



General Certificate of Secondary Education
2024–2025

Centre Number

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Candidate Number

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Single Award Science: Physics

Unit 3
Higher Tier



[GSA32]

GSA32

THURSDAY 22 MAY 2025, 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 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.

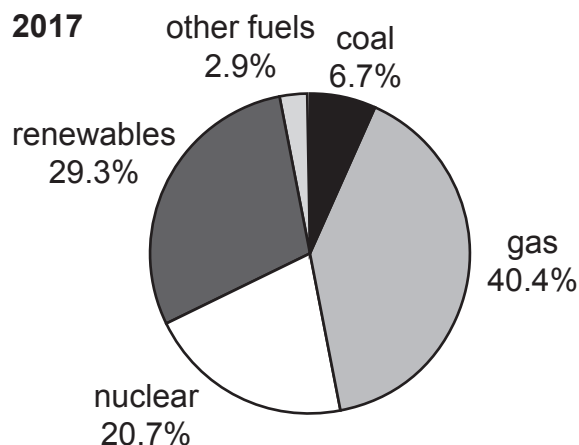
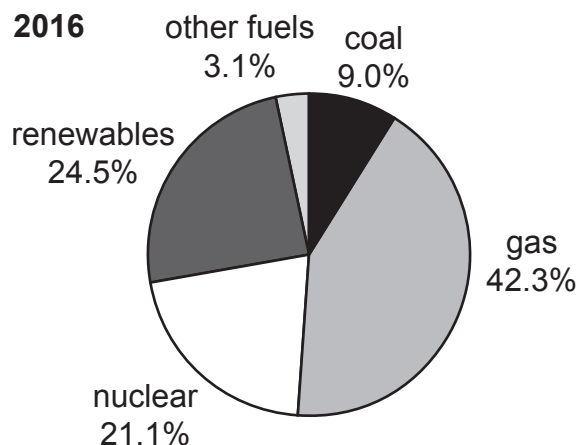
Quality of written communication will be assessed in Question 4.

14912



20GSA3201

- 1 (a) The pie charts below compare the energy sources used to make electricity in 2016 and 2017.



- (i) Which energy source **decreased** in use the most from 2016 to 2017?

_____ [1]

- (ii) Name the fossil fuel **not** shown in the pie charts.

_____ [1]

- (iii) Calculate the percentage increase in the use of renewables to generate electricity.

_____ % [1]

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

_____ [1]

- (ii) Name **one** renewable energy source.

_____ [1]



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(Questions continue overleaf)

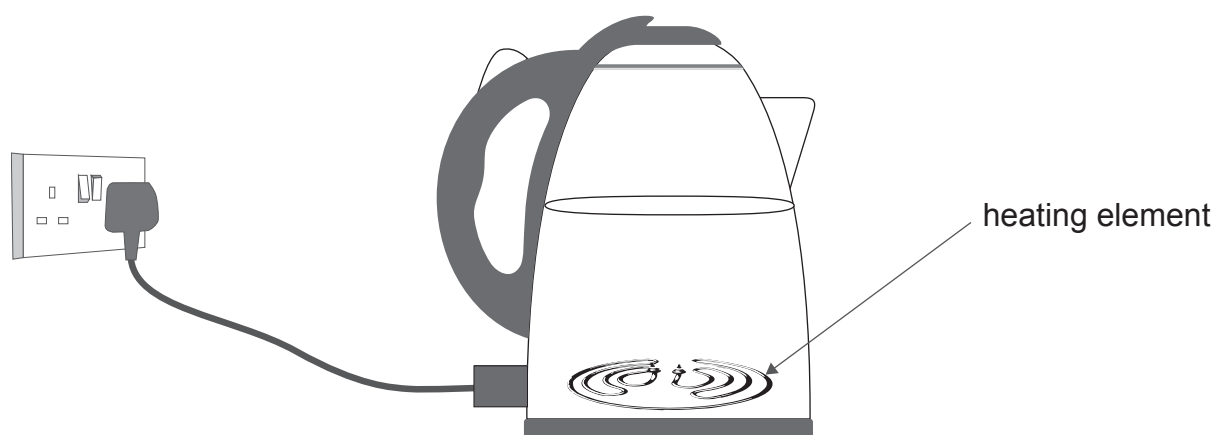
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[Turn over



20GSA3203

2 The diagram below shows the inside of an electric kettle.



(a) What method of heat transfer is used to heat all the water inside the kettle?

