Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2024–2025

Single Award Science: Physics

Unit 3

Foundation Tier

[GSA31] *GSA31*

WEDNESDAY 13 NOVEMBER 2024, MORNING

TIME

1 hour.

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 outside the boxed area on each page or on blank pages.
Complete questions in black ink and use a dark HB pencil for drawings and graphs.
Do not write with a gel pen.
Answer **all nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You may use a scientific calculator.
Quality of written communication will be assessed in Question **7**.

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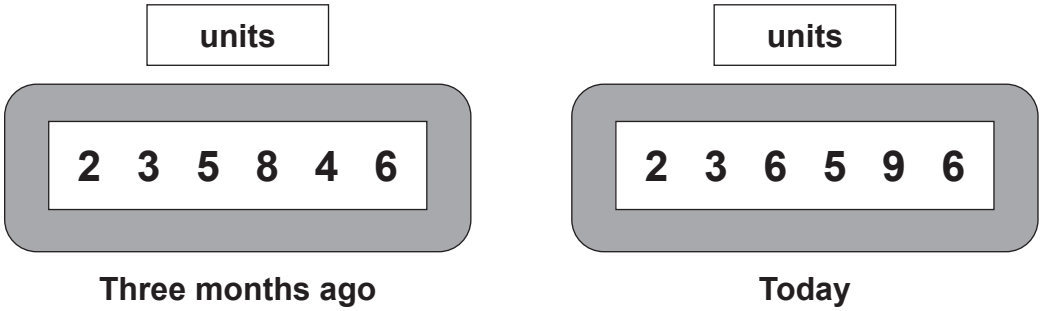
1 **(a)** The diagrams below show electricity meter readings three months apart.



(i) Use these meter readings to calculate the number of units of electricity used during these three months.

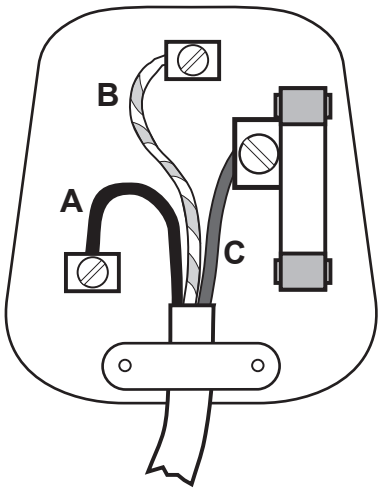
Show your working out.

_____ units [2]

(ii) Each unit of electricity costs 20p.
Calculate this household cost for these three months.

_____ p [1]

(b) The diagram below shows a three pin plug.



(i) Which wire **A**, **B**, or **C** is the earth wire?

_____ [1]

(ii) Complete the following sentence to explain the function of the earth wire.

Choose from:

current **voltage** **resistance**

If a fault occurs in an appliance the earth wire will provide a

low _____ path for the _____

to flow to the ground. [2]

[Turn over

(c) The photograph below shows a double insulated kettle.

(i) Explain how this kettle is double insulated.

_____

_____ [1]

This kettle has a power rating of 1200 W.

(ii) Use the equation:

$$\textbf{current} = \frac{\textbf{power}}{\textbf{voltage}}$$

to calculate the current flowing when this kettle is connected to the 240 V mains.

Show your working out.

_____ A [2]

(iii) Which fuse should be used in the plug of this kettle?

