Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017–2018

# Double Award Science: Physics

GSD31

Unit P1
Foundation Tier

**[GSD31]**

**FRIDAY 10 NOVEMBER 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 **9**.

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

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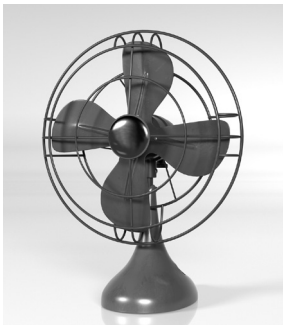
| Examiner Only | |
|---|---|
| Marks | Remark |
| | |

**1** A microphone is **designed** to change sound energy into electrical energy.

| Sound energy | → | Electrical energy |
|---|---|---|

Fill in the spaces below to show the energy change the device is **designed** to bring about.

**(i)** Electric fan



| _____ energy | → | _____ energy |
|---|---|---|

[2]

**(ii)** Match

| _____ energy | → | _____ energy |
|---|---|---|

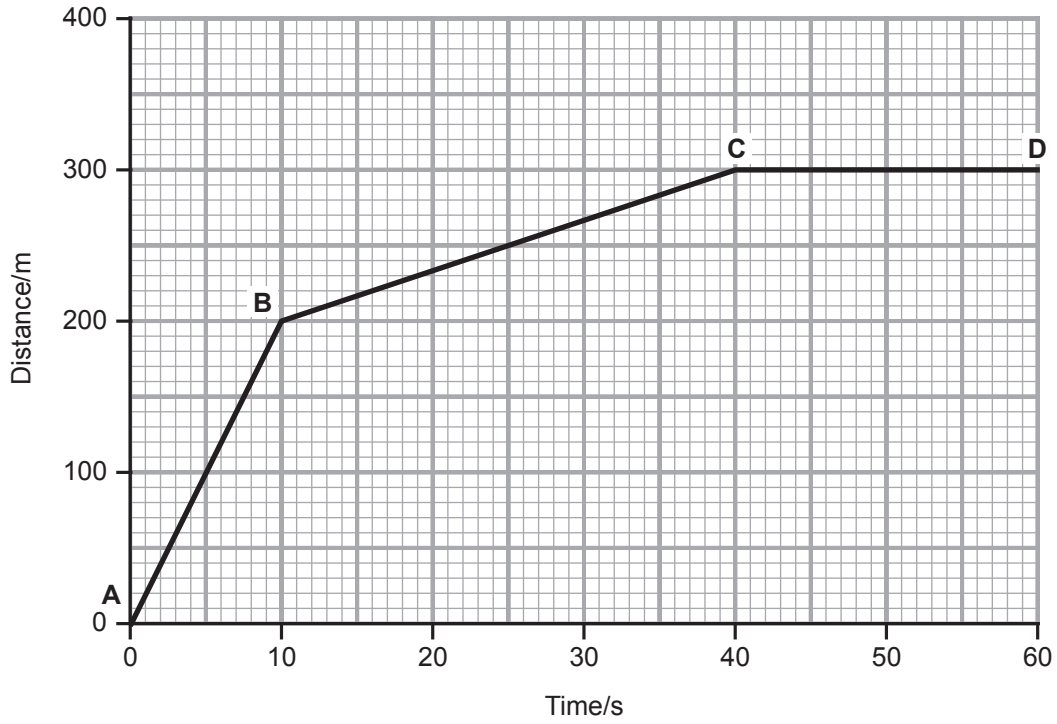
[2]

**(iii)** Loudspeaker

| _____ energy | → | _____ energy |
|---|---|---|

[2]

**2** The distance—time graph for a vehicle is shown.




The graph is labelled AB, BC and CD.

Describe the motion of the vehicle for each region by using one of the following phrases:

| | | |
|---|---|---|
| constant speed | increasing speed | at rest |

**(a) (i)** AB _____

**(ii)** BC _____

**(iii)** CD _____ [3]

Examiner Only

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

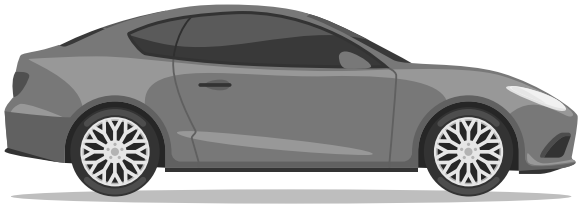
**(b)** Calculate the average speed of the vehicle during the 60 second period shown in the graph.

