



General Certificate of Secondary Education  
2013–2014

## Double Award Science: Physics

Unit P1

Foundation Tier

[GSD31]



WEDNESDAY 26 FEBRUARY 2014, MORNING

### 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 Question **9(a)**.

Centre Number

71

Candidate Number

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

- 1 A light bulb is designed to change electrical energy to light energy.



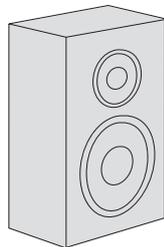
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Complete the sentences below for the other devices.



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- (i) A petrol engine is designed to change \_\_\_\_\_ energy  
to \_\_\_\_\_ energy. [2]



- (ii) A loudspeaker is designed to change \_\_\_\_\_ energy  
to \_\_\_\_\_ energy. [2]

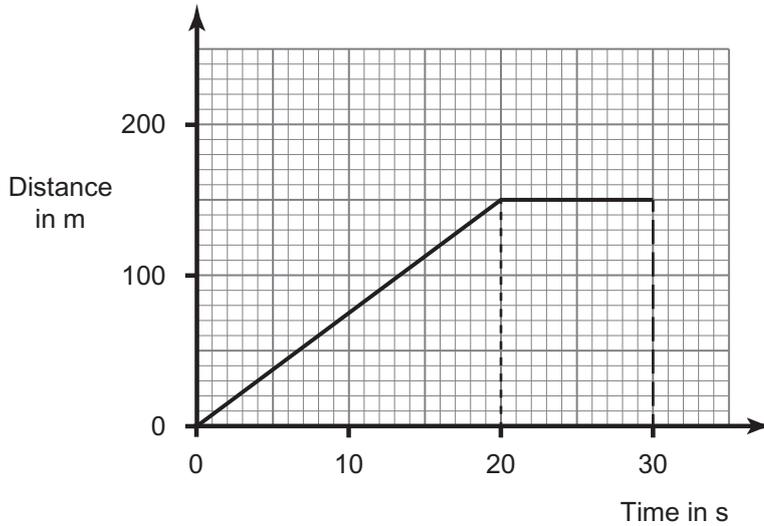


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- (iii) A catapult which fires an object upwards changes \_\_\_\_\_  
energy into gravitational potential energy and \_\_\_\_\_  
energy. [2]

Examiner Only	
Marks	Remark
○	○

2 The distance–time graph below represents the motion of a car.



(a) How can you tell, from the graph, that the car is travelling at constant speed for the first 20 seconds of the journey?

\_\_\_\_\_ [1]

(b) Describe the motion of the car from 20 seconds to 30 seconds.

\_\_\_\_\_ [1]

(c) Calculate the average speed for the 30 seconds shown.

**You are advised to show your working out.**

Average speed \_\_\_\_\_ m/s [3]

(d) What is the difference between the velocity and the speed of a car?

\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark
○	○

- 3 A cyclist of mass 65 kg is riding a cycle of mass 10 kg.



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- (a) (i) What resultant force must the cyclist exert so that he accelerates at  $2.0 \text{ m/s}^2$ ?

**You are advised to show your working out.**

Resultant force = \_\_\_\_\_ N [4]

- (ii) If a strong wind blows in the **same direction** of the cyclist's movement, what could the cyclist do if he **still** wanted to accelerate at  $2.0 \text{ m/s}^2$ ?

\_\_\_\_\_ [1]

- (b) Air resistance is a type of friction.

What do you understand by the word friction?

