Centre Number

Candidate Number

cea
Rewarding Learning

**General Certificate of Secondary Education
2016–2017**

Double Award Science: Physics

Unit P1
Foundation Tier

GSD31

[GSD31]

FRIDAY 11 NOVEMBER 2016, AFTERNOON

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 nine** 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 **7**.

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

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1 The box contains the names of different forms of energy.

| sound | electrical | strain |
| light | kinetic | heat | chemical |

The pictures below show situations in which energy changes are taking place.
Use words **in the box** to describe each of the **main** energy changes.

(a) An electric kettle boiling water

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changes *electrical* energy to _____ energy. [1]

(b) A microphone

© Sia_Anastasia / iStock / Thinkstock

changes _____ energy

to _____ energy. [2]

(c) A catapult

© goodapp / iStock / Thinkstock

changes _____ energy

to _____ energy. [2]

2 In Northern Ireland some electricity is generated using wind farms. Wind is a renewable energy resource.

(a) Tick (✓) the statement which best describes renewable energy resources.

They produce unlimited amounts of energy. ☐

They produce energy which can be used over and over again. ☐

They produce limited amounts of energy. ☐

[1]

**(b)** Name two **other** renewable energy resources.

1. _____

2. _____ [2]

(c) Name a non-renewable energy resource which does **not** produce greenhouse gases.

_____ [1]

A diesel engine has an energy flow diagram illustrated below.

Wasted heat and sound energy

Chemical energy input 1000 J

340 J of useful kinetic energy
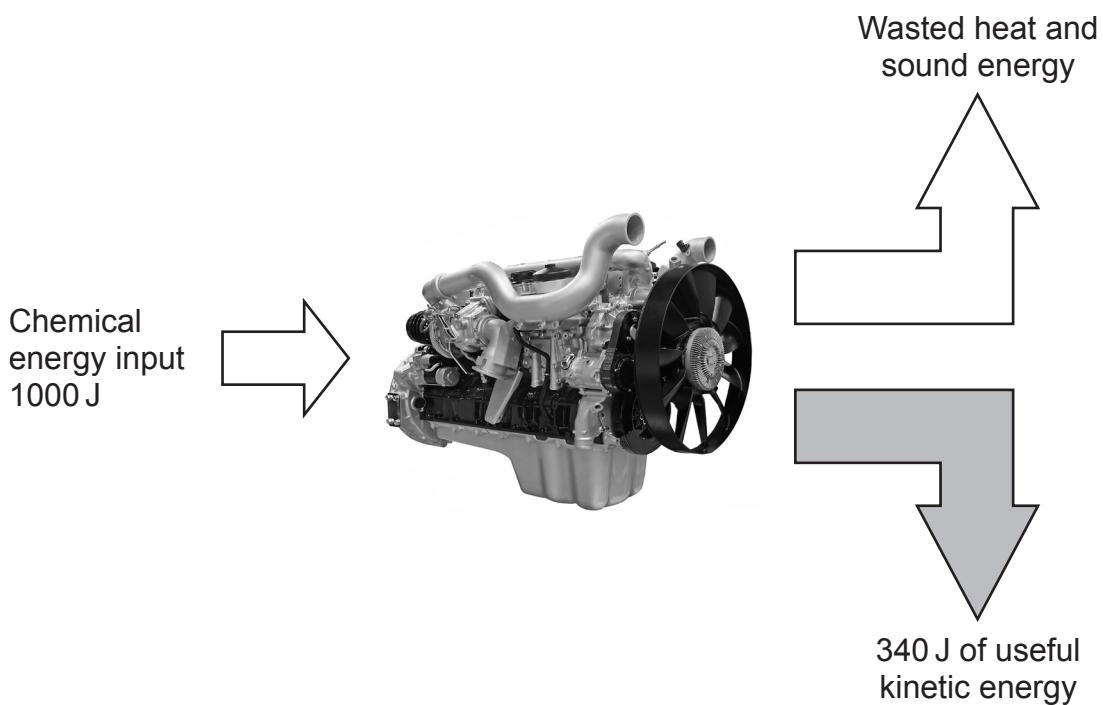
© sspopov / iStock / Thinkstock

(d) (i) How much energy is converted into wasted heat and sound energy?

Wasted heat and sound energy = _____ J [1]

(ii) Calculate the diesel engine's efficiency.

You are advised to show your working out.

Efficiency = _____ [3]

5

[Turn over

3 In the gym, a runner jogs 1500 m on a treadmill. The time taken by the runner to run this distance is 5 minutes.

© Antonio_Diaz / iStock / Thinkstock

(a) By first converting the time to seconds, calculate the runner's average speed on the treadmill in m/s.

You are advised to show your working out.