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

Average speed = _____ m/s [3]

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

**3** A car of mass 1190 kg fills up with 60 kg of fuel and then moves off with an acceleration of 2.5 $m/s^2$.



By first finding the total mass of the car when filled with fuel, calculate the resultant force acting on the car.

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

Total mass of car with fuel = _____ kg

Resultant force = _____ N [4]

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

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

**4** A **heat** bulb is used in an incubator containing newly hatched chicks. The **only** purpose of the bulb is to keep the chicks warm.


| |
|---|
| Total input energy = 2000 J |
| Heat energy output = 1800 J |
| Light energy output = 200 J |

**(i)** Use the above data to calculate the efficiency of the heat bulb.

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

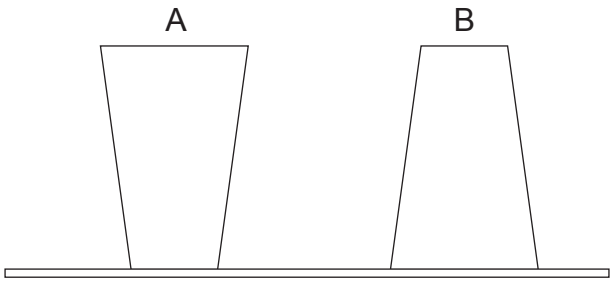
Efficiency = _____ [3]

**(ii)** If the bulb was left switched on for a longer period of time then more heat and more light would be produced. How would this affect the efficiency of the bulb? Circle the correct answer below.

Efficiency increases  Efficiency remains the same  Efficiency decreases

[1]

**5** Consider the two objects below.




**(a) (i)** Tick (✓) the correct box below.

A is more stable than B ☐

B is more stable than A ☐

A and B are equally stable. ☐ [1]

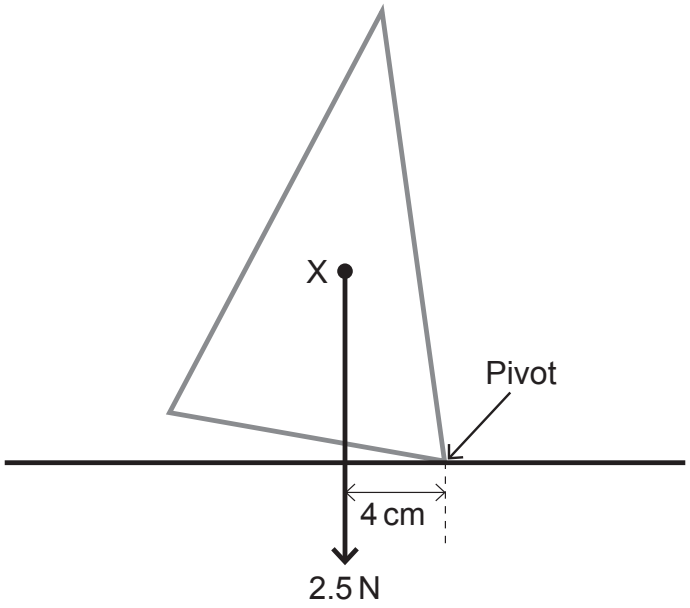
**(ii)** Give a reason for your choice.

_____ [1]

Examiner Only

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

An object has a weight of 2.5 N. It is tipped over into the position shown below creating a pivot.
X is the point through which the weight of the object appears to act.




**(b) (i)** What do we call the point X?

Point X _____ [1]

**(ii)** The object is released. Calculate the moment exerted by the 2.5 N force about the pivot.
Remember to include the unit with your answer.

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

Moment = _____ [4]

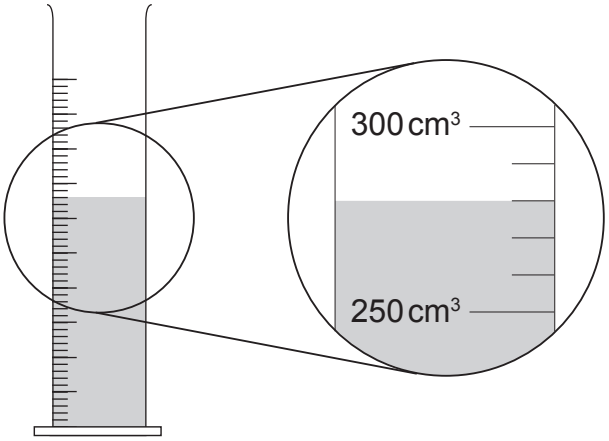
**(iii)** State the direction of this moment.