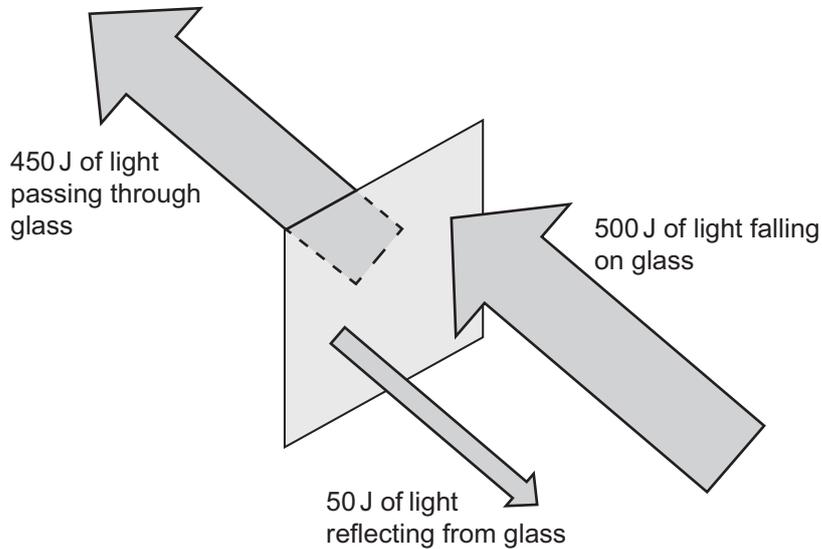
\_\_\_\_\_

\_\_\_\_\_ [2]

Examiner Only	
Marks	Remark
○	○

- 4 Window glass can reflect light and allow light to pass through. The diagram shows what happens with one particular type of glass that is designed to let light through.

Over a period of time 500 J of light energy falls on the glass as shown.



- (i) Calculate the efficiency of the glass.

**You are advised to show your working out.**

Efficiency = \_\_\_\_\_ [3]

- (ii) What unit, if any, is used for efficiency? Choose from the list below.

Circle your answer.

joule

newton

no unit

[1]

Examiner Only	
Marks	Remark
○	○

5 An athlete is practising the hammer throw for the Olympics.



© Ria Novosti/Science Photo Library

(a) (i) What is the name of the force which keeps the hammer moving in a circle?

\_\_\_\_\_ [1]

(ii) In what direction does this force act?

\_\_\_\_\_ [1]

(iii) At the beginning of the swing the hammer travels faster and faster. How does this affect the force mentioned in part (a)(i)? Put a tick (✓) in the correct box.

Gets bigger

Stays the same

Gets smaller

[1]

(b) The hammer has a mass of 7 kg. At one instant its speed is 5 m/s.

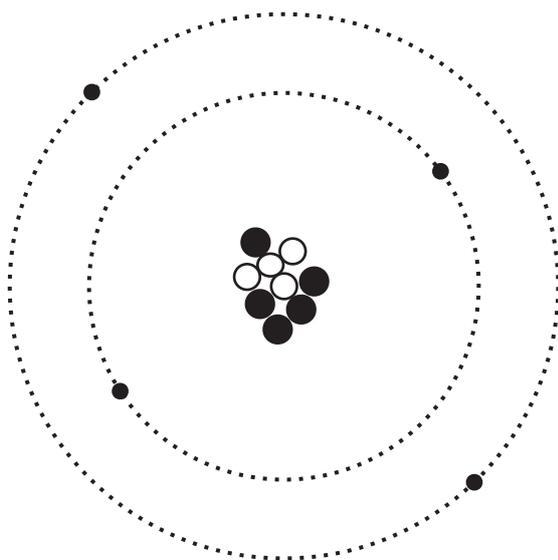
Calculate its momentum.

**You are advised to show your working out.**

Momentum = \_\_\_\_\_ kg m/s [3]

Examiner Only	
Marks	Remark
○	○

6 The diagram shows a neutral atom, X.



(a) (i) Complete the table for the atom X.

Number of neutrons	
Number of electrons	
Number of protons	
Mass number of atom X	

[4]

(ii) A nucleus of the atom X may be represented as below. Fill in the missing numbers.



[2]

(b) Another neutral atom has the **same number** of neutrons as X but a different number of protons.

Tick (✓) the correct box to show what this other atom is.

