Rewarding Learning

Centre Number

71

Candidate Number

General Certificate of Secondary Education
2013–2014

Double Award Science: Physics

Unit P1

Higher Tier

[GSD32]

MV18

WEDNESDAY 26 FEBRUARY 2014, MORNING

TIME

1 hour, plus your additional time allowance.

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 at the end of each question indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Questions **1(a)** and **6(c)**.

1 **(a)** You are given a number of steel objects. Describe an experiment you would carry out to find the density of steel. [6]

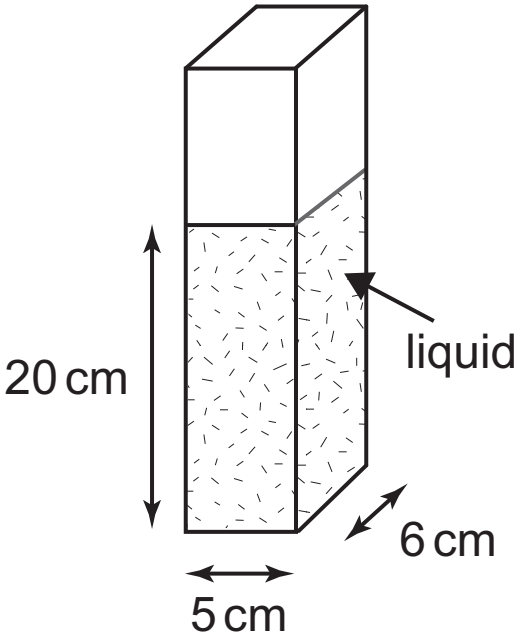
Your answer should include,

- the apparatus used,
- the readings you take,
- how the readings are used.

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

(b) A student wants to find the density of a liquid. Use the information below to find the density of the liquid in g/cm^3. [3]

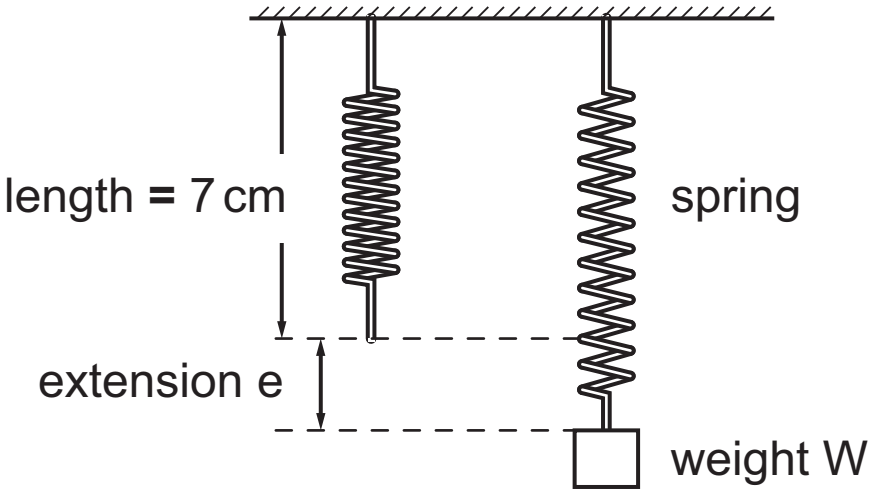
Mass of container **+** liquid **=** 1540 g Mass of container **=** 1000 g



You are advised to show your working out.

Density **=** _____ g/cm^3

2 A student investigates how the extension of a spiral spring depends on the weight hung on it.



The equation connecting the extension, e and weight, W is given by:

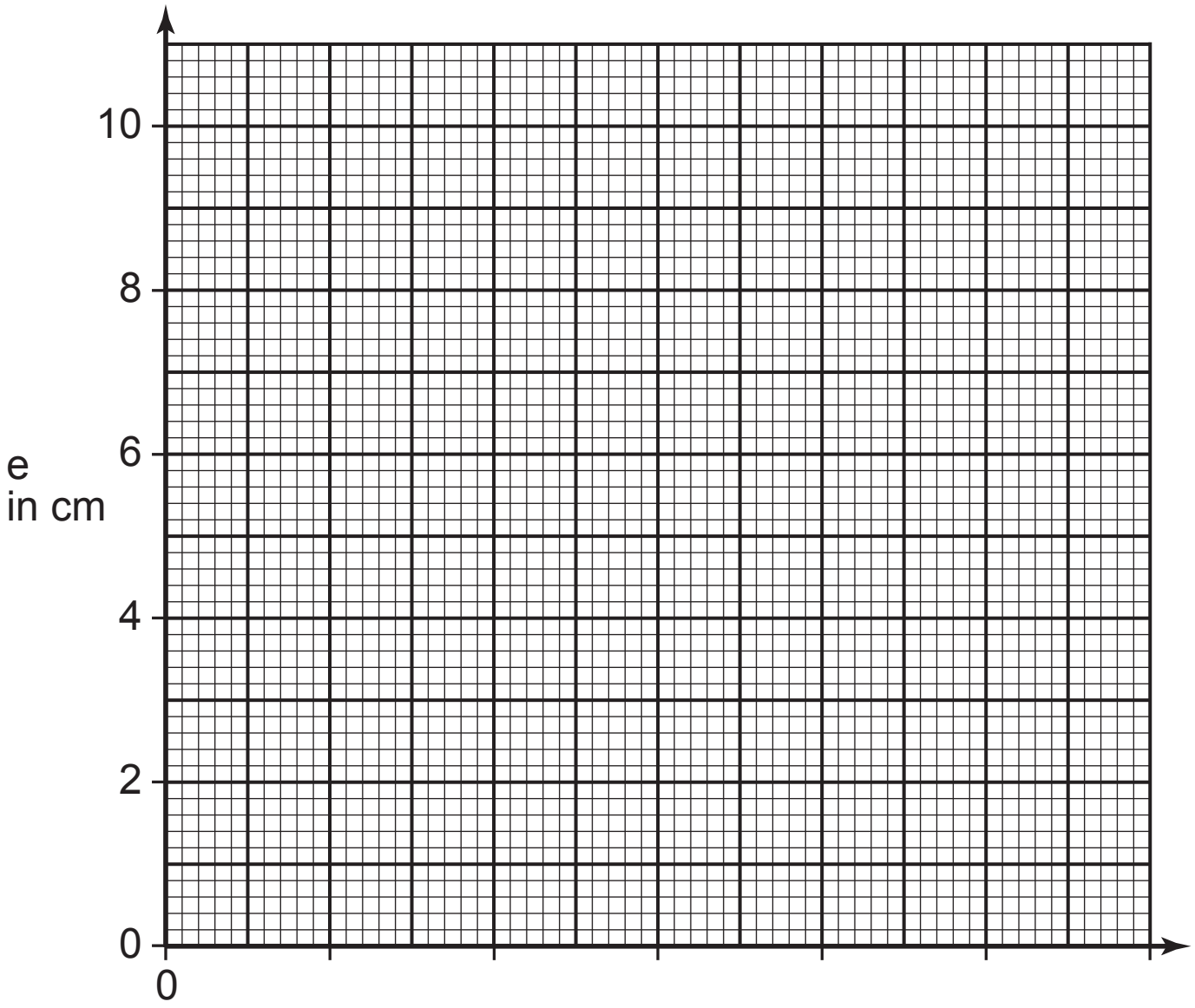
$$\mathbf{e = kW}$$

The table shows some of the results of the investigation.

W in N	0.5	1.0	1.5	2.0	2.5
e in cm	2	4	6	8	10

You are asked to plot a graph of e against W.

(i) Choose a suitable scale for W and label the horizontal axis. [2]



(ii) Plot the points on the graph and draw the best fit line. [3]

(iii) Find the gradient of your graph and give its unit. [3] for gradient and [1] for unit.

You are advised to show your working out.

Gradient **=** _____

Unit **=** _____

The original length of the spring shown on page 4 is 7 cm.

(iv) Use your graph to find the load needed to stretch the spring to a total length of 12 cm. [2]

You are advised to show your working out.

