



Rewarding Learning

General Certificate of Secondary Education
2020–2021

Centre Number

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Candidate Number

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Single Award Science: Physics

Unit 3

Foundation Tier



[GSA31]

GSA31

FRIDAY 13 NOVEMBER 2020, 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 only. **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.

Quality of written communication will be assessed in Question **9(a)**.



- 1 (a) The names of four planets in our Solar System are given below.

Neptune

Mars

Uranus

Saturn

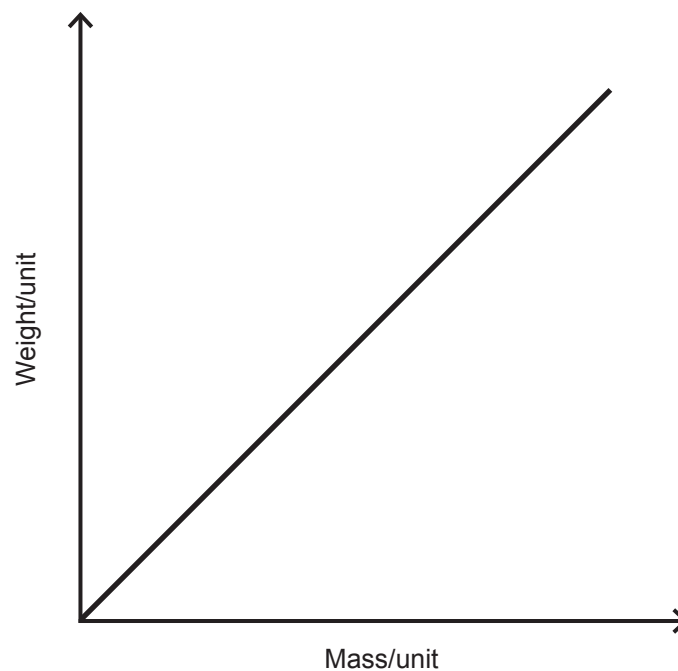
- (i) Which of these planets is described as a rocky planet?

_____ [1]

- (ii) Which of these planets is furthest from the Sun?

_____ [1]

- (b) The graph below shows the relationship between mass and weight for objects on Earth.



- (i) State the trend shown in the graph.

_____ [1]



- (ii) The measurements of mass and weight should be given with units.
Using lines, match each measurement with its unit.

Measurement

Unit

weight

kilogram

metre

mass

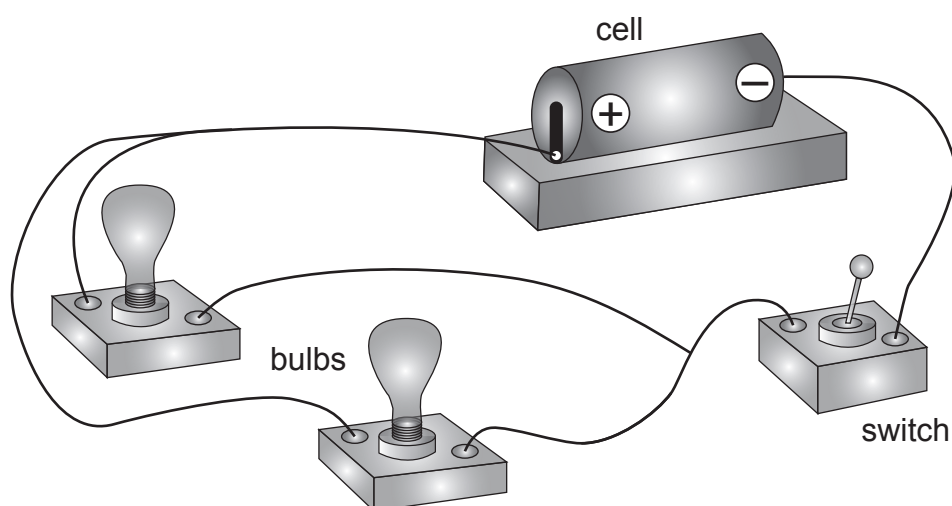
newton

[2]

[Turn over



- 2 (a) The diagram below shows a simple electric circuit.



Source: Principal Examiner

- (i) What term is used to describe how the bulbs are connected in this circuit?

Circle your answer.

series **short** **parallel** [1]

- (ii) In what way should a voltmeter be connected in the circuit to measure the voltage of the cell?

