Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016–2017

# Double Award Science: Physics

GSD31

Unit P1
Foundation Tier

**[GSD31]**

**FRIDAY 24 FEBRUARY 2017, 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 **8**.

| For Examiner's use only | |
|---|---|
| Question Number | Marks |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| Total Marks | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

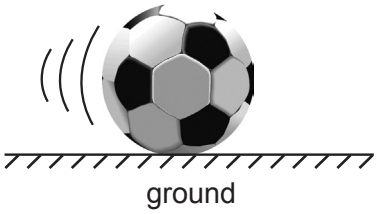
**1** What type of energy is represented by the drawings below?

**(i)** A stretched spring



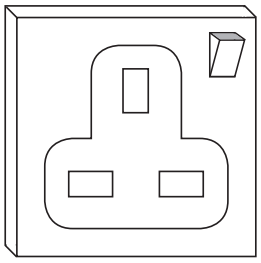
_____ energy [1]

**(ii)** A rolling ball




_____ energy [1]

**(iii)** A wall socket



_____ energy [1]

**(iv)** A box of breakfast cereal



_____ energy [1]

**2** Renewable energy resources are used to produce electricity.

A wind turbine may be used to produce electricity. The turbine blades are connected to a generator.

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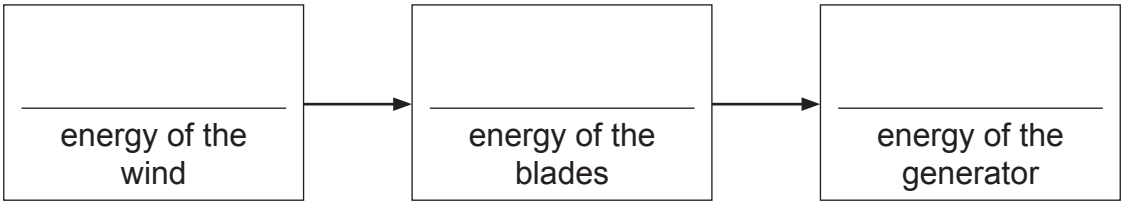
**(a)** Complete the energy flow diagram below.




[3]

**(b) (i)** A generator produces 40 J of electrical energy for every 200 J of input energy.

Calculate the efficiency of the generator.

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

Efficiency = _____ [3]

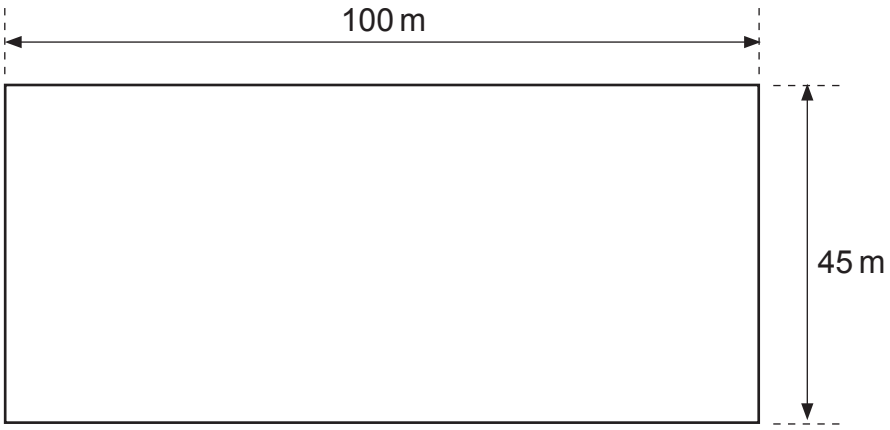
**(ii)** Give the unit, if any, for efficiency. Choose from the following list. Circle your choice.

**joule** **no unit** **newton** **watt**

[1]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**3** **(a)** A cyclist cycles once around the school football pitch in a time of 116 seconds. A plan (bird's eye view) of the football pitch is shown.