_____ [1]

(b) The table below shows how long a kettle took to boil different volumes of water. For each volume of water, the kettle was boiled twice within five minutes so that an average time could be calculated.

Volume of water/ ml	First time to boil/s	Second time to boil/s	Average time to boil/s
250	46	42	44
500	84	78	81
750	117	109	
1000	155	143	149
1250	208	196	202
1500	256	238	247



- (i) Calculate the average time for the kettle to boil **750 ml** of water.

Show your working out.

_____ s [2]

- (ii) Suggest why the times were shorter when the kettle was boiled for the second time.

_____ [1]

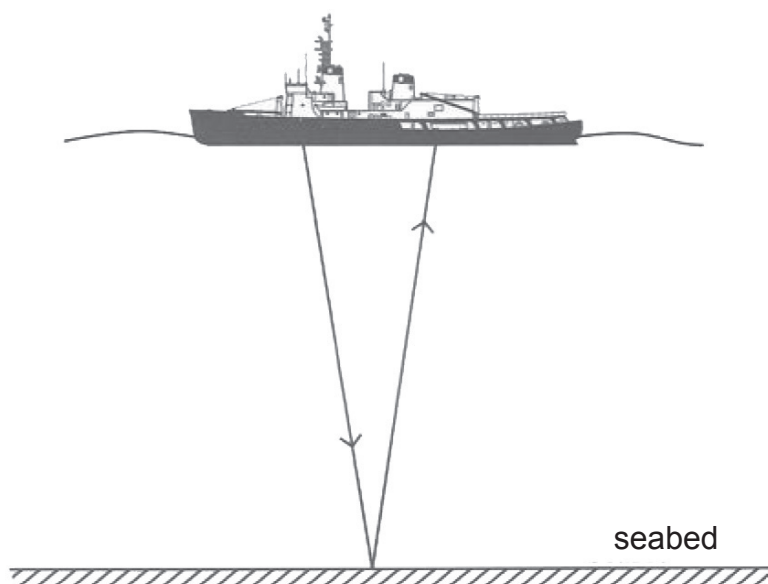
- (iii) What effect, if any, does the volume of water have on the time to boil?

_____ [1]

[Turn over



- 3 (a) The diagram below shows a ship sending out a pulse of ultrasound which is reflected from the seabed and detected 0.8 s later. Ultrasound travels at a speed of 1500 m/s through water.



- (i) What is meant by the term ultrasound?

_____ [2]

- (ii) Use the equation:

$$\text{distance} = \text{speed} \times \text{time}$$

to calculate the depth of the seabed below the ship.

Show your working out.

_____ m [3]



(b) The diagram below shows the electromagnetic spectrum.

gamma rays	X-ray	ultraviolet	visible light	infrared	microwave	radio waves
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(i) Give **one** property that is the **same** for each of these waves.

