Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2018–2019

Double Award Science
Physics

Unit P1

Higher Tier

MV18

[GDW32]

FRIDAY 1 MARCH 2019, 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.
You must answer the questions in the spaces provided.
Do not write on blank pages.
Complete in black ink only.
Answer **all nine** questions.

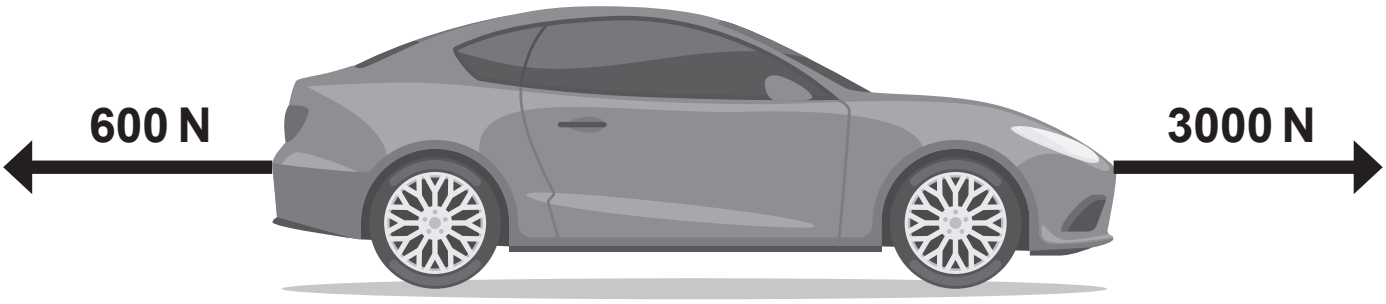
Information for Candidates

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 Question **3**.

1 **(a)** What does a resultant force always cause? [1 mark]

_____

(b) **(i)** The forces acting on a car travelling in a straight line are shown below.



The combined mass of the car and its driver is 1200 kg.
Calculate the car's acceleration. [4 marks]

You are advised to show your working out.

Acceleration = _____ m/s^2

(ii) Later in the car's journey, the forces acting on it are balanced.
What is the car's acceleration at this point?
[1 mark]

Acceleration = _____ m/s^2

2 Atoms are made up of protons, neutrons and electrons.

(a) Complete the table below to show the relative charge of the particles in an atom. [3 marks]

Particle	**Relative charge**
Proton	
Neutron	
Electron	

(b) The nucleus of an atom can be described using the notation

$$ {}^{A}_{Z}X $$

Which letter, A, X or Z, represents a value that is different for a pair of isotopes? [1 mark]

_____

(c) The nucleus of an atom of lead can be described using the notation

$$^{207}_{82}Pb$$

Complete the table below to show how many of each particle there is **in the nucleus** of an atom of lead.
[3 marks]

Particle	**Number of particles in the nucleus**
Proton	
Neutron	
Electron	

3 Write an account of background radioactivity and the precautions taken when working with radioactive sources. [6 marks]

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

Your account should include:

What background radioactivity is.

Two **major** sources of background radioactivity.

How background radioactivity is taken into account.

Two precautions.

4 A sofa of weight 720 N exerts a pressure on the floor.

(i) Calculate the mass of the sofa. [2 marks]

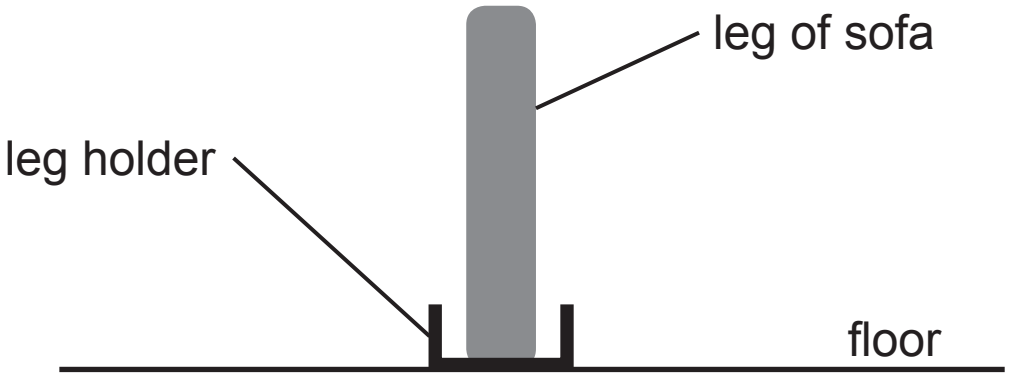
You are advised to show your working out.