Calculate the cyclist's average speed in m/s.

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

Average speed = _____ m/s [4]

The cyclist has a weight of 540 N.

| Examiner Only | |
|---|---|
| Marks | Remark |

**(b) (i)** Calculate the cyclist's mass.

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

The cyclist's mass = _____ kg [2]

**(ii)** The cyclist and his bicycle have a total mass of 110 kg.

Calculate the combined momentum of the cyclist and his bicycle when travelling at 3.0 m/s.

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

Momentum = _____ kg m/s [3]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**4** A gardener pushes a lawnmower a total distance of 600 m when she mows a lawn.

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**(i)** She exerts an average force of 25 N.

Calculate the work done.

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

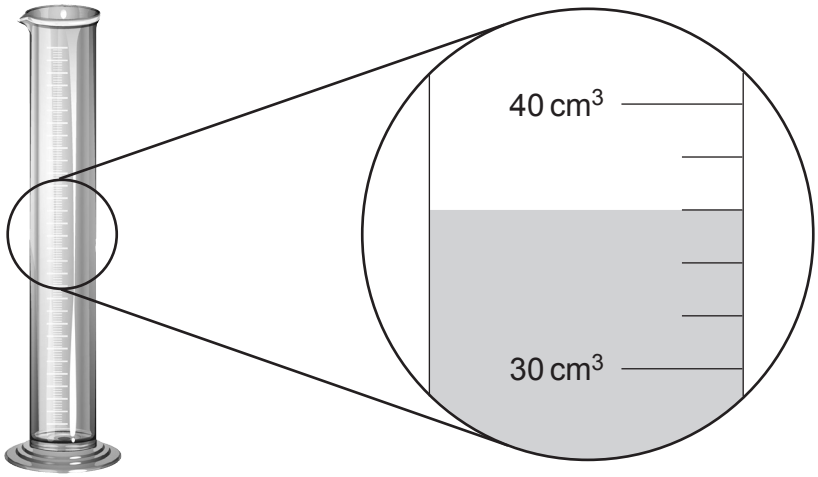
Work done = _____ J [3]

**(ii)** On another occasion, the gardener does 21 000 J of work in 300 s. Calculate the power she develops during this time. Remember to include the correct unit.

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

Power developed = _____ [4]

**5** A student wants to find the density of a liquid. The student puts the liquid into a measuring cylinder, as shown below.




© *jauhari1 / iStock / Thinkstock*

He then obtains the following readings:

Mass of empty measuring cylinder = 250.0 g
Mass of measuring cylinder + liquid = 278.8 g

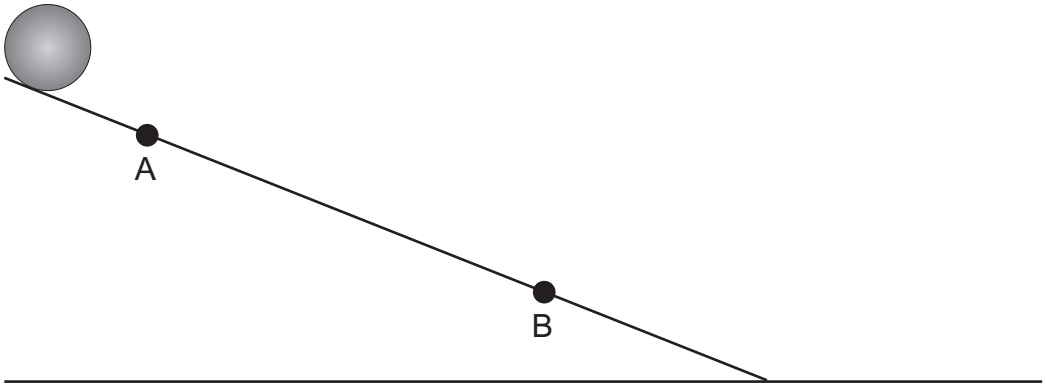
Calculate the density of the liquid in g/cm$^3$.