Average speed = _____ m/s [4]

(b) The diagram shows an object moving in a circle.
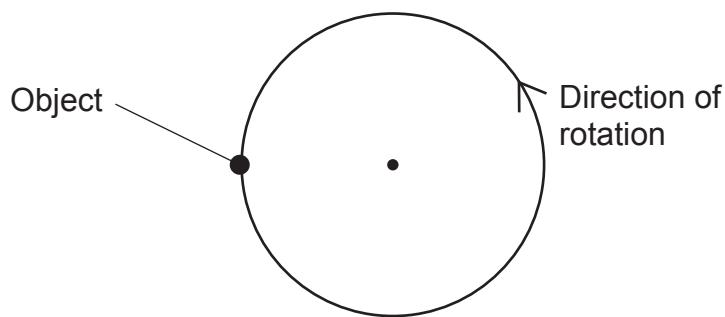
(i) On the diagram, draw an arrow, beginning at the object, to show the direction of the centripetal force. Label this arrow F. [1]

(ii) What happens to the size of the centripetal force if the mass of the object moving is increased and the speed remains the same? Tick (✓) the correct box.

☐ Increases   ☐ Decreases   ☐ Remains the same [1]

(iii) What happens to the size of the centripetal force if the speed of the object is increased and the mass remains the same? Tick (✓) the correct box.

☐ Increases   ☐ Decreases   ☐ Remains the same [1]

(iv) On the diagram draw an arrow, beginning at the object, to show the direction the object would move if the centripetal force was removed.
Label this arrow T. [1]

4 **(a)** **(i)** A student is given a lump of coal with an irregular shape and asked to find its volume.
Describe how the student could find the volume of the lump of coal.

[3]
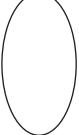
(ii) State one precaution the student should take to ensure an accurate result.

[1]

(b) The student finds that the volume of the lump of coal is 175 cm^3 and its mass is 280 g.
Calculate the density of the lump of coal, in g/cm^3.

You are advised to show your working out.

Density = _____ g/cm^3 [3]

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(Questions continue overleaf)

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[Turn over

5 A crane raises a load, as shown below.

© DrPAS / iStock / Thinkstock

Information about the process is given in the table below.

Load in N	Time in s	Height raised in m
2000	5	2.5

(a) (i) Select information from the table to calculate the work done by the crane.

You are advised to show your working out.

Work done = _____ J [3]

(ii) What is the change in the potential energy of the load when it is raised?

Change in potential energy = _____ J [1]

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(b) Calculate the power output of the crane.
Remember to include the unit with your answer.

You are advised to show your working out.

Power = _____ [4]

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11

6 The diagram shows a spanner being used to tighten a nut.
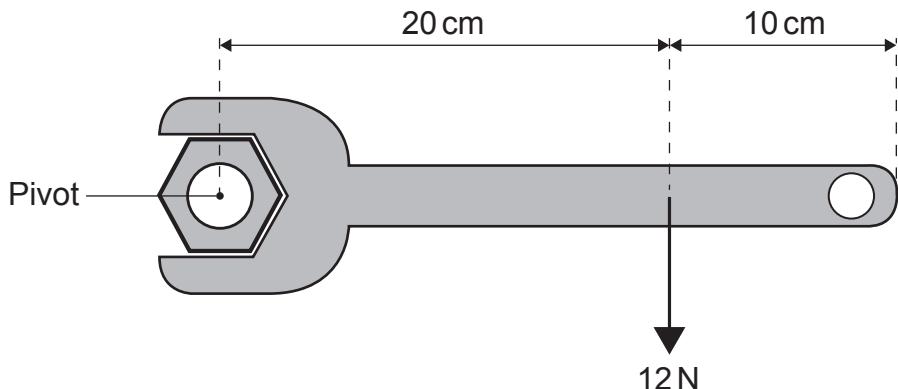
Source: Chief Examiner

(a) Calculate the moment of the 12 N force about the pivot.

You are advised to show your working out.

Moment = _____ N cm [3]

(b) Tick (✓) the box to show the direction of the moment of the 12 N force.

☐ Anticlockwise

☐ Vertically downwards

☐ Clockwise   [1]

7 Describe an experiment you would carry out to measure the power output of an electric motor.
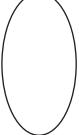
In your description you should include:

- the apparatus used;
- the measurements you take.

Do not include any formulas.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [6]

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[Turn over

8 **(a)** Explain why atoms are electrically neutral.

_____

_____ [1]

(b) The incomplete table below gives the properties of the three particles which make up an atom.
Complete the table.

Particle	Relative mass	Relative charge
	1	+1
Neutron		
Electron	$\dfrac{1}{1840}$	

[4]

(c) Explain in terms of nuclear particles the meaning of the word **isotope**.

_____

_____ [2]

(d) The lithium nucleus contains three protons and four neutrons.
Complete the symbol below for the lithium nucleus.

☐
☐ Li
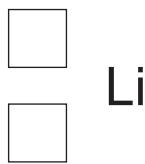
[2]

**(e)** Another atom has the same number of neutrons but a different number of protons.
Tick (✓) the box to show what this other atom is.

☐ An isotope of lithium

☐ An ion

☐ Another element [1]

Nuclear reactors are used in power stations to release energy through nuclear fission.