Circle your answer.

series **short** **parallel** [1]

- (iii) How many bulbs, if any, will light when the switch is closed?

_____ [1]

- (iv) Which symbol below represents the cell being used as shown in the circuit above?


A


B


C

_____ [1]



(b) In a circuit a cell provides 1.5 V and a current of 0.5 A flows.

Use the equation:

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

to calculate the resistance of the circuit.

(Show your working out.)

_____ Ω [2]

(c) Another cell is added to increase the voltage in the circuit. Complete each row of the table using a tick (✓) to show the effect, if any, of adding this extra cell.

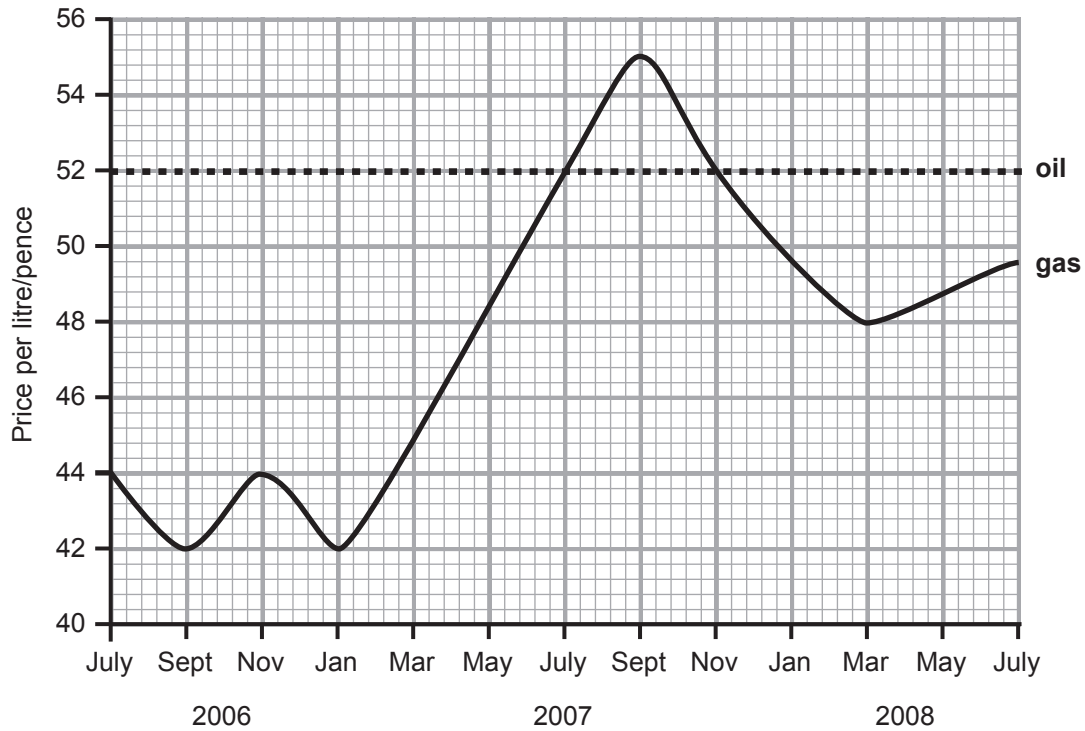
	increased	decreased	no effect
bulb brightness			
current			
bulb temperature			

[2]

[Turn over



- 3 (a) Kilroot power station can use either oil or gas to generate electricity. The graph below shows the price of both oil and gas over a two year period.



Source: Principal Examiner

- (i) Between which two months in 2007 would it have been best for the power station to use oil?

_____ to _____ [1]

- (ii) Use the graph above to calculate the maximum difference in the price of gas.

(Show your working out.)

_____ pence [2]



- (iii) Oil and gas are both described as non-renewable energy sources. What is meant by the term **non-renewable**?

[1]

- (b) The wind turbines shown in the photograph below use a renewable source of energy.



Source: Principal Examiner

- (i) Give **one** disadvantage of using wind turbines.