Load **=** _____ N

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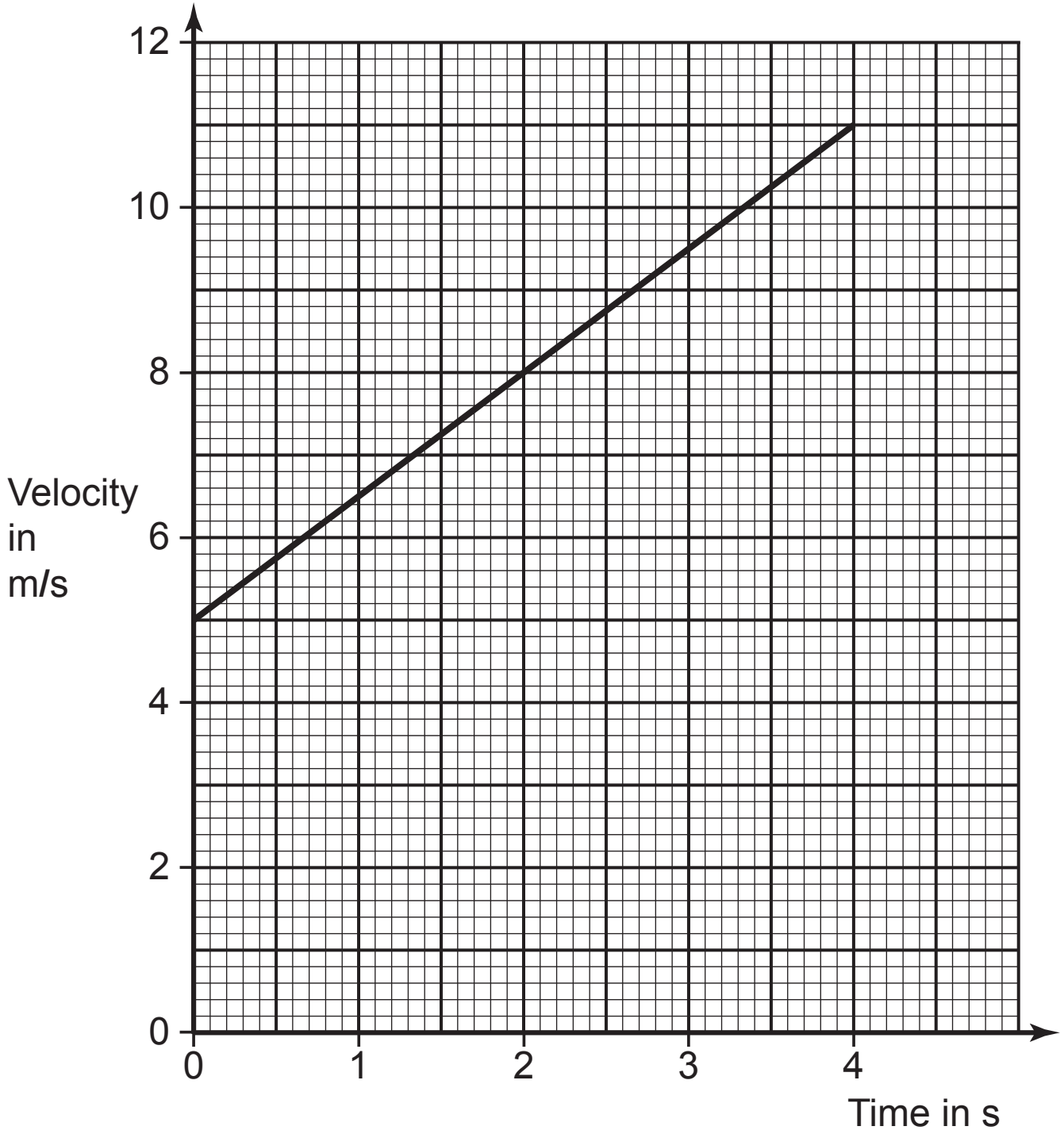
(Questions continue overleaf)

3 A steel ball was thrown downwards from a height above the surface of the Moon.

The graph shows part of the motion of the steel ball.



Use the graph to answer the following questions.

