Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2019–2020

Double Award Science: Physics

Unit P1
Higher Tier

MV24

[GDW32]

FRIDAY 8 NOVEMBER 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 **2(a)**.

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(Questions start overleaf)

1 (a) A hydraulic press is used to crush various items in a recycling plant.

A force of 3000 N causes the hydraulic press to exert a pressure of 2000 Pa. Calculate the area of the press and include the unit. [4 marks]

You are advised to show your working out.

Area = _____

(b) Farm vehicles are designed so that they do not sink into soft ground.
Which of the following design features would help to ensure this? [2 marks]

Tick (✓) the correct boxes.

Keep the weight small ☐

Keep the weight large ☐

Keep the area of tyres small ☐

Keep the area of tyres large ☐

Keep the centre of gravity low ☐

Keep the centre of gravity high ☐

2 **(a)** You are asked to write an account of radioactivity.

Give the names of the three types of radiation which may be emitted and in each case describe what the radiation consists of. [6 marks]

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

Radiation 1 _____

Consists of _____

_____

Radiation 2 _____

Consists of _____

_____

Radiation 3 _____

Consists of _____

_____

(b) The half-life of a particular radioisotope is 2 days.
The original sample contains 120 g of the radioisotope.
What **fraction** of the radioisotope will remain after 6 days? [3 marks]

You are advised to show your working out.

Fraction = _____

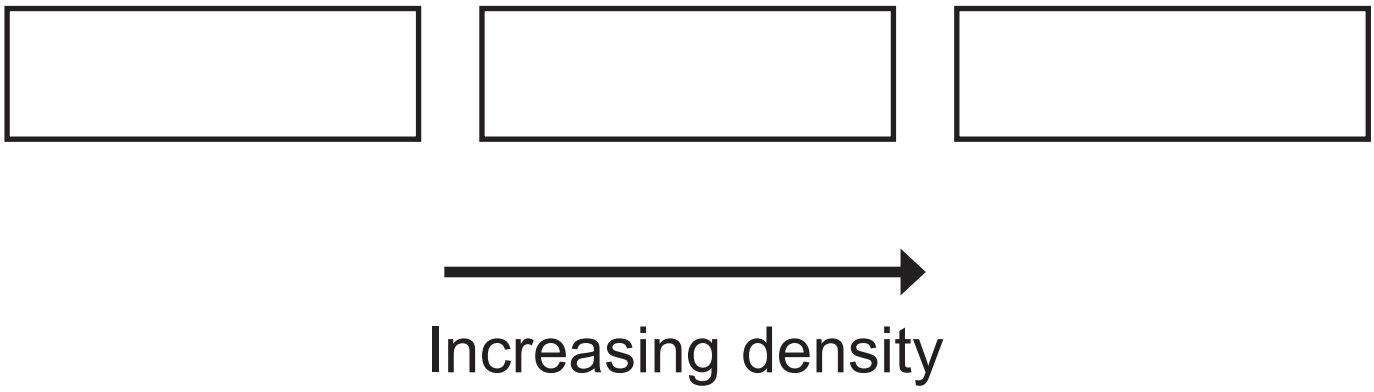
3 **(a)** The mass of a piece of jewellery is 420 g and its density is 10.5 g/cm^3.
The jewellery is totally immersed in a measuring cylinder containing 45 cm^3 of water.
Calculate the new reading on the measuring cylinder. [4 marks]

You are advised to show your working out.

New reading = _____ cm^3

(b) Water, oxygen and gold have different densities.

Write the materials in the boxes below in order of increasing density. [1 mark]



4 (i) A workman of weight 600 N carries a bag of stones of weight 22 N to the top of a staircase of height 350 cm.

Calculate the work done on the stones. [4 marks]

You are advised to show your working out.

