropriate numbers and symbol in the empty boxes.

$$\square_{90}\text{Th} \rightarrow {}^{228}_{\square}\text{Ra} + \begin{matrix}\square \\ \square\end{matrix}\square$$

[5]

THIS IS THE END OF THE QUESTION PAPER

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