(a) (i) What is the initial velocity of the ball? [1]

_____ m/s

(ii) Describe the motion of the steel ball between times t = 0 s and t = 4 s. [1]

_____

(b) Calculate the acceleration of the steel ball. [3]

You are advised to show your working out.

Acceleration = _____ m/s^2

(c) How far did the steel ball fall between times t = 0 s and t = 4 s? [4]

You are advised to show your working out.

Distance = _____ m

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4 An isotope of iron has a half-life of 46 days.

(a) (i) Explain what is meant by a half-life of 46 days. [2]

_____

_____

A sample of this isotope has an activity of 512 disintegrations per second.

(ii) What length of time must pass before its activity falls to 32 disintegrations per second? [3]

You are advised to show your working out.

Time **=** _____ days

A source of radioactivity emits all three types of radiation: alpha, beta and gamma.

(b) (i) Which radiation(s) will pass through 3 cm of lead? [1]

_____

(ii) Which radiation(s) will pass through a thick piece of cardboard? [1]

_____

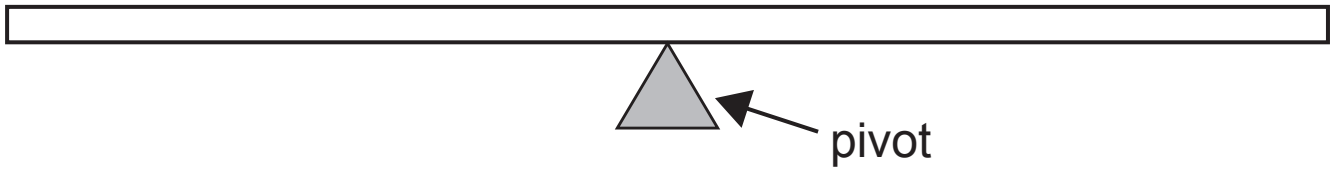
5 **(a)** Write, in words, the Principle of Moments. [3]

_____

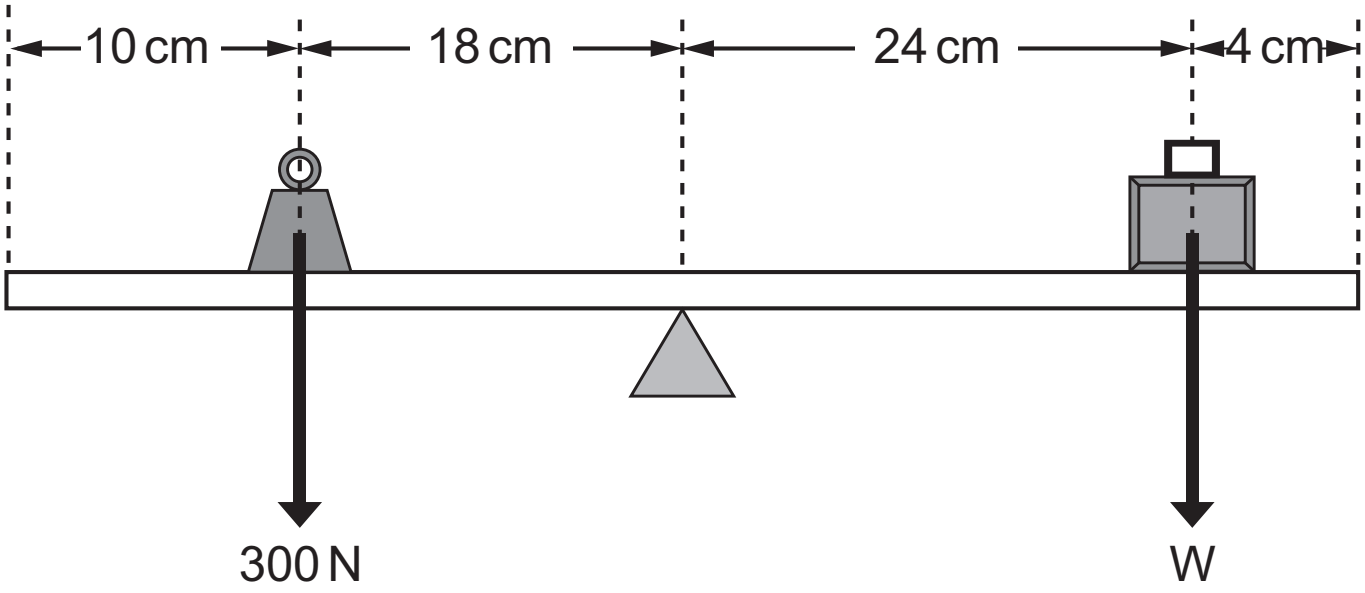
_____

John must find the weight of his suitcase before going on holiday.