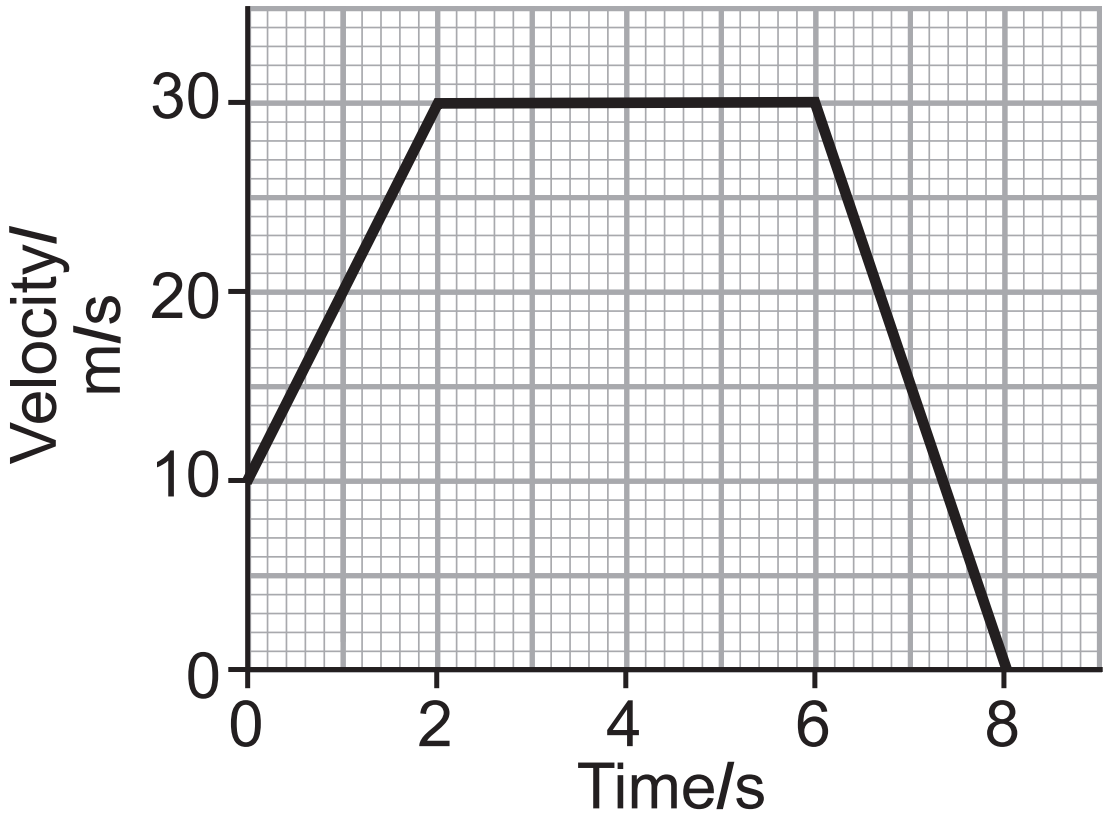
Work done on stones = _____ J

(ii) On another occasion 480 J of work was done on a different bag of stones.
It took one minute to do this work.
Calculate the power produced in lifting the stones. [4 marks]

You are advised to show your working out.

Power = _____ W

5 The velocity-time graph for an object is shown below.



(a) For how long is the object travelling at a constant velocity? [1 mark]

Time = _____ s

(b) Calculate the average velocity of the object during the first 2 seconds. [3 marks]

You are advised to show your working out.

Average velocity = _____ m/s

(c) (i) Calculate the acceleration of the object during the final 2 seconds of its journey. [4 marks]

You are advised to show your working out.

Acceleration = _____ m/s^2

(ii) What single word can be used to describe negative acceleration? [1 mark]

_____

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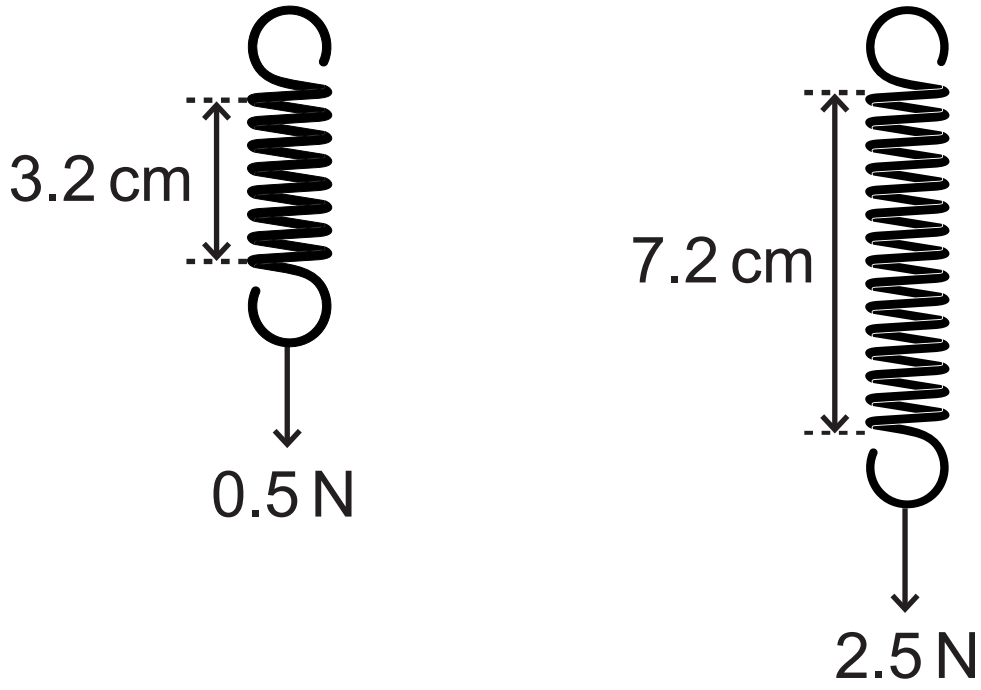
(Questions continue overleaf)