_____ [1]

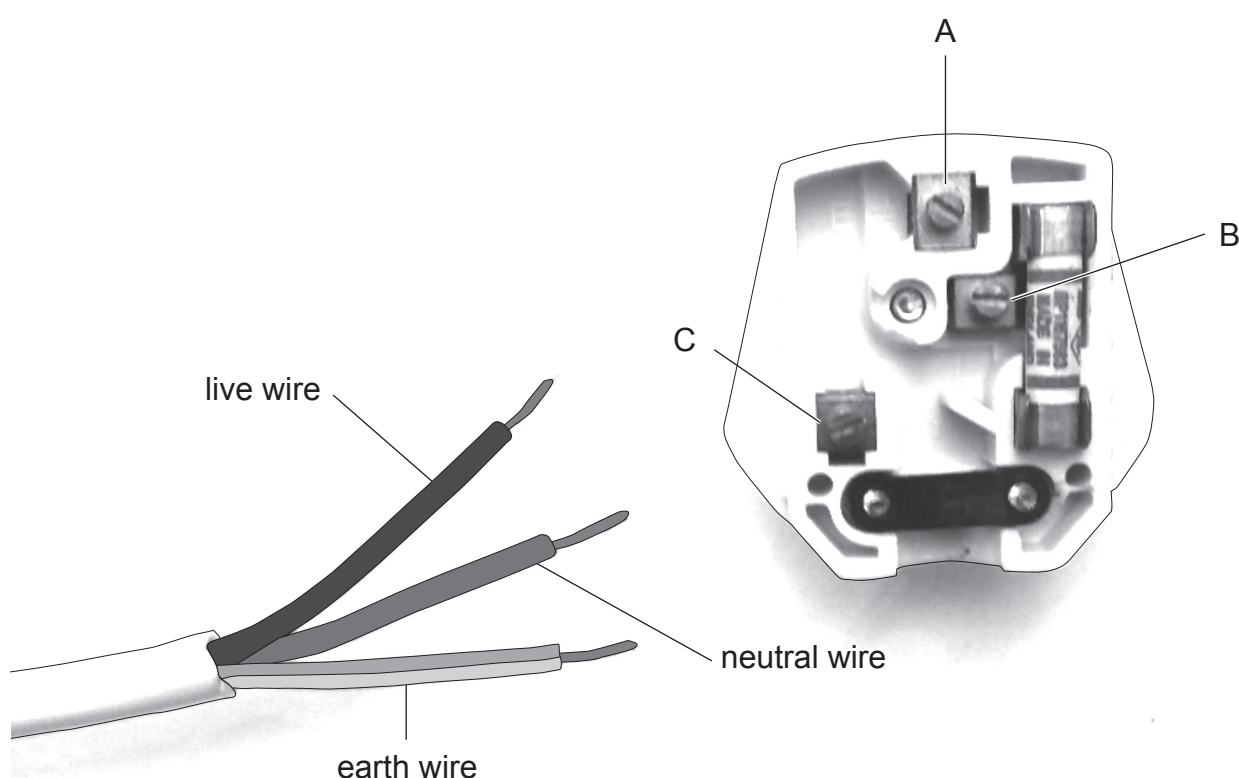
(ii) Give **one** property that is **different** for each of these waves.

_____ [1]

[Turn over



- 4 The picture below shows an open three-pin plug about to be wired.



Describe how this plug should be correctly wired.

Your answer should include:

- the names of the pins **A**, **B** and **C**;
- the colour of the wires that should be connected to each pin; and
- **two** safety features.

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



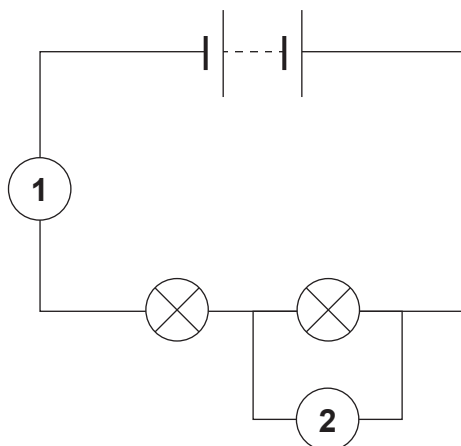


[6]

[Turn over



- 5 (a) The diagram below shows a simple electrical circuit with two identical lamps.



The battery supplies a voltage of 3 V and a current of 2 A.

- (i) Name the meters **1** and **2** shown in this circuit.

1 _____

2 _____

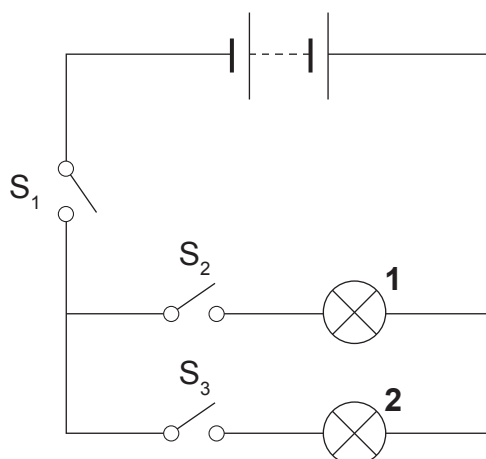
[1]

- (ii) What is the voltage across each bulb?