Direction = _____ [1]

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

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

**6** A student puts a certain volume of water into a graduated cylinder.
She adds **steel nails of total volume 25 cm$^3$** to the cylinder and the water level changes to a value illustrated below.




**(i)** What was the original volume of water in the graduated cylinder before the nails were added?

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

Original volume of water = _____ cm$^3$ [2]

**(ii)** The nails have a total mass of 210 g.
Calculate the density of the nails.
Remember the total volume of the nails is 25 cm$^3$.

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

Density = _____ g/cm$^3$ [3]

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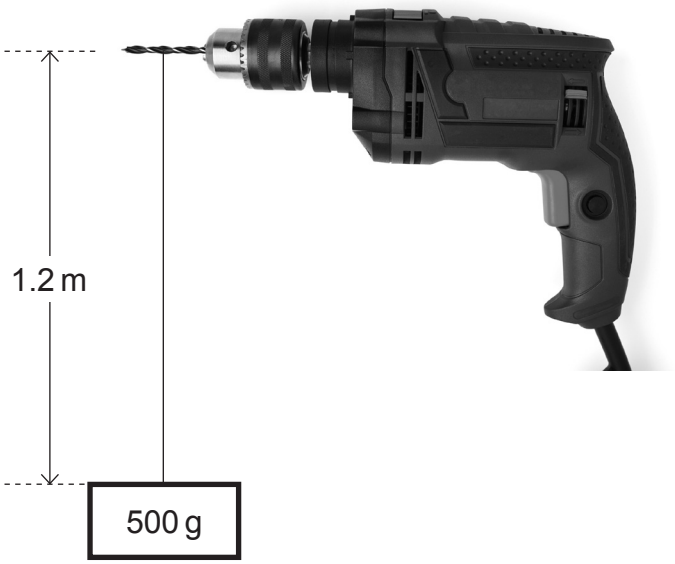
**(Questions continue overleaf)**

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

**7** A piece of string is attached to an electric drill. The other end of the string is attached to a mass of 500 g.




**(a) (i)** Calculate the weight of the 500 g mass.

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

Weight = _____ N [2]

**(ii)** Calculate the work done by the drill in lifting the mass through 1.2 m.

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

Work done = _____ J [3]

**(b) (i)** A different drill does 15 200 J of work in 4 seconds.
Calculate the power developed by the drill in watts.

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

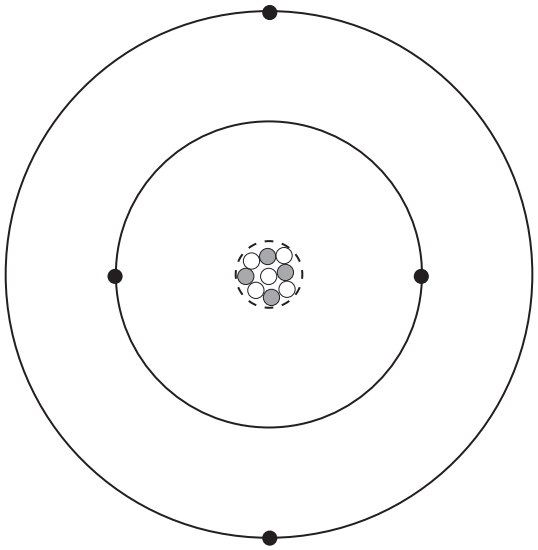
Power = _____ W [3]

**(ii)** Express your answer to **(b)(i)** in kW.

Power = _____ kW [1]

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

**8** A neutral atom is represented by the diagram below.



Some information about the atom is given in the table below.

**(a)** Complete the table.

| Particle | Name | Relative mass | Relative charge |
|---|---|---|---|
| ● | | $\frac{1}{1840}$ | |
| ◉ | | | +1 |
| ○ | neutron | | |

[6]

When a substance is radioactive it will emit ionising radiation.

**(b)** What do you understand by 'ionisation'?

_____

_____ [2]

Examiner Only

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

**(c)** A radioactive substance has a half-life of 4 minutes. There are 8000 undecayed nuclei present now.
How many undecayed nuclei will remain after 12 minutes?