6 Different forces are applied to a spring and its length recorded, as shown below.



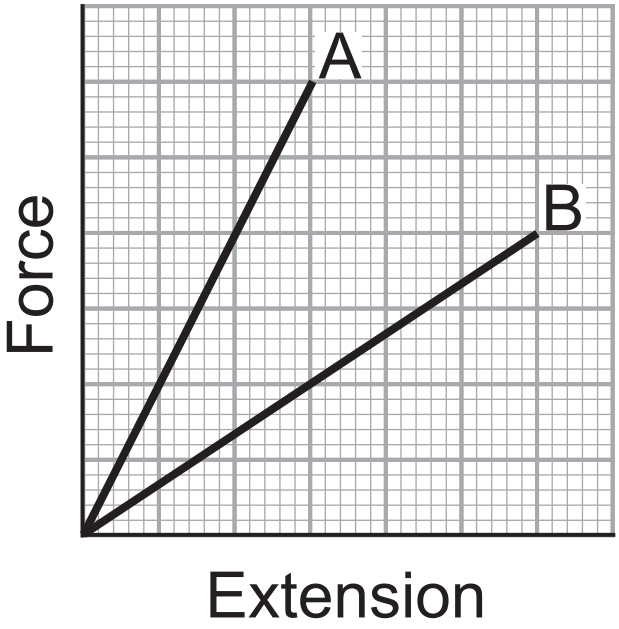
(a) (i) Use the information given to calculate the spring constant. [4 marks]
You are advised to show your working out.

Spring constant = _____ N/cm

(ii) Calculate the original length of this spring. [2 marks]
You are advised to show your working out.

Original length = _____ cm

(b) Graphs of force against extension for two different springs are shown below.



Which spring has the greater spring constant? Circle your choice.

A **B**

Give a reason for your choice.
[1 mark]

_____

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(Questions continue overleaf)

7 **(a)** The following five phrases refer to nuclear reactions.

neutrons produced

new nuclei produced

light nuclei combine

neutron absorbed

large nuclei combine

Select the three phrases which apply to nuclear **fission**.
Write them in the boxes below in the order in which they occur. [4 marks]

Fission and fusion are both sources of energy.

(b) Complete the sentences below.
[2 marks]

Fusion releases _____ times more energy per kg than a chemical reaction such as burning coal.
Fusion releases _____ times more energy per kg than nuclear fission reactions.

(c) When doing experiments with radioactive sources, scientists often have to take background activity into account.

(i) What do you understand by background activity? [1 mark]

_____

_____

(ii) Rocks and soil are a natural source of background activity because they contain a certain radioactive gas. Name the gas. [1 mark]

_____

(iii) Give the other major source of natural background activity. [1 mark]

_____

(iv) Give one example of human behaviour that can add to background activity. [1 mark]

_____

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(Questions continue overleaf)

8 **(a)** **(i)** What property does a vector quantity have that a scalar quantity does not? [1 mark]