Mass = _____ kg

(ii) Each of the sofa's 4 legs has an area of 6 cm^2.
Calculate the total pressure the sofa exerts on the floor.
[5 marks]
Remember to include the unit.
Do not change any units.
You are advised to show your working out.

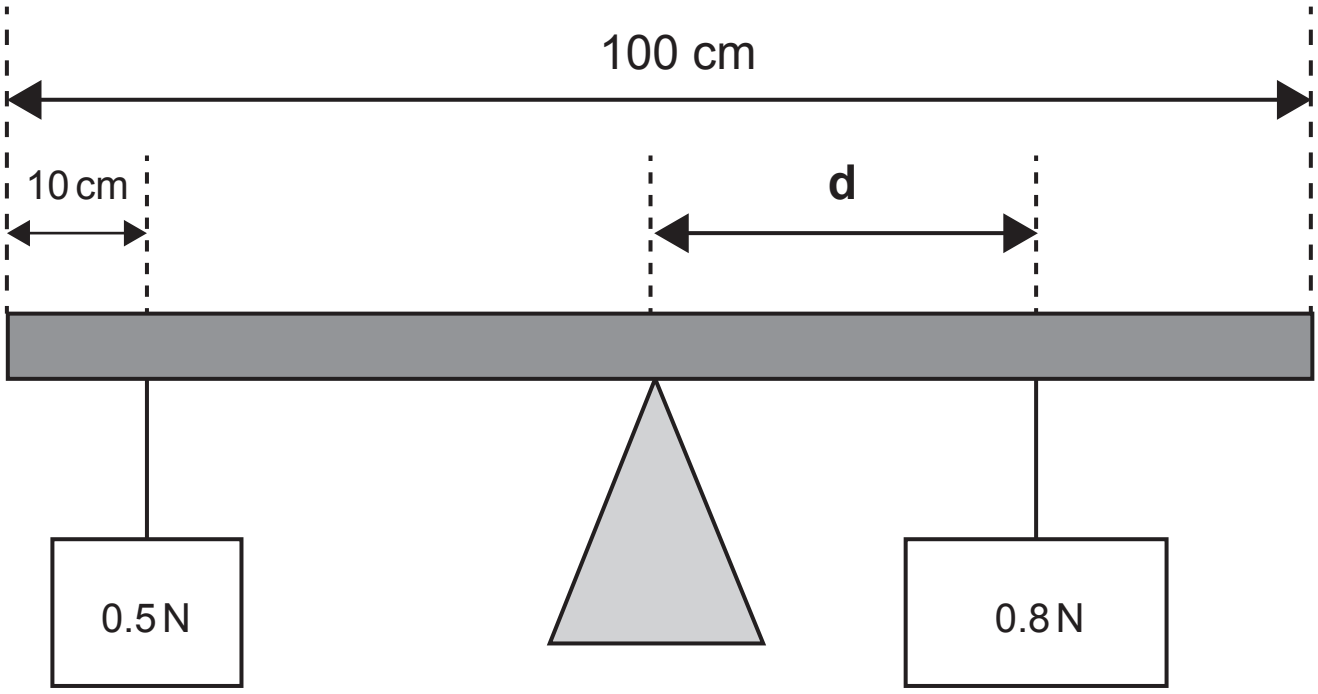
Pressure = _____

(iii) The legs of the sofa are placed in leg holders that are designed to prevent the floor being damaged.