[1]

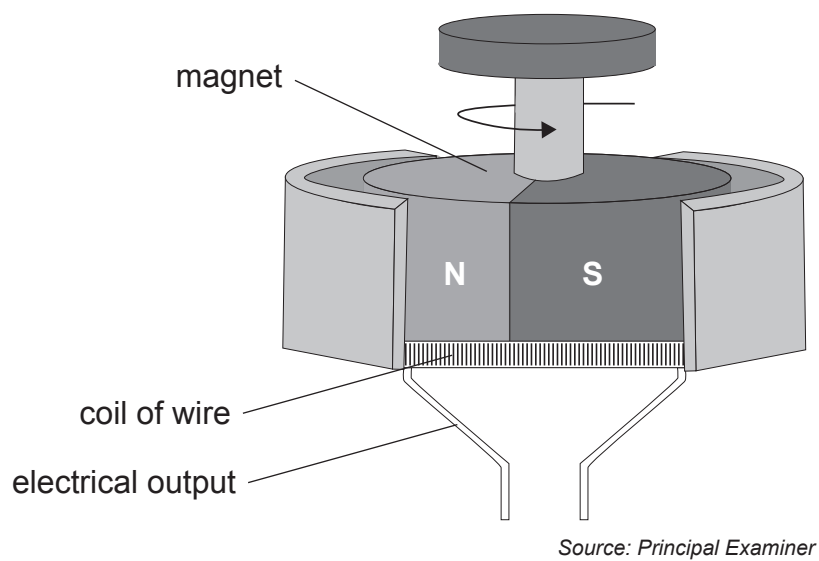
- (ii) Name **one** other renewable energy source.

[1]

[Turn over



(c) The diagram below represents a generator.



(i) Use the diagram to describe how a generator produces electricity.

_____ [1]

(ii) Suggest **one** way the amount of electricity generated could be increased.

_____ [1]





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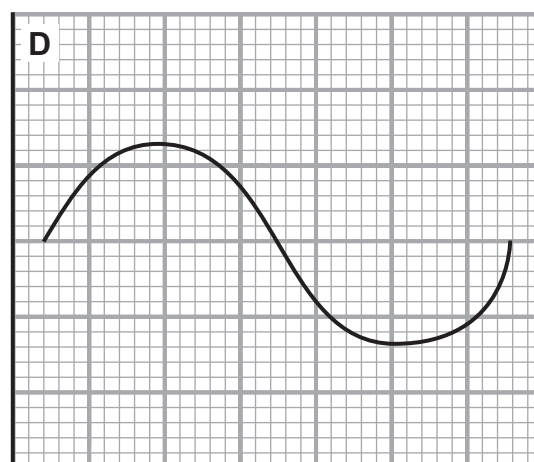
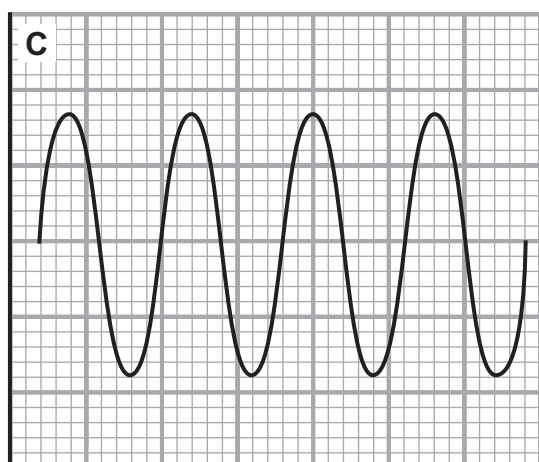
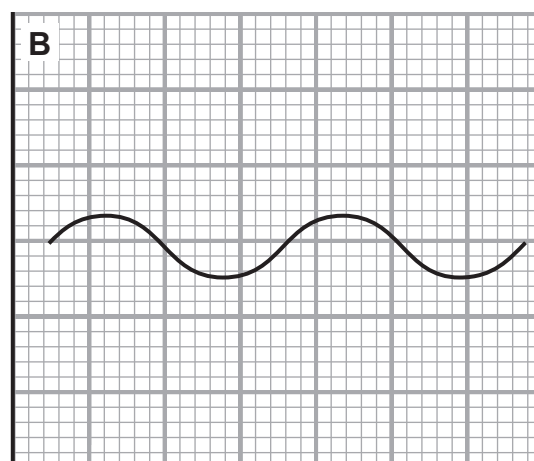
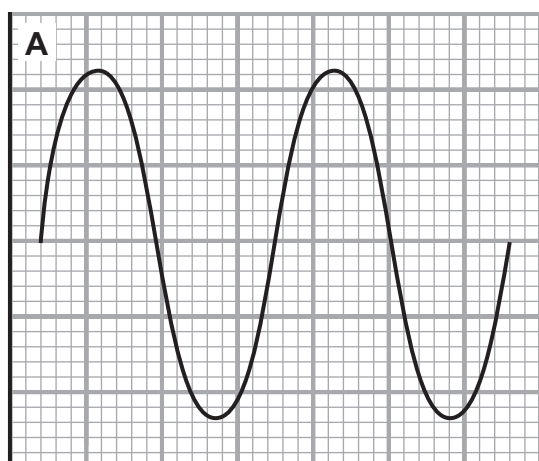
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[Turn over