_____ V [1]



- (b) The diagram below shows another electrical circuit.
The battery supplies a voltage of 3 V and a current of 2 A.



- (i) What is the current flowing through each lamp when all the switches are closed?

_____ A [1]

- (ii) Which switch or switches will need to be closed to light lamp **2 only**?

_____ [1]

- (iii) Describe the effect, if any, of adding extra cells to this circuit.

_____ [2]

- (iv) Explain the difference between conventional current flow and electron flow in this circuit.

_____ [3]

[Turn over



- 6 (a) The photograph below shows strawberries packed in plastic boxes on a shop shelf. These strawberries have been irradiated before being placed on the shelf.



The table below gives information about five radioactive isotopes.

Isotope	Half-life	Radiation emitted
caesium-134	2 years	beta
cobalt-60	5 years	gamma
curium-242	160 days	alpha
strontium-90	28 years	beta
technetium-99	6 hours	gamma

- (i) Suggest which isotope would be best for a food producer to irradiate these boxes of strawberries. Explain your answer.

Isotope _____

Explanation _____

_____ [3]



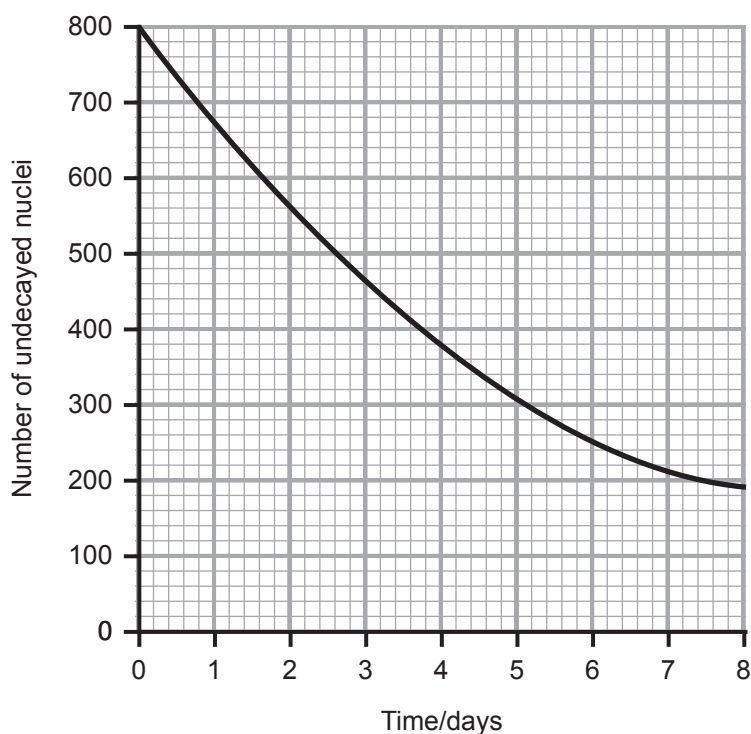
- (ii) Suggest **one** reason why some people may be concerned about irradiating food.

_____ [1]

- (iii) Suggest **one** reason why irradiating food is an advantage for shopkeepers.

_____ [1]

The graph below shows how the number of undecayed nuclei in a radioactive isotope changes with time.



- (b) Use the graph to find the half-life of this isotope.