Explain how the leg holders help to reduce any damage to the floor. [2 marks]

5 A uniform metre rule is balanced at its midpoint when two forces act as shown.



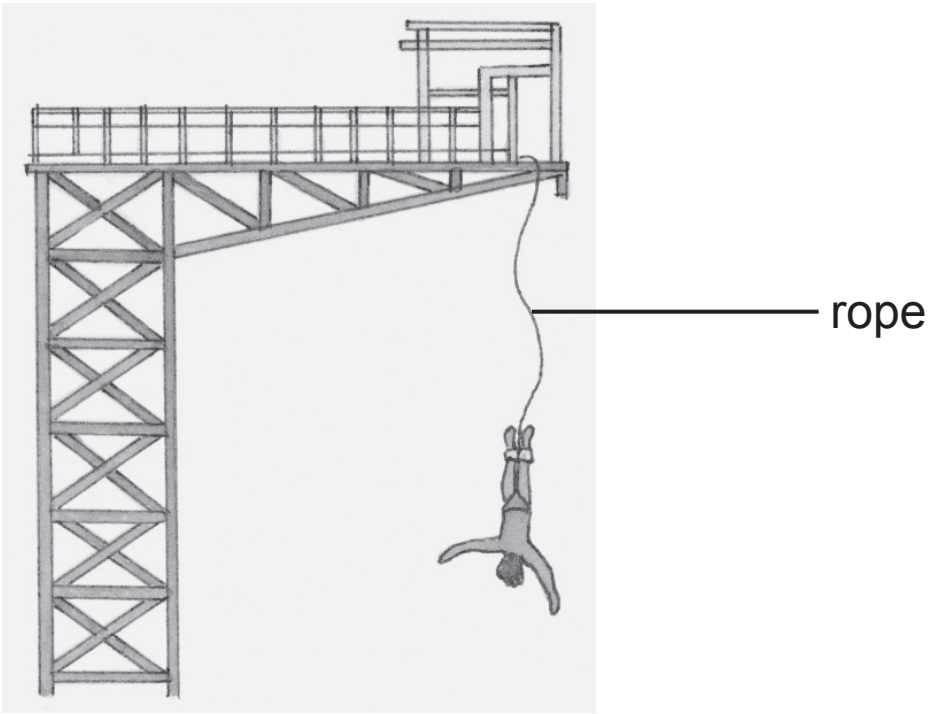
Calculate the distance '**d**'. [4 marks]
Do not change any units.

You are advised to show your working out.

d = _____ cm

6 **(a)** A spring obeys Hooke's Law. In the space below write the equation for Hooke's Law and define each term in the equation. [4 marks]

A bungee jumper jumps from a platform. The spring-like rope attached to the jumper obeys Hooke's Law.



(b) The weight of the bungee jumper is 600 N and the unstretched length of the rope is 27 m. When the rope is fully stretched at the bottom of the jump it is 32 m long. Find the spring constant of the rope and give its unit. [4 marks]

Do not change any units.

You are advised to show your working out.