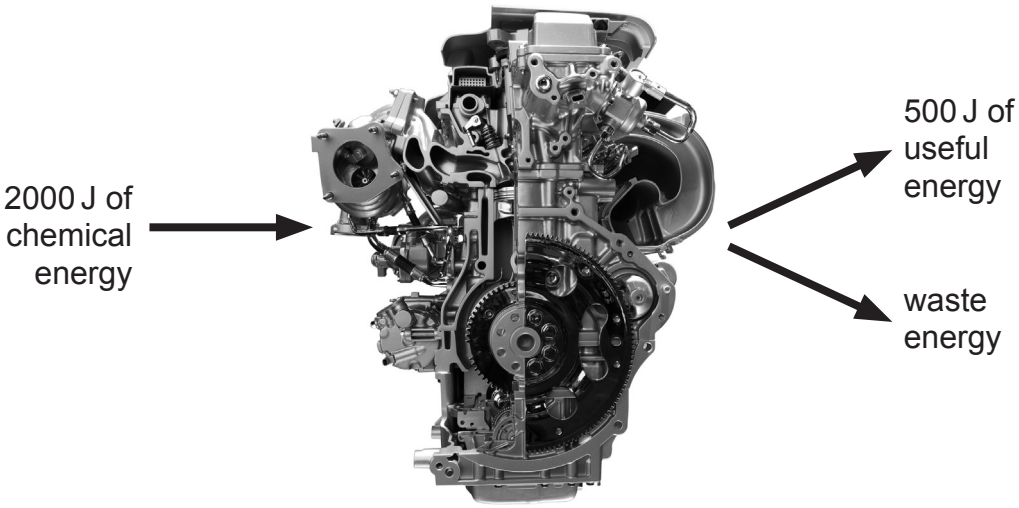
Circle your answer.

1 A **3 A** **5 A** **13 A**

[1]

[Turn over

2 **(a)** The photograph below shows 2000 J of energy going into a car engine.



(i) Name **one** form of waste energy produced by a car engine.

_____ [1]

(ii) Calculate the amount of energy wasted by this engine.

_____ J [1]

(iii) Use the equation:

$$\textbf{efficiency} = \frac{\textbf{useful energy out}}{\textbf{total energy in}}$$

to calculate the efficiency of this engine.

Show your working out.

_____ [2]

The picture below shows the inside of a car after an accident.

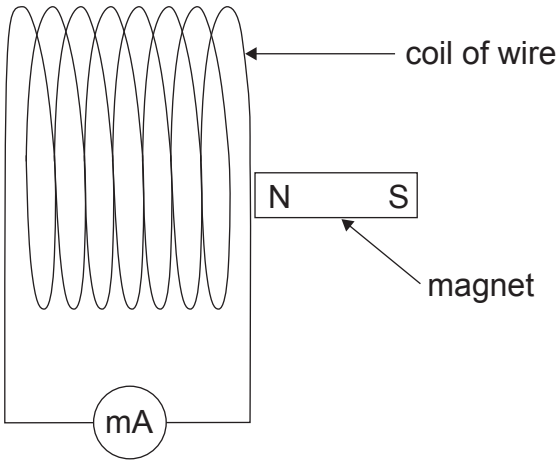
(b) Name **two** safety features shown in this picture.

1. _____

2. _____ [2]