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

Density of liquid = _____ g/cm$^3$ [4]

Examiner Only
Marks | Remark

**6** A ball runs down a slope.




At A the ball has a speed of 1.0 m/s and 2.0 seconds later at B it has a speed of 4.0 m/s.

**(i)** Calculate the acceleration of the ball.

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

Acceleration = _____ $m/s^2$ [3]

**(ii)** The ball has a mass of 0.6 kg. Calculate the resultant force causing the acceleration.

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

Resultant force = _____ N [3]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**7** A guillotine is used to cut through an apple. The second diagram illustrates the force used and some dimensions.

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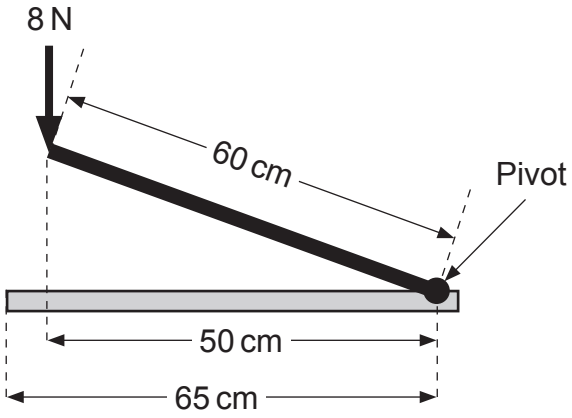


**(i)** Calculate the moment exerted by the 8 N force about the pivot.
Give your answer in N cm.

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

Moment = _____ N cm [3]

**(ii)** State the direction of the moment.

_____ [1]

**8** This question is about **renewable** and **non-renewable** energy forms.

- State what is meant by each type of energy resource.
- Give **two** examples of each type of energy resource.

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

Renewable _____

_____

_____

_____

_____

_____

_____

Non-renewable _____

_____

_____

_____

_____

_____

_____ [6]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

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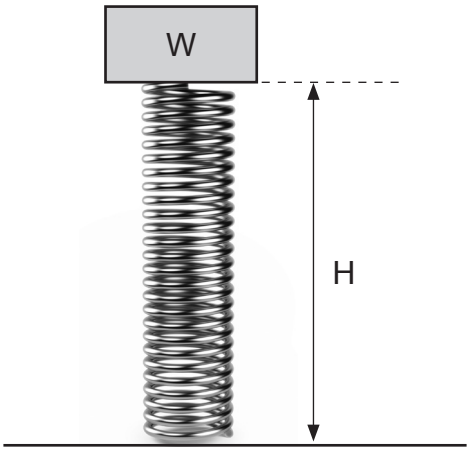
**(Questions continue overleaf)**

**9** When a load, W, is added to a spring as shown then the height, H, of the spring changes.






A student suspects that the height, H, is proportional to the load, W, according to the equation below:

$$H = kW \qquad \textbf{Equation 9.1}$$

where k is a constant.

She obtains a number of readings of W and H and these are shown.