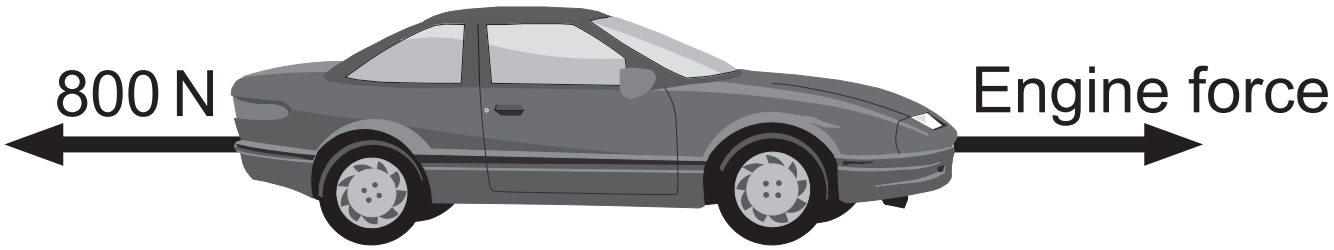
_____

(ii) Newton's 2nd law relates three physical quantities.
State one quantity which is a vector and one which is a scalar. [2 marks]

Vector quantity _____

Scalar quantity _____

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



The total frictional forces are 800 N and the combined mass of the car and its driver is 1400 kg.

Calculate the size of the engine force needed to cause an acceleration of 3 m/s^2. [4 marks]

You are advised to show your working out.

Engine force = _____ N

9 **(a)** State, in words, the Principle of Moments and include a unit in which a moment is measured. [4 marks]

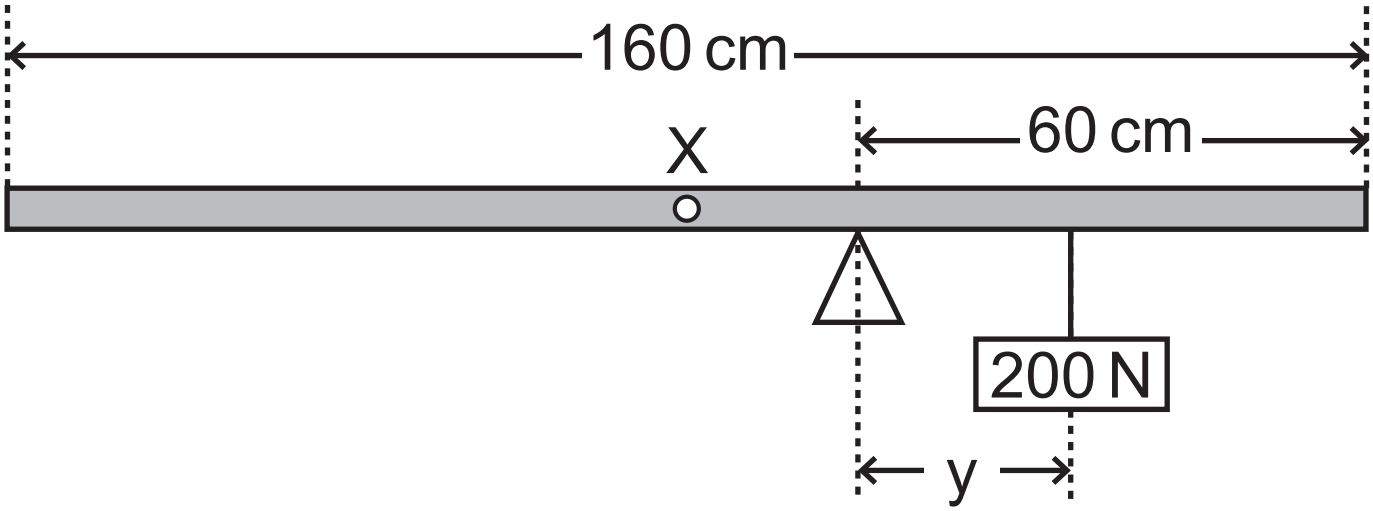
_____

_____

_____

Unit = _____

(b) A uniform beam has a weight of 150 N. Its centre of gravity is labelled X.
When a 200 N weight is hung on the beam 25 cm from the pivot, it does not balance.
The 200 N weight is moved until the beam is balanced as shown below.



By first finding the distance y, calculate how far the 200 N weight was moved to balance the beam.
In what direction was the 200 N weight moved? [5 marks]
You are advised to show your working out.

Distance moved = _____ cm
Direction _____

This is the end of the question paper

SOURCES:

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Q8(b) .....Source: Principal Examiner

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

Examiner Number