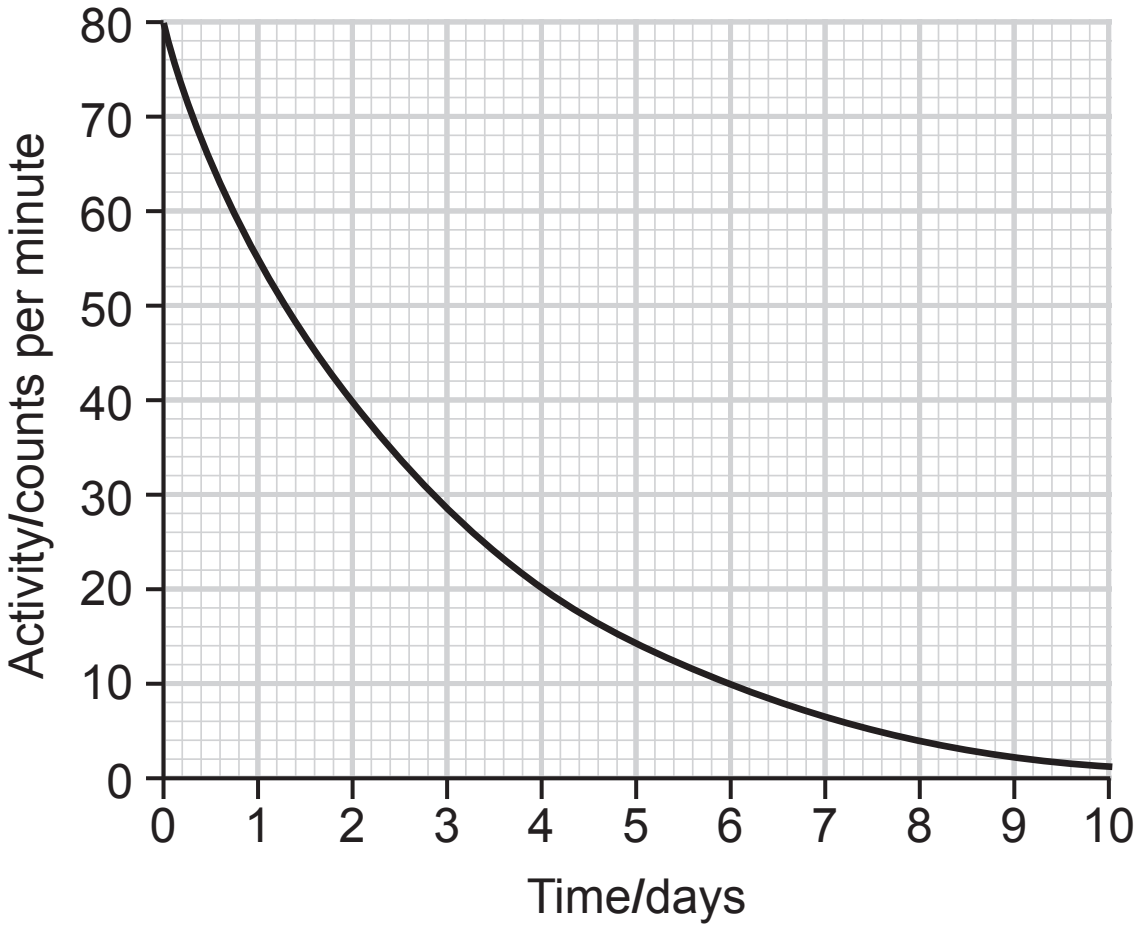
Spring constant = _____

7 **(a)** Explain the meaning of the term half-life. [2 marks]

_____

_____

The graph below shows how the activity of a radioactive substance varies with time.



(b) **(i)** Use the graph to find the half-life of the substance. [2 marks]
You are advised to show how you have used the graph.

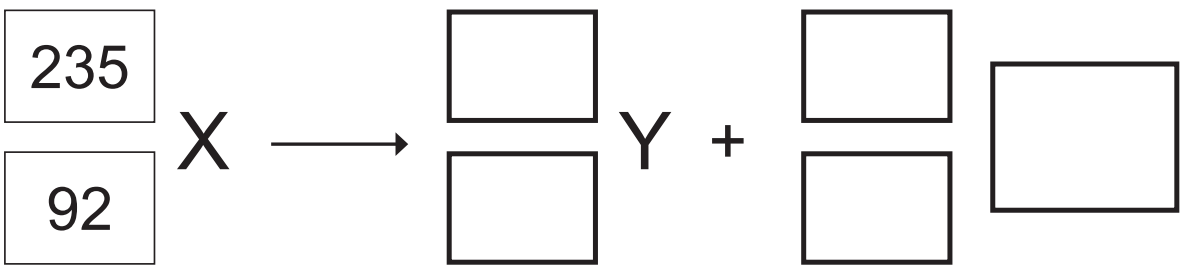
Half-life = _____ days

(ii) For a particular purpose the activity of the substance must be 10 counts per minute.
Use the graph to find how many half-lives must occur before the substance may be used.
[2 marks]