[Turn over

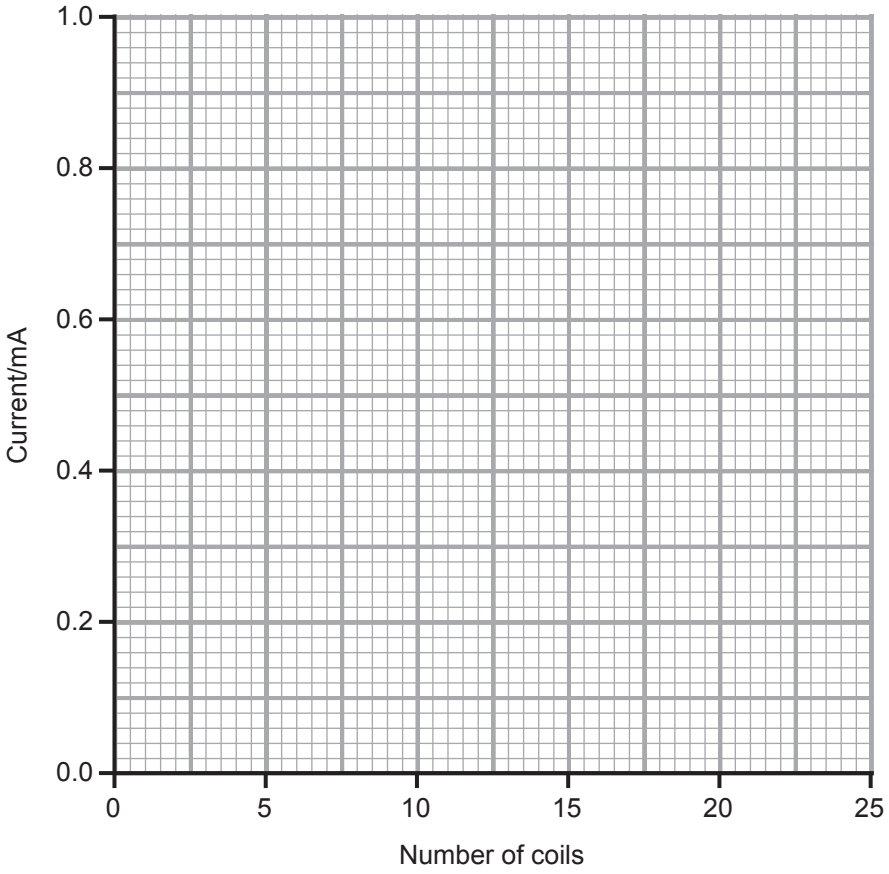
3 **(a)** The diagram below shows a simple generator used to produce an electrical current.



The table below shows how the amount of current produced changes with the number of coils of wire used.

Number of coils of wire	Current/mA
5	0.2
10	0.4
15	0.6
20	0.8
25	1.0

(i) On the grid below plot and draw a line graph for these results.



[3]

(ii) What conclusion can be drawn from these results?

_____

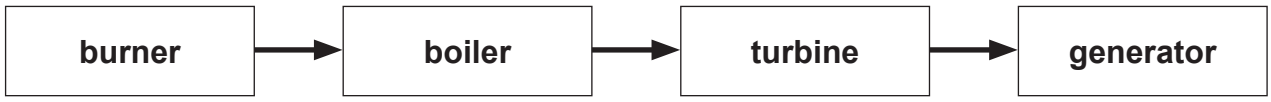
_____ [1]

(iii) State **one** other factor that would increase the amount of current produced.

_____ [1]

[Turn over

(b) Given below are the names of the component parts found in a fossil fuel power station.



(i) Using lines match each component part with its function.

Component part	Function
burner	turns water into steam
boiler	turns fossil fuels into heat
turbine	spins magnet inside generator

[2]

(ii) Name the parts of the power station where the following energy changes occur.

kinetic ⟶ electrical _____

chemical ⟶ heat _____ [2]

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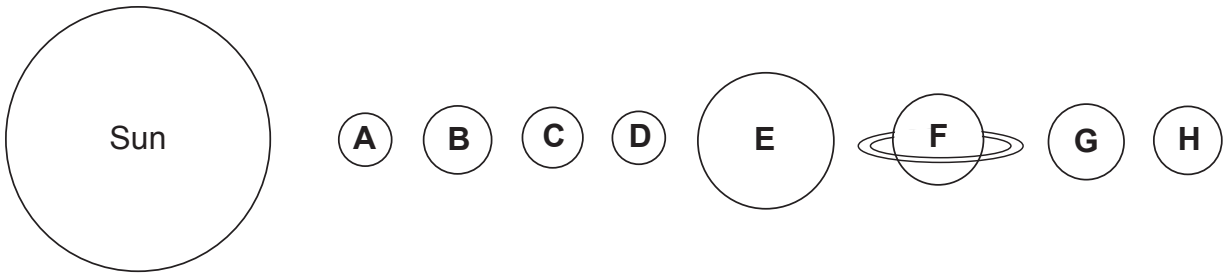
(Questions continue overleaf)

[Turn over

4 **(a)** The diagram below represents the Solar System.