24GSA3109

- 4 (a) The diagrams below represent four waves over the same length of time.



Source: Principal Examiner

- (i) Which wave (**A**, **B**, **C** or **D**) has the lowest amplitude?

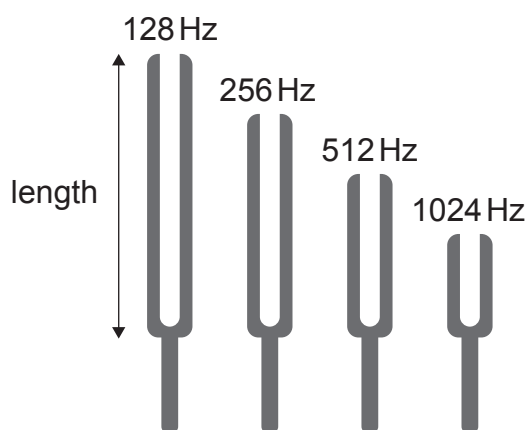
_____ [1]

- (ii) Which **two** waves (**A**, **B**, **C**, **D**) have the same wavelength?

_____ and _____ [1]



- (b) The diagram below shows how the length of a tuning fork affects the frequency of sound it produces.



Source: Principal Examiner

- (i) What conclusion can be made from this information?

_____ [1]

- (ii) Another tuning fork vibrates at a frequency of 136 Hz.

Use the equation:

$$\text{wavelength} = \frac{\text{speed}}{\text{frequency}}$$

to calculate the wavelength of the sound produced.
The speed of sound is 340 m/s.

(Show your working out.)

_____ m [2]

[Turn over]



(c) The table below gives the audible range for five animals.

Animal	Audible range
elephant	16 Hz – 12 kHz
cat	45 Hz – 64 kHz
dog	67 Hz – 45 kHz
whale	1 kHz – 123 kHz
chicken	125 Hz – 2 kHz

(i) Which of these animals can hear the **lowest** frequency?

_____ [1]

(ii) How many of these animals can hear sounds above 20 000 Hz?

_____ [1]

(iii) What name is given to sounds above 20 000 Hz?

_____ [1]



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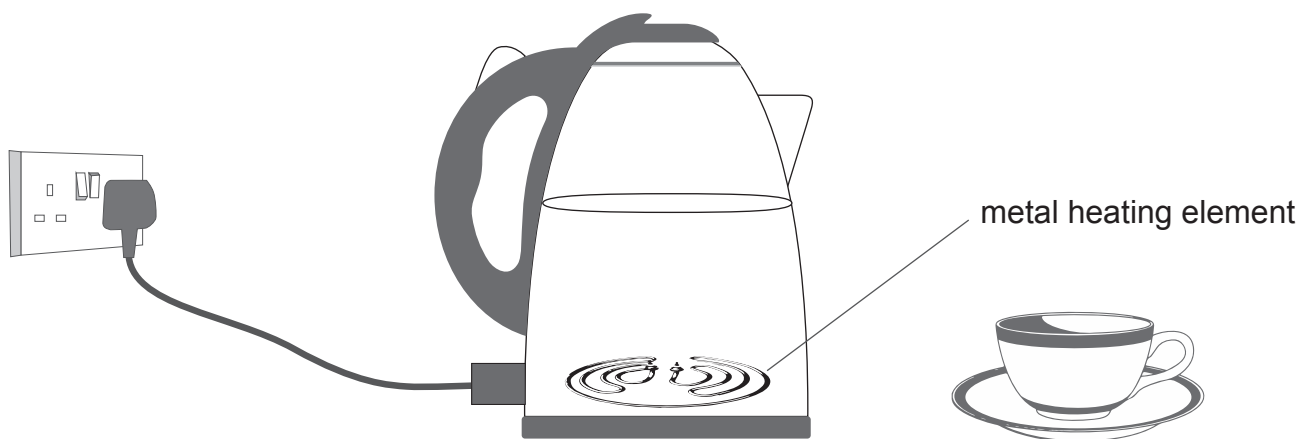
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[Turn over



24GSA3113

- 5 The diagram below shows a kettle heating water to make a cup of tea.