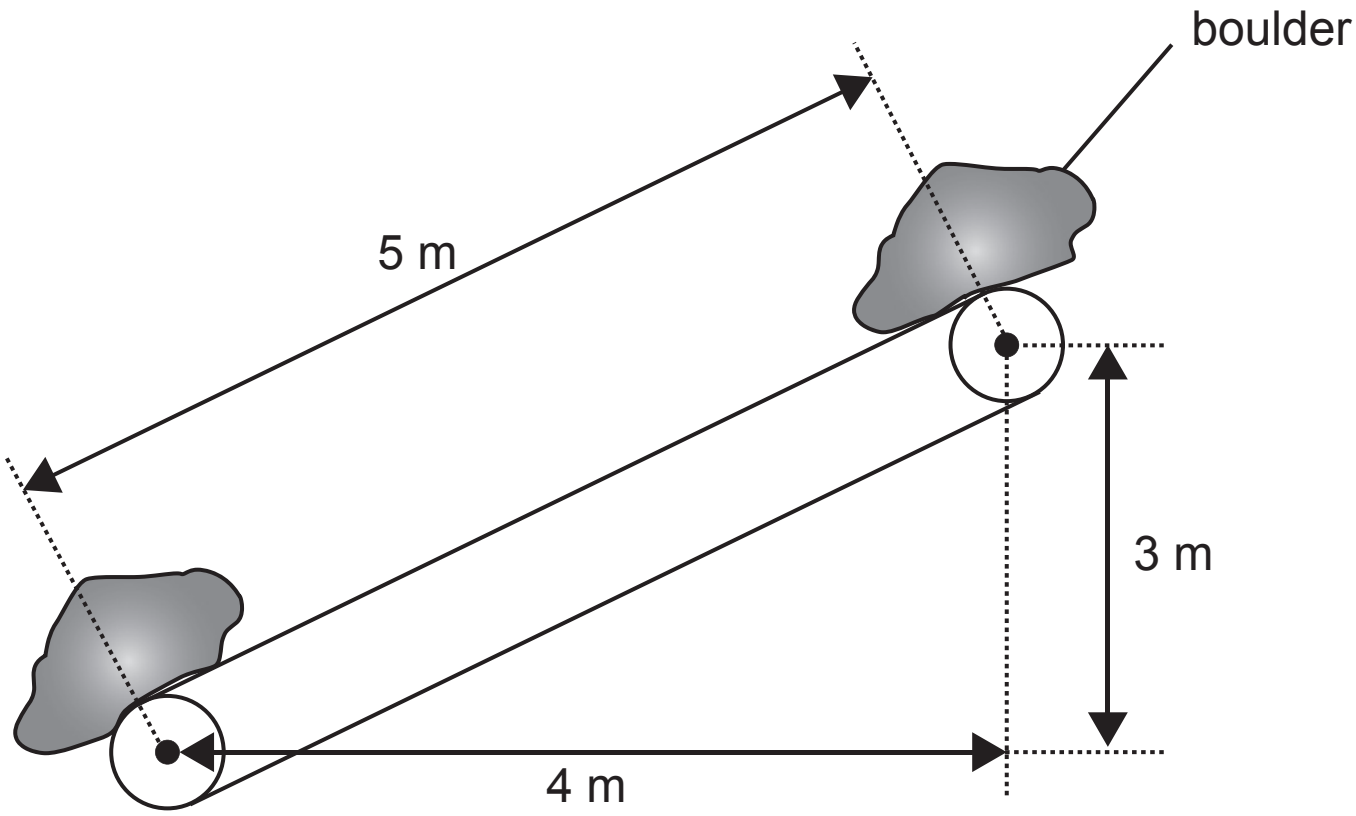
You are advised to show your working out.

Number of half-lives = _____

(c) A radioactive nucleus, X, decays to a different nucleus, Y, by alpha emission. Complete the equation below for this decay. [5 marks]
Begin by inserting the correct **symbol** for an alpha particle in the large box on the right.



8 A conveyor belt lifts a boulder so that it can be dropped into a lorry.



(a) The mass of the boulder is 250 kg. Calculate the useful work done on the boulder as it is moved from one end of the conveyor belt to the other. [3 marks]

You are advised to show your working out.

Useful work done = _____ J

On another occasion the conveyor belt does 60 kJ of work in lifting a different boulder. The power output of the conveyor belt is 5000 W.

(b) How long did it take to raise this boulder? [4 marks]

You are advised to show your working out.