(i) Name the planets labelled **B** and **G**.

B _____

G _____ [2]

(ii) Name **one** gas planet.

_____ [1]

(iii) On the diagram above circle the planet which is the coldest. [1]

Most asteroids in the Solar System are found orbiting between Mars and Jupiter. Occasionally an asteroid can break free and collide with other planets or moons.

(b) Give **one** piece of evidence that shows asteroids have collided with our moon in the past.

_____

_____ [1]

(c) The table below gives the diameter (size) and gravity of five planets **P**, **Q**, **R**, **S** and **T**.

Planet	Diameter/ m × 10^6	Gravity/ N/kg
P	4.8	3.6
Q	12.8	9.8
R	6.8	3.8
S	140	26.0
T	40	14.1

(i) What relationship, if any, exists between diameter and gravity of the planets in the table? Explain your answer.

_____

_____ [1]

(ii) Use the equation:

weight = mass × gravity

to calculate the weight of an 80 kg astronaut on planet **R**.

Show your working out.

_____ N [2]

[Turn over

5 **(a)** The table below shows how the percentage of global energy supply is expected to change between 2011 and 2040.

	Percentage of global energy supply	
Energy source	**2011**	**2040**
biomass	4	7
hydroelectric	3	5
nuclear	8	9
coal	20	18
gas	26	28
oil	37	30
other renewables	2	3

(i) What is meant by the term renewable energy?

_____

_____ [1]

(ii) Name the fossil fuel that is likely to increase in use between 2011 and 2040.

_____ [1]

(iii) How is the use of renewable energy sources likely to change between 2011 and 2040?

_____ [1]

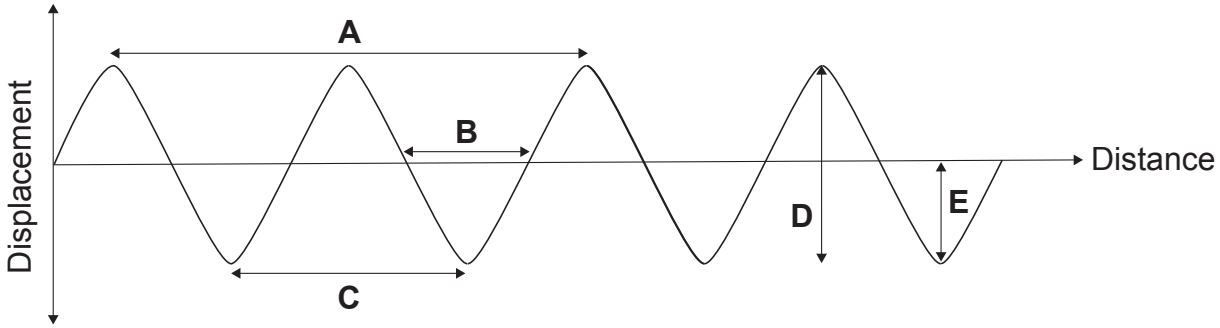
(b) **(i)** Name **one** renewable source **not** in the table.

_____ [1]

(ii) State **one** disadvantage of using this renewable source.

_____ [1]

6 **(a)** The diagram below shows a wave.



(i) Which letter **A**, **B**, **C**, **D** or **E** represents the amplitude of this wave?

_____ [1]

(ii) Which letter **A**, **B**, **C**, **D** or **E** represents the wavelength of this wave?

_____ [1]

There are two types of waves, transverse and longitudinal.

(b) Name **one** example of a transverse wave.

_____ [1]

(c) Use the equation:

wave speed = frequency × wavelength

to calculate the speed of a wave that has a wavelength of 3.4 m and a frequency of 100 Hz.

Show your working out.

_____ m/s [2]

[Turn over

(d) Echoes can cause problems with the music heard by an audience inside concert halls (auditoria).

(i) What is an echo?