_____ days [1]

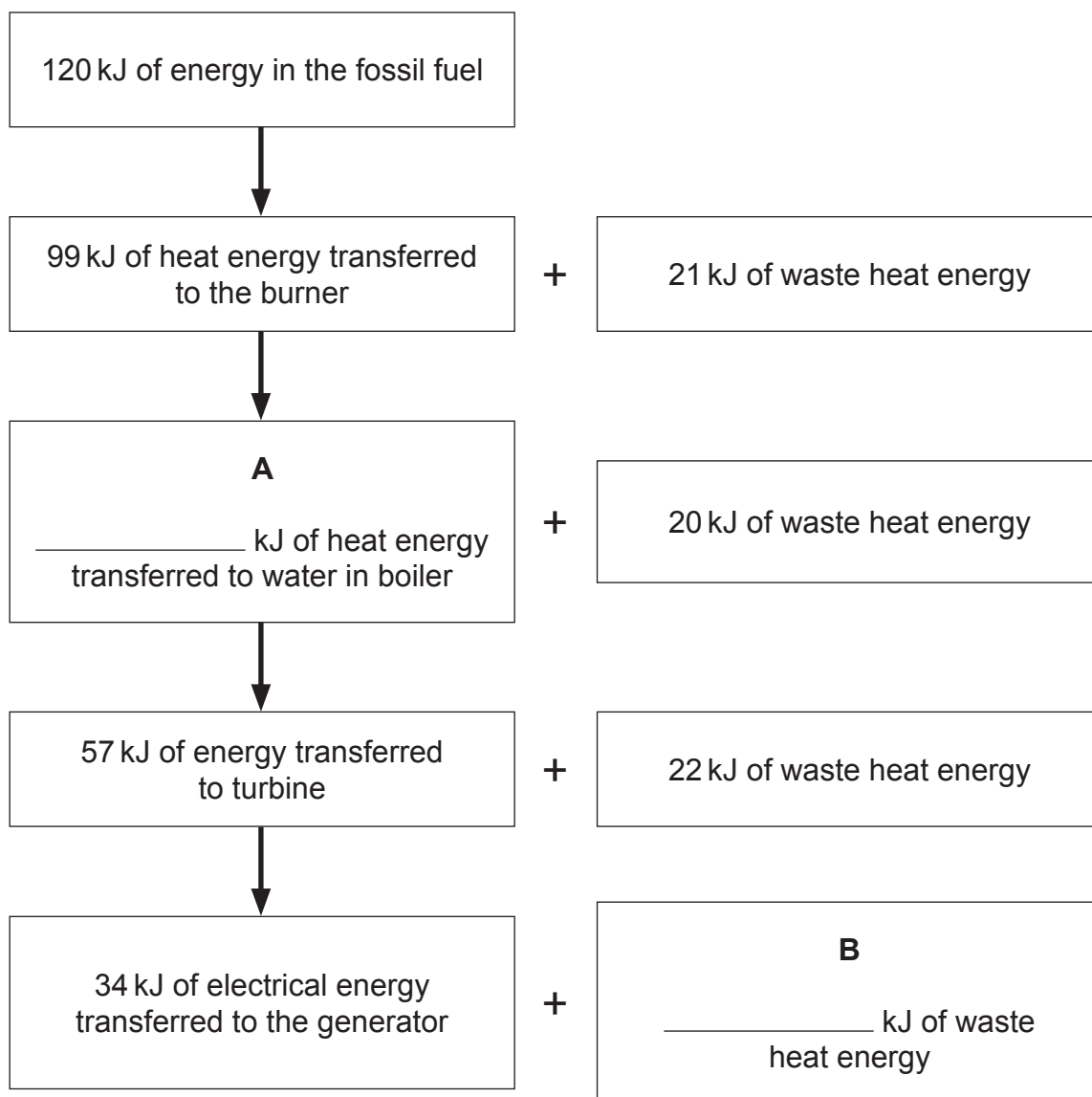
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7 (a) State the Principle of Conservation of Energy.

[1]

(b) The diagram below shows what happens when a fossil fuel is burnt in a power station.



(i) Use the Principle of Conservation of Energy to complete boxes **A** and **B** above.

[2]



(ii) Use the equation:

$$\text{efficiency} = \frac{\text{useful output energy}}{\text{total input energy}}$$

to calculate the efficiency of the power station.

Show your working out.

_____ [2]

(iii) Name the form of energy contained in fossil fuels.

_____ [1]

(iv) Name the main form of energy produced in the turbine.

_____ [1]

(c) The electricity from the generator is sent through a transformer before being distributed across the National Grid.

(i) Name this type of transformer.