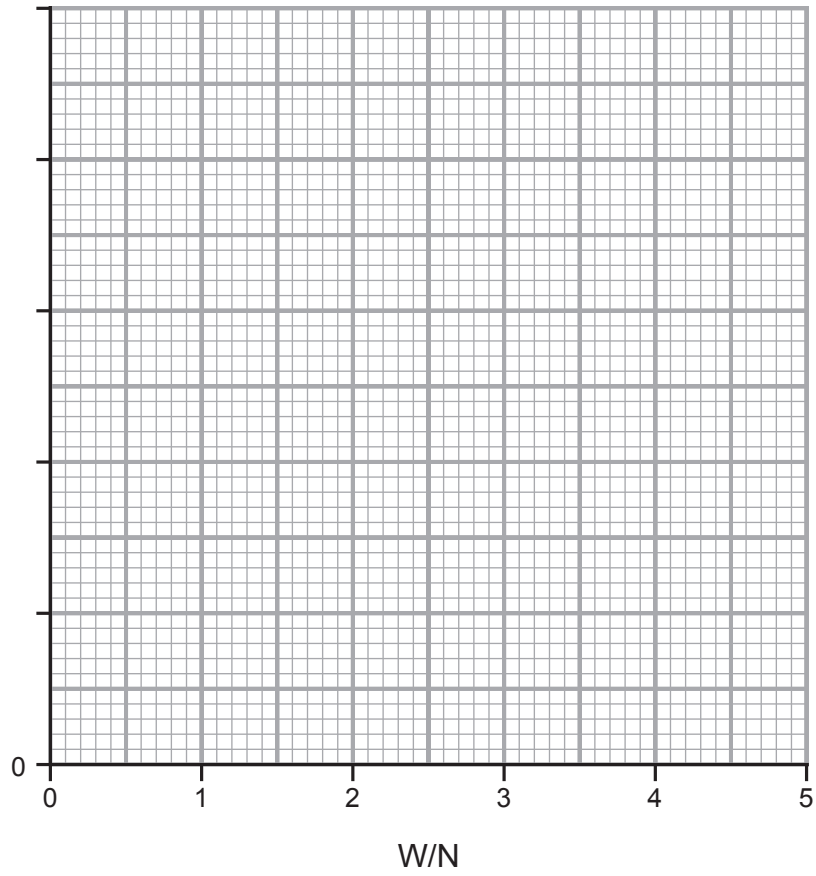
| **W/N** | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| **H/mm** | 100 | 80 | 60 | 40 | 20 |

You are asked to plot a graph of H (vertical axis) against W (horizontal axis).

**(i)** Choose a suitable scale for the vertical axis and label it. [2]

**(ii)** Plot the points on the grid. [2]

**(iii)** Draw the best fit line. [1]




**(iv)** Describe how the height, H, depends on the load, W.

_____ [1]

**(v)** Use your graph to find the original length of the spring. This is the length when no weight is added.

Original length = _____ mm [1]

**(vi)** Does your graph confirm the theory described by **Equation 9.1**?

Yes / No Circle your choice

Explain your answer.

_____ [1]

**(vii)** When the spring is actually used in a machine it **compresses by 30 mm** when a force is applied. Calculate the value of H, when the spring compresses by 30 mm.

H = _____ mm

Use this value of H and your graph to find the force which has been applied.

Load = _____ N [3]

| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

Examiner Only

| Marks | Remark |
|---|---|
| | |

**10** Information about the particles which make up an atom can be presented in a table.

**(a)** Complete the table below for the three different particles.

| Particle | Location | Charge |
|---|---|---|
| proton | | |
| | nucleus | |
| | in orbit | |

[6]

The nucleus of the element uranium is represented below.

$$^{235}_{92}U$$

**(b) (i)** What is the mass number of uranium?

Mass number = _____ [1]

**(ii)** How many neutrons does the uranium nucleus contain?

Number of neutrons = _____ [1]

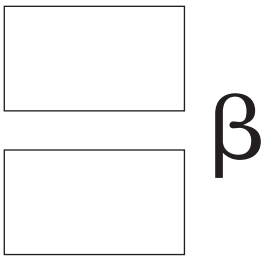
**(iii)** What is the total number of particles in the uranium nucleus?

Total number of particles = _____ [1]

| Examiner Only | |
|---|---|
| Marks | Remark |

**(c)** In radioactive decay, alpha ($\alpha$) particles, beta ($\beta$) particles and gamma ($\gamma$) rays may be emitted.

**(i)** Complete the two boxes for a beta ($\beta$) particle.




[2]

**(ii)** From what part of an atom is a beta ($\beta$) particle emitted?

_____ [1]

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

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