_____

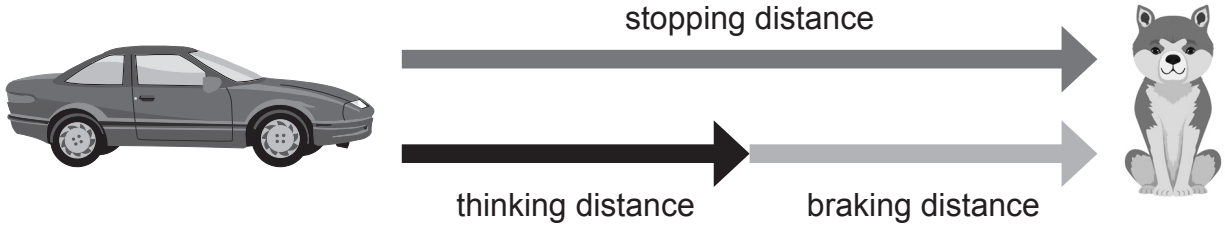
_____ [1]

(ii) State **one** way to counteract the problem caused by echoes inside concert halls (auditoria).

_____

_____ [1]

7 The diagram below shows the process involved in a car coming to a stop.



Use the diagram and your knowledge to explain the terms thinking, braking and stopping distances when a driver needs to stop suddenly.

Your answer should include:

- a description of each term;
- a factor that will affect thinking distance **only** and its effect;
- a factor that will affect braking distance **only** and its effect; and
- a factor that will affect **both** thinking and braking distance and its effect.

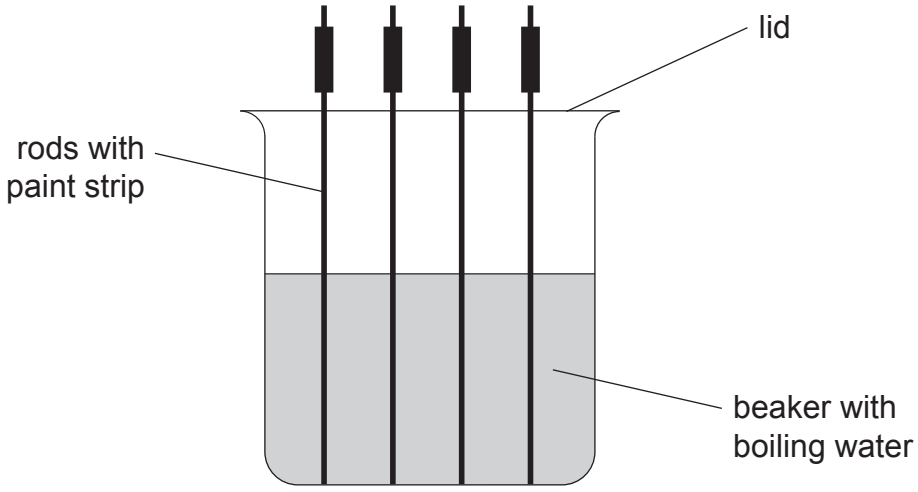
In this question you will be assessed on the quality of your written communication skills, including the use of specialist scientific terms.

[6]

[Turn over

8 **(a)** A student used the apparatus shown below to compare how heat travels through **four** different metal rods.

Each rod has a strip of paint which will change colour when heated.



The investigation was repeated, and the results are shown below.

Rod material	Time for paint to change colour/s	Time for paint to change colour/s	Average time/s
copper	7	5	6
aluminium	11	13	12
brass	10	15	13
steel	17	21	19

(i) Which metal is the best conductor?