Time = _____ s

9 **(a)** State, **in words**, how you would calculate speed and acceleration.
In each case indicate whether the quantity is a scalar or a vector quantity. [4 marks]

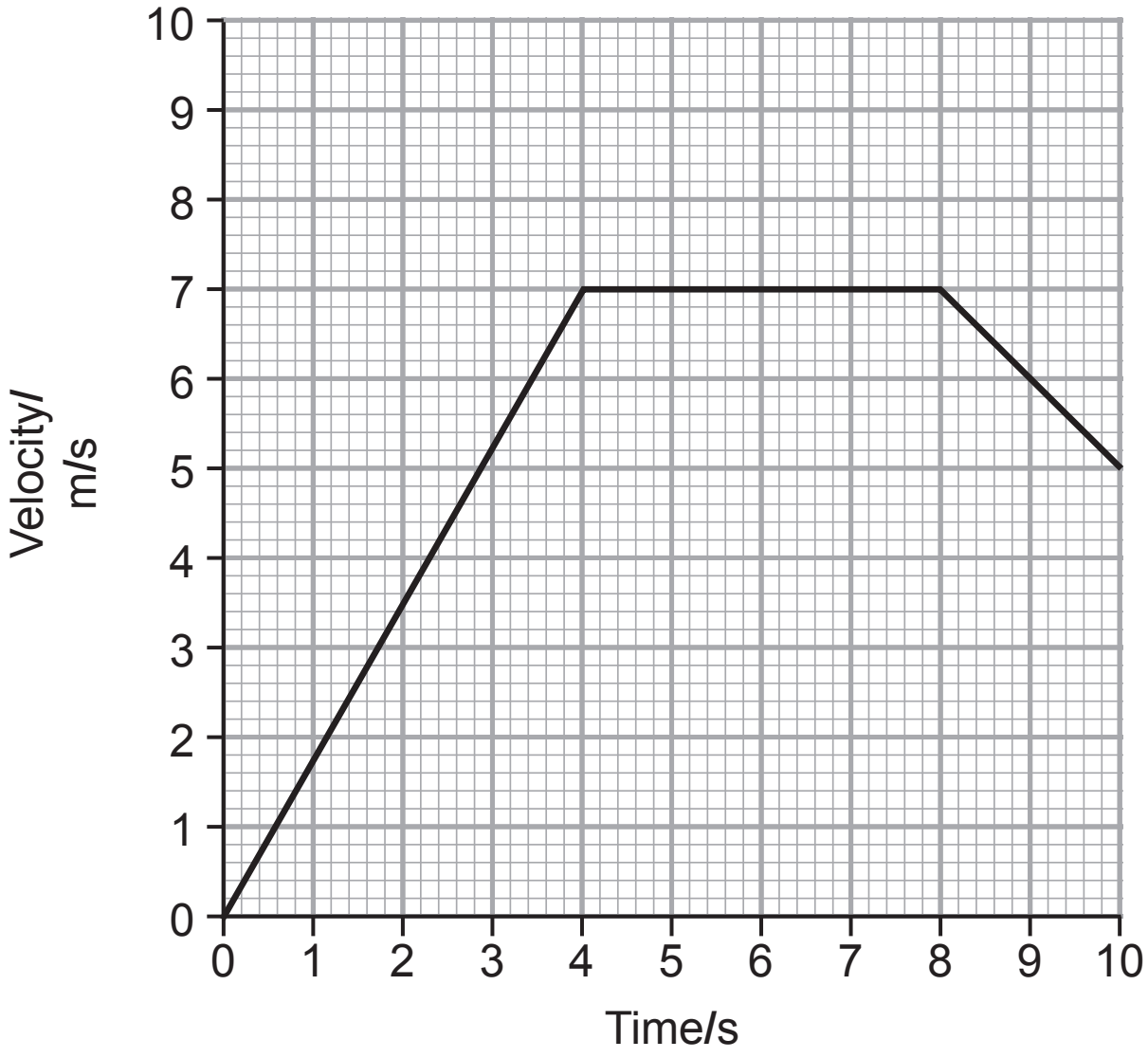
Speed _____

_____

Acceleration _____

_____

Below is a velocity-time graph for a very short train journey from one part of a railway station to another.



(b) The train is at rest once during this 10 second interval. State this time below. [1 mark]

t = _____ s

(c) (i) Calculate the train's acceleration during the first 4 seconds of its journey. [2 marks]

Give your answer correct to one decimal place.

You are advised to show your working out.

Acceleration = _____ m/s^2

(ii) Calculate the displacement of the train during the last 6 seconds. [5 marks]

You are advised to show your working out.

Displacement = _____ m

THIS IS THE END OF THE QUESTION PAPER

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Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

Examiner Number