He balanced a uniform plank of wood as shown in the diagram below.



He then placed a weight of 300 N on the left hand side of the plank and his suitcase on the other side.



John adjusted the positions of the 300 N weight and the suitcase until the plank was in balance again.

(b) Calculate the weight of the suitcase. [4]

You are advised to show your working out.

Weight **=** _____ N

6 **(a)** Explain in terms of mass number and atomic number the meaning of the word isotope. [2]

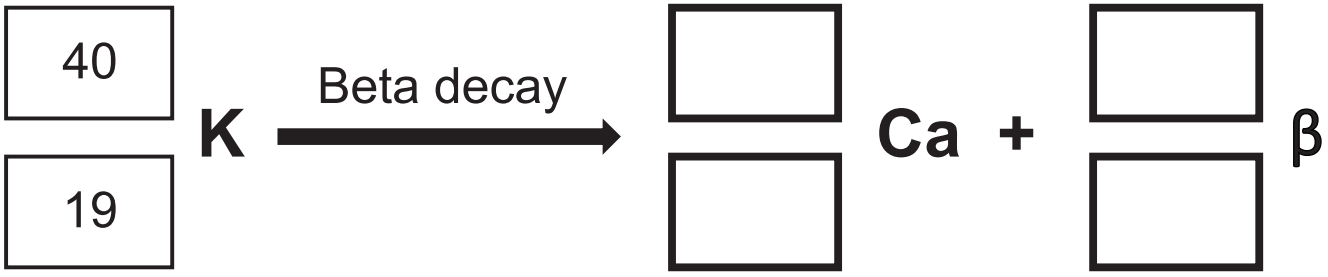
_____

_____

This part of the question is about a nuclear disintegration of an isotope of potassium by beta decay.

(b) Potassium, K, undergoes beta decay to calcium, Ca.

Complete a balanced nuclear equation for this reaction. [4]



(c) In nuclear power stations, nuclei can be forced to disintegrate by incident neutrons.

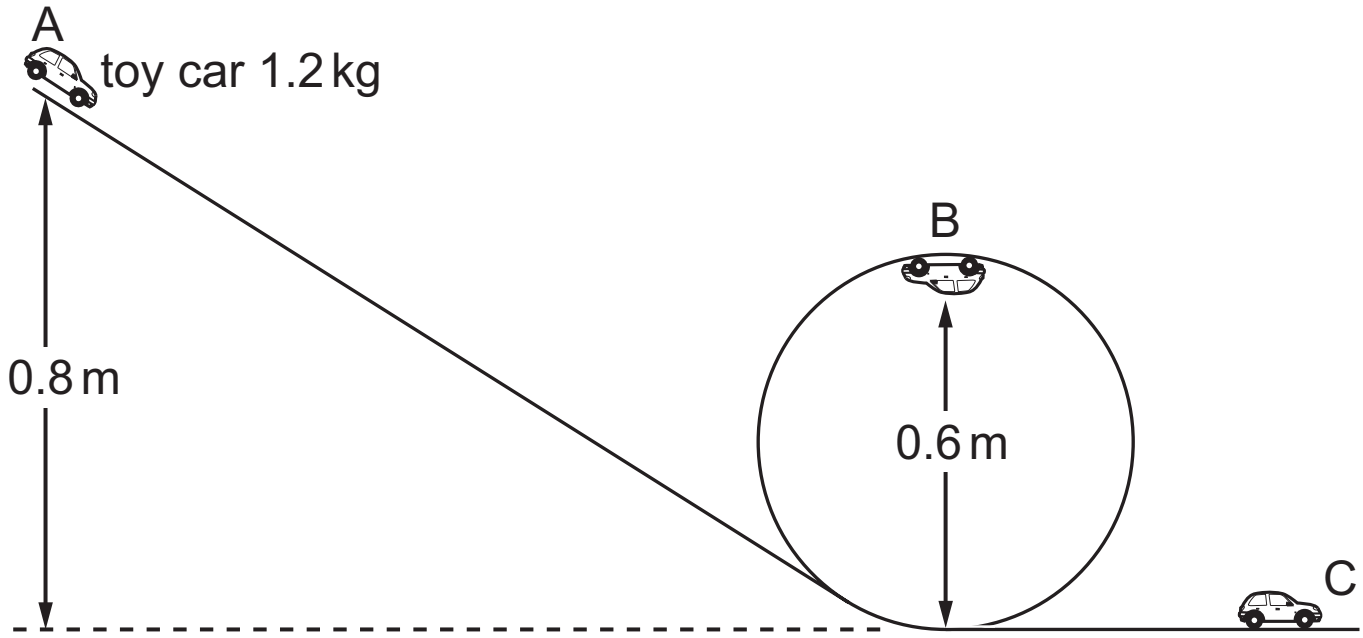
Describe this process. [6]