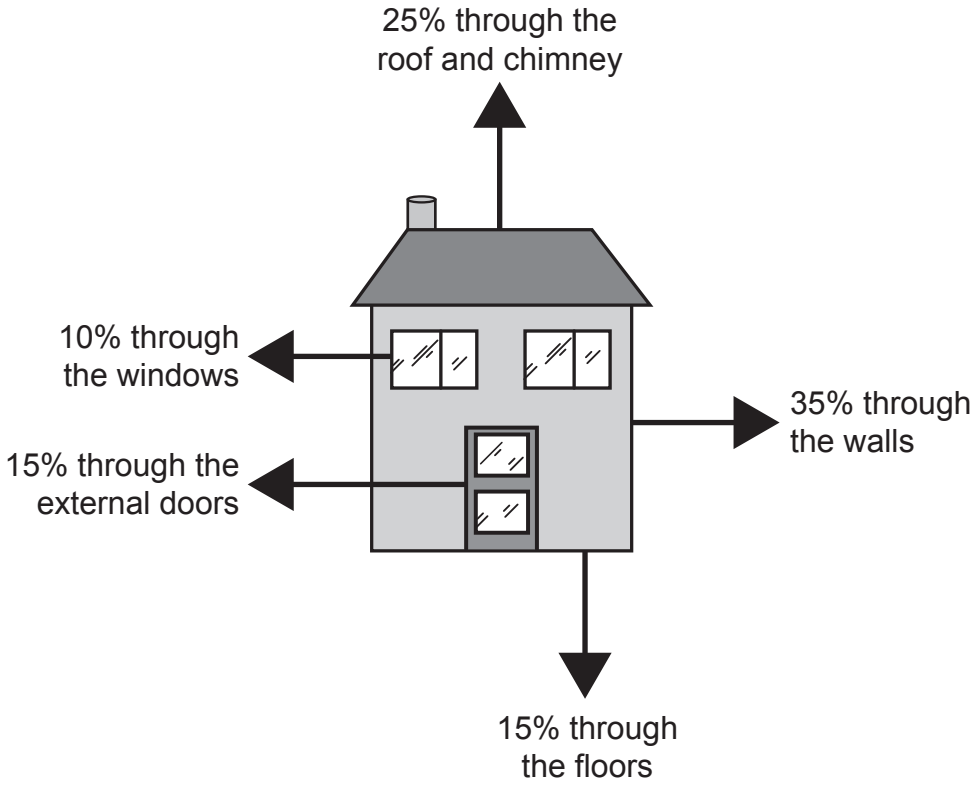
_____ [1]

(ii) Suggest **one** way the student ensured a valid (fair) test was carried out.

_____

_____ [1]

(b) The diagram below shows the percentage of heat lost from different parts of our home.



(i) Give **one** conclusion that can be made from this information.

_____ [1]

(ii) Describe **one** way heat loss can be reduced in our homes.

_____

_____ [1]

(iii) Explain why it is important to reduce heat loss from our homes.

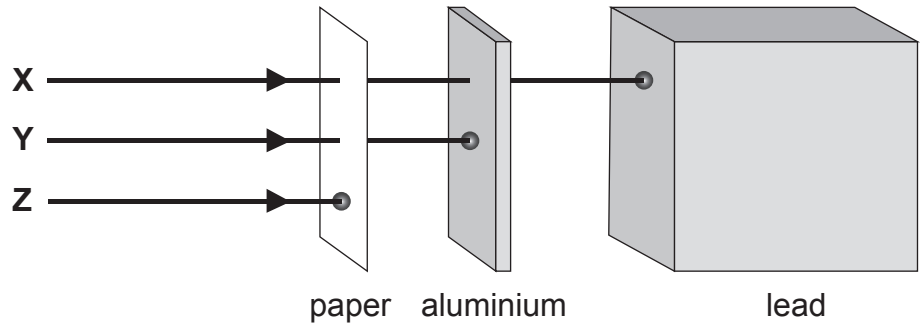
_____

_____

_____ [2]

[Turn over

9 The diagram below shows how the different types of radiation are stopped.



(a) Name the types of radiation **X**, **Y** and **Z**.

X _____

Y _____

Z _____ [2]

(b) Describe **one** use of radioactivity.

_____

_____ [1]

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1	
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Total Marks	

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