An isotope of X

An ion

Another element

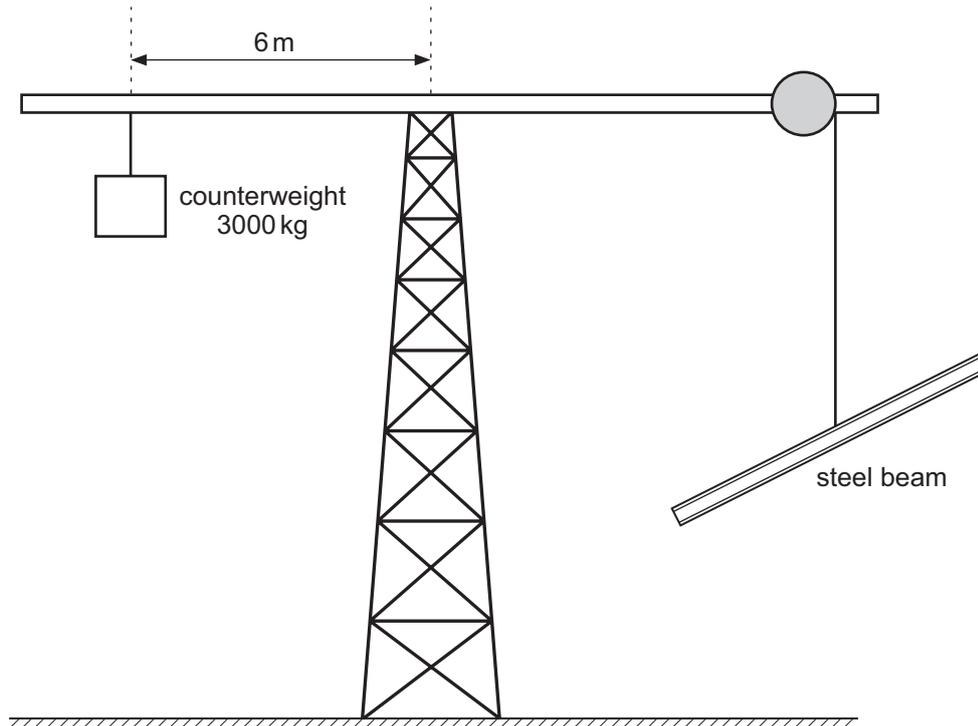
[1]

Examiner Only

Marks Remark

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- 7 A crane raises a steel beam to the top of a tall building.



- (a) How is the stability of the structure affected as the beam is raised?  
Explain your answer.

Effect on stability \_\_\_\_\_

Explanation \_\_\_\_\_ [2]

The counterweight, which has a mass of 3000 kg, exerts a moment about the top of the crane.

- (b) Calculate the moment and give its unit.

**You are advised to show your working out.**

Moment = \_\_\_\_\_ [5]

Examiner Only	
Marks	Remark
○	○

8 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?

**You are advised to show your working out.**

Time = \_\_\_\_\_ days [3]

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?

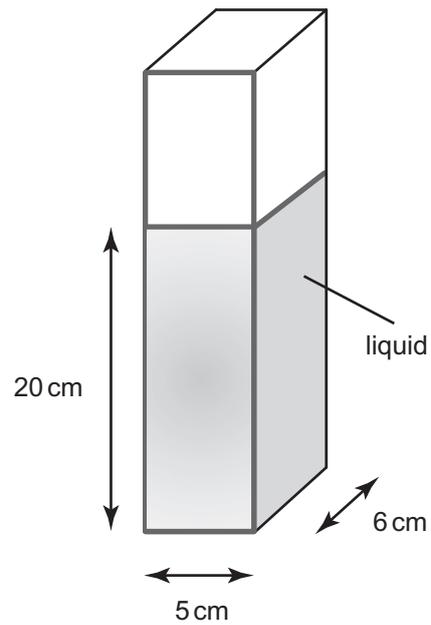
\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark
○	○



- (b) A student wants to find the density of a liquid. Use the information below to find the density of the liquid in  $\text{g/cm}^3$ .

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

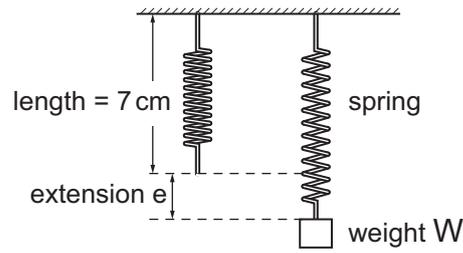


You are advised to show your working out.