(f) **(i)** What is meant by **nuclear fission**?

_____

_____ [2]

(ii) Name one fission fuel commonly used in nuclear reactors.

_____ [1]

(iii) State one disadvantage, not related to cost, of producing electricity using nuclear power.

_____ [1]

9 The acceleration due to gravity can be measured by finding the times, T, for a marble to fall through various heights, H, above the Earth's surface.
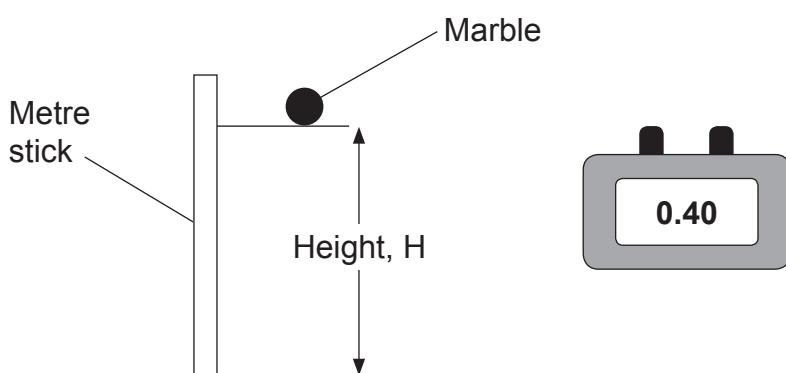
Source: Chief Examiner

According to theory, the relationship between the height, H and the time T, is given by:

$$H = k\,T^2 \quad \text{Equation 9.1}$$

The following data was obtained.

| Height/m	0.2	0.4	0.6	0.8	1.0
T^2/s^2	0.04	0.08	0.12	0.16	0.20

(a) On the grid opposite, draw a graph of height H on the vertical axis versus T^2 on the horizontal axis.

(i) Label the vertical axis and insert the appropriate scale. [2]

(ii) Plot the points. [2]

(iii) Draw a line of best fit. [1]

T^2/s^2
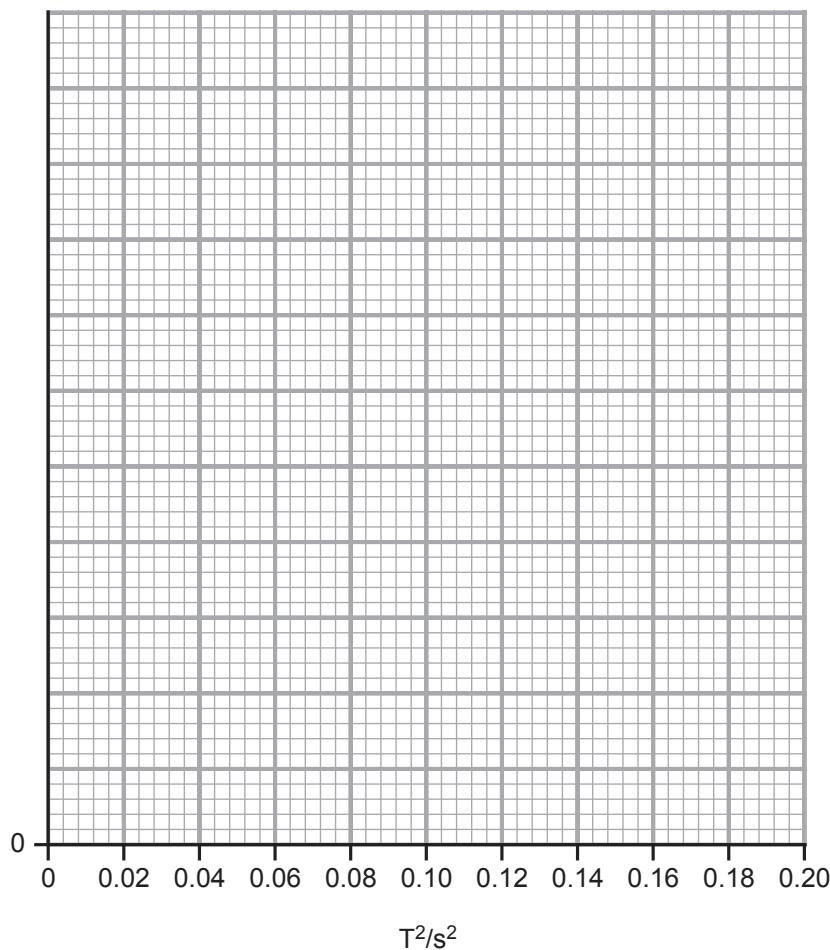
(b) (i)   Use your graph to find the value of k.
          Remember to include the unit for k.

You are advised to show your working out.

k = _____ [2]

Unit of k = _____ [1]

(ii) Does your graph support the relationship between H and T^2 in
      equation 9.1?

YES   NO   **Circle the correct answer.**

Explain your answer.

_____

_____ [2]

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THIS IS THE END OF THE QUESTION PAPER

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