Your description should include:

- name of process,
- details of the process,
- the outcome of the process.

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

7 A toy car of mass 1.2 kg is released from rest at point A, before it loops the loop.



(i) Calculate the **difference** in potential energy of the toy car at points A and B. [4]

You are advised to show your working out.

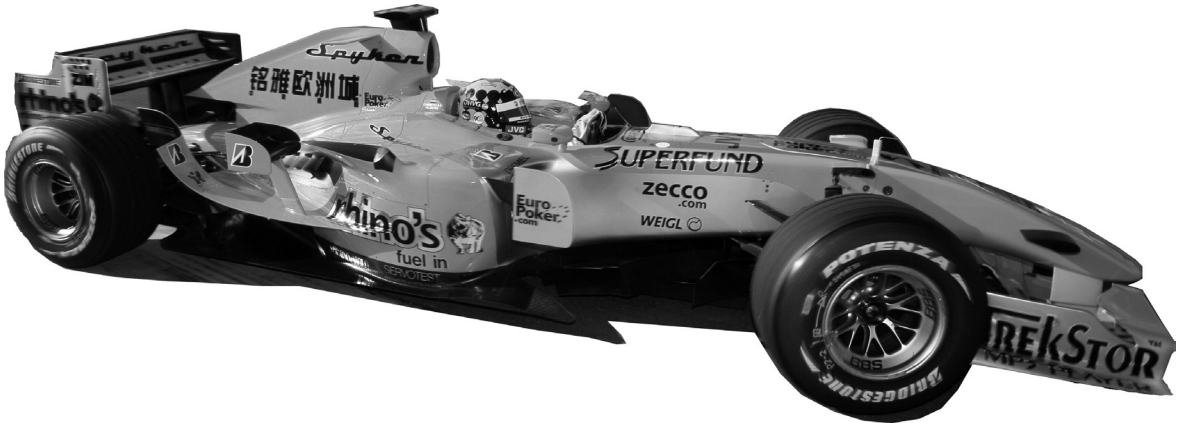
Difference in potential energy **=** _____ J

(ii) Calculate the velocity of the toy car at point C, if its kinetic energy at C is 3.75 J. [4]

You are advised to show your working out.

Velocity **=** _____m/s

8 A racing car, of mass 2500 kg, accelerates from rest on the starting grid. The engine exerts a force of 1.5×10^4 N.



(a) Calculate the acceleration of the racing car. [3]

You are advised to show your working out.

Acceleration = _____ m/s^2

(b) The racing car accelerates for 10 s and covers a distance of 300 m.

Calculate the work done by the engine of the racing car. [4]

Give your answer in megajoules.

You are advised to show your working out.

Work done **=** _____ MJ

THIS IS THE END OF THE QUESTION PAPER

SOURCES

Q1(a) Image of Assorted Screws - © Les Cunliffe/iStock/Thinkstock
Q8 Racing Car image - © Gustoimages/Science Photo Library

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