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

Number of undecayed nuclei = _____ [3]

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

**9** Give a description of nuclear fission.

Your description should include:

- the name of a fuel;
- the particle which starts the fission;
- what occurs during fission;
- the result of the fission.

**You will be assessed on your written communication skills including the use of specialist scientific terms.**

[6]

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

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**(Questions continue overleaf)**

**10** An object accelerates from rest for a time, t. During the acceleration it travels a distance, d.

It is suggested that the distance, d and the time, t are related by the equation:

$$d = kt^2 \qquad \textbf{Equation 10.1}$$

where k is a constant.

An engineer obtains the following results in an investigation.

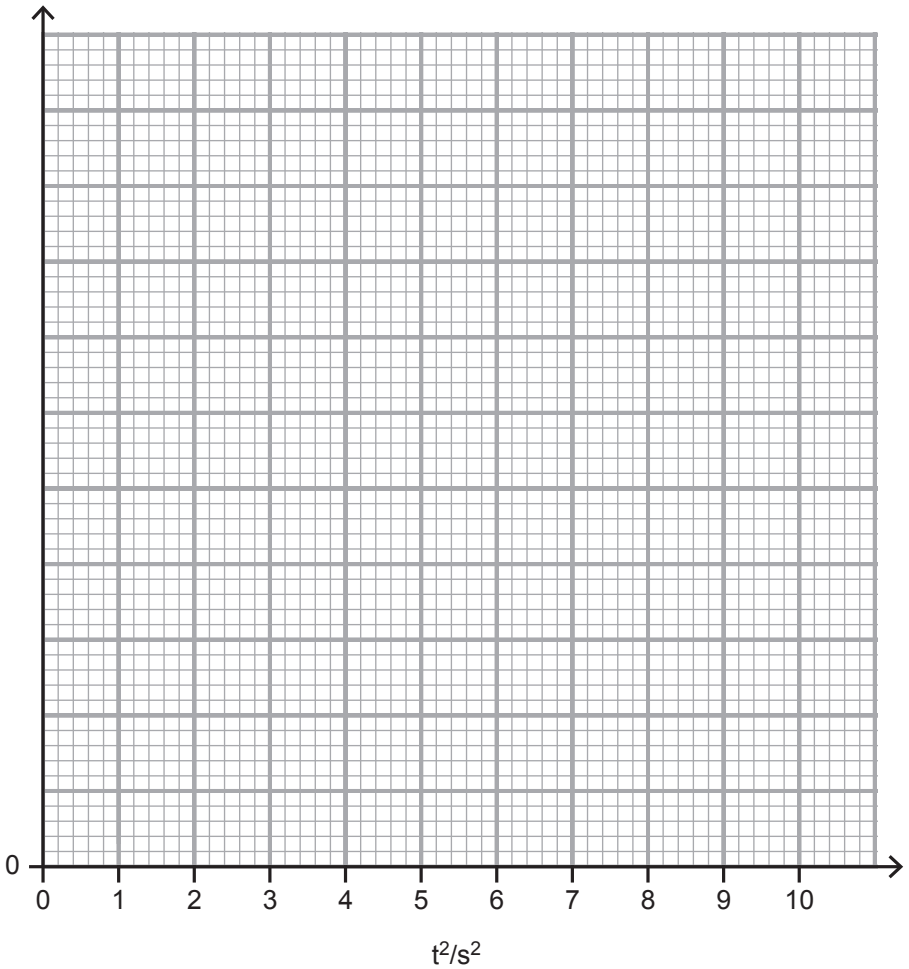
| d/m | 0 | 2 | 8 | 18 | 20 |
|---|---|---|---|---|---|
| $t^2/s^2$ | 0 | 1 | 4 | 9 | 10 |

You are asked to plot a graph of d (vertical axis) against $t^2$ (horizontal axis).

**(a)** Choose a suitable vertical scale and label it. [2]

**(b)** Plot a graph of d against $t^2$. [2]

**(c)** Draw the straight line of best fit. [1]

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

**(d) (i)** Use your graph to state the relationship, in words, between distance (d) and time$^2$ ($t^2$).

_____

_____ [1]

**(ii)** Explain how your graph shows this.

_____

_____ [2]

**(e)** Calculate the gradient of your line and give its unit.

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

Gradient = _____

Unit = _____ [3]

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

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

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