_____ [1]

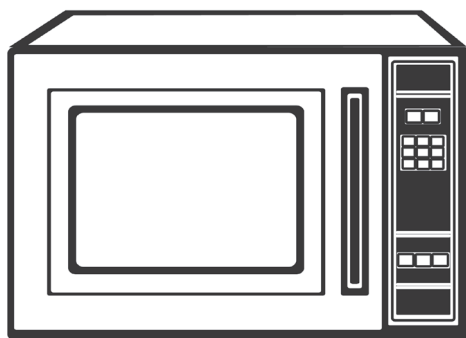
(ii) Explain why this type of transformer is used.

_____ [1]

[Turn over



8 The diagram below shows a microwave oven.

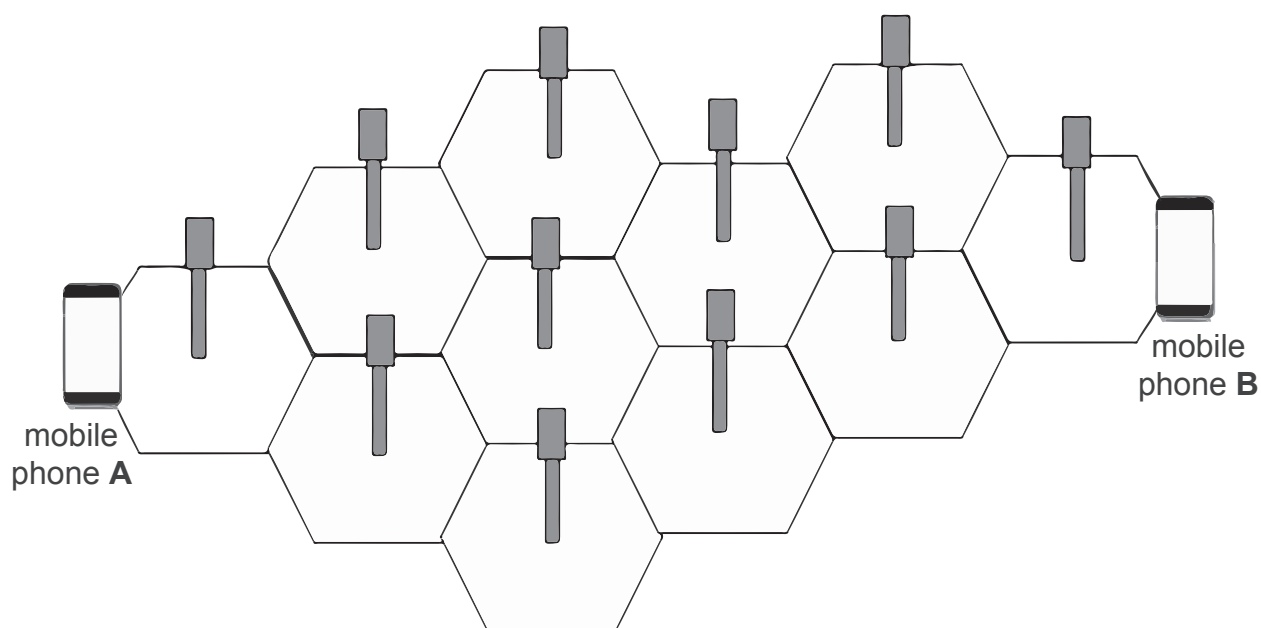


- (a) Explain the microwave heating effect in terms of energy absorption and molecular behaviour.

[3]



The diagram below shows a mobile phone network.



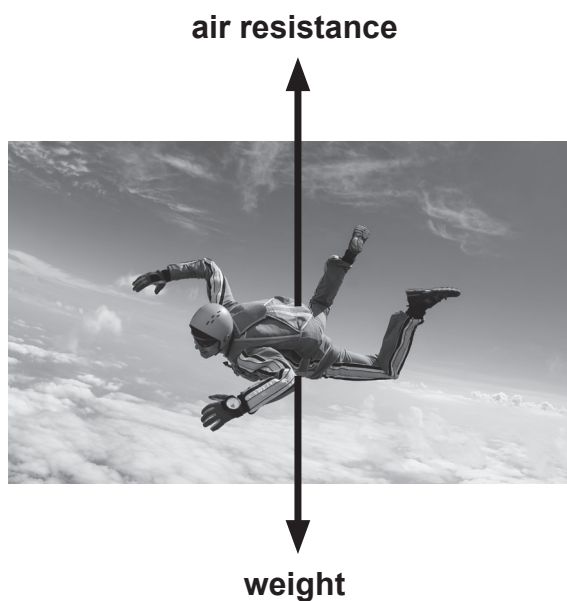
- (b) Describe how mobile phones use microwaves to send signals from phone **A** to phone **B**.