Density = \_\_\_\_\_  $\text{g/cm}^3$  [3]

Examiner Only	
Marks	Remark

10 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:

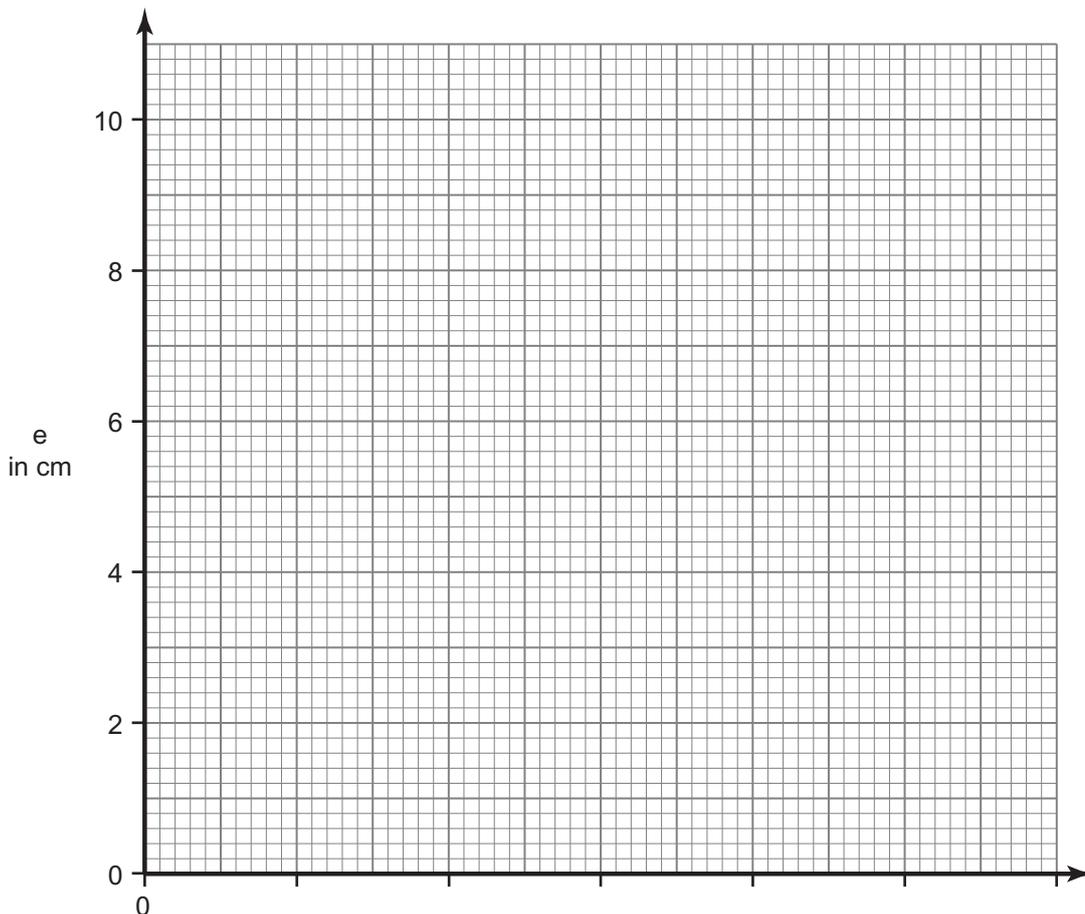
$$e = kW$$

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]



Examiner Only	
Marks	Remark
○	○

Examiner Only

Marks Remark

(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.

**You are advised to show your working out.**

Gradient = \_\_\_\_\_ [3]

Unit = \_\_\_\_\_ [1]

The original length of the spring shown opposite is 7 cm.

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

**You are advised to show your working out.**

Load = \_\_\_\_\_ N [2]

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**THIS IS THE END OF THE QUESTION PAPER**

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