[2]

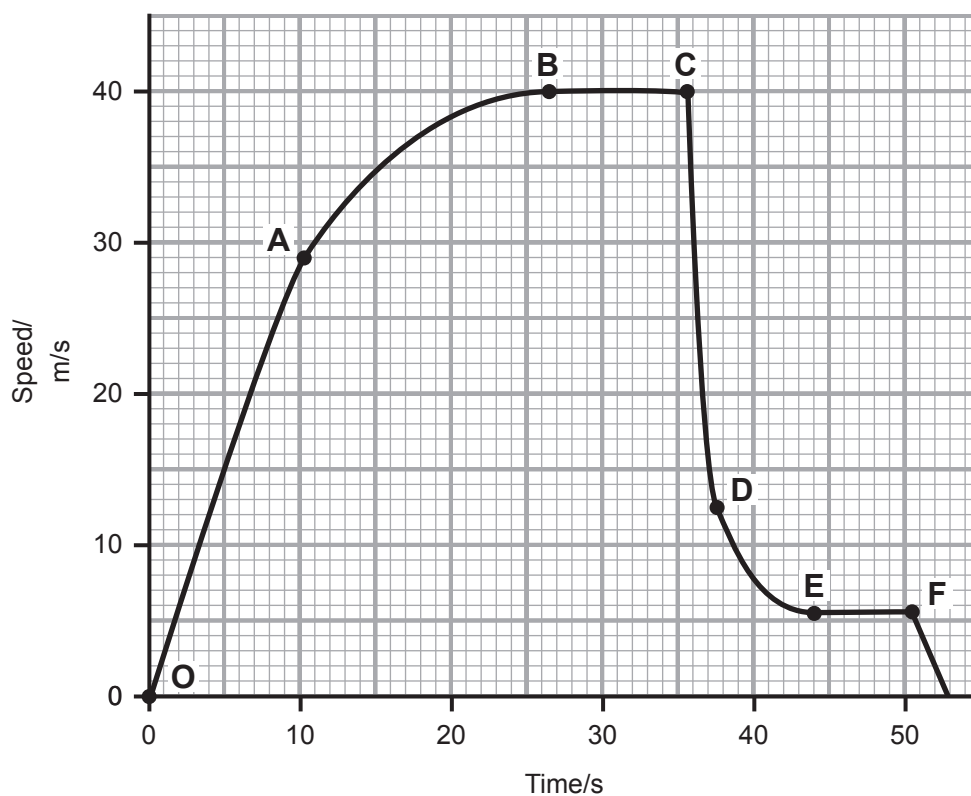
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- 9 The photograph below shows some of the forces acting on a skydiver shortly after jumping from an aeroplane.



The graph below shows how the speed of the skydiver changes during the fall.



(a) (i) During which period **OA**, **BC**, or **EF** is the skydiver accelerating?

_____ [1]

(ii) Explain, **in terms of forces**, why the skydiver is accelerating during this period.

_____ [2]

(b) During which period **AB**, **BC** or **CD** are the forces acting on the skydiver balanced?

_____ [1]

(c) At which point **B**, **C**, **D** or **E** is the parachute initially opened?

_____ [1]

(d) Describe the difference between the weight and the mass of an object. Include the units of each in your answer.

_____ [3]

THIS IS THE END OF THE QUESTION PAPER



Sources:
 Question 1(a). Chief Examiner
 Question 2 Chief Examiner
 Question 3(a). Chief Examiner
 Question 4 Chief Examiner
 Question 5(a). Chief Examiner
 Question 5(b). Chief Examiner
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Question Number	Marks
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Examiner Number

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