Source: Principal Examiner

- (a) Complete the sentences below to name the heat transfer methods involved in heating the water in the kettle.

Heat is transferred through the heating element by _____.

Heat is transferred through the water by _____. [2]



- (b) The table below shows the thermal (heat) conductivity of four metals at different temperatures.

Metal	Thermal Conductivity/W/m °C		
	25 °C	125 °C	225 °C
iron	80	68	60
copper	401	400	398
gold	310	310	310
steel	54	51	47

A student concluded:

*'As temperature increases, the thermal conductivity of **all** metals decreases.'*

- (i) Was the student's conclusion correct? Use information from the table to explain your answer.

[1]

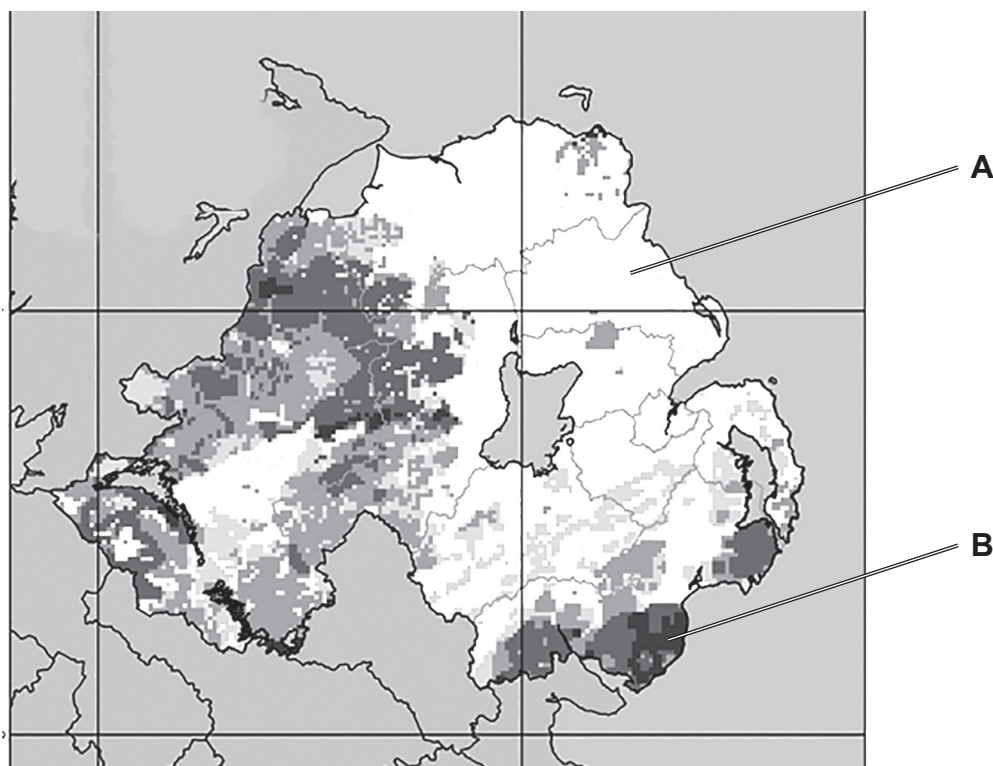
- (ii) Which of these metals would be **best** to use as the heating element in the kettle?

[1]

[Turn over



- 6 Radon gas is a source of background radiation. The map below shows how radon levels vary across Northern Ireland. The darker the area, the higher the level of radon.



Public Health England © Crown copyright and British Geological Survey
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- (a) Explain fully why there may be more of a risk to health by living in area **B** rather than area **A**.

[2]



(b) (i) What is meant by the term **background radiation**?

[1]

(ii) Radon gas is a natural source of background radiation. Name **one** man-made source of background radiation.

[1]

(c) Bananas grown in Africa can be treated with radiation before they are transported to Northern Ireland.

(i) Name the type of radiation used to treat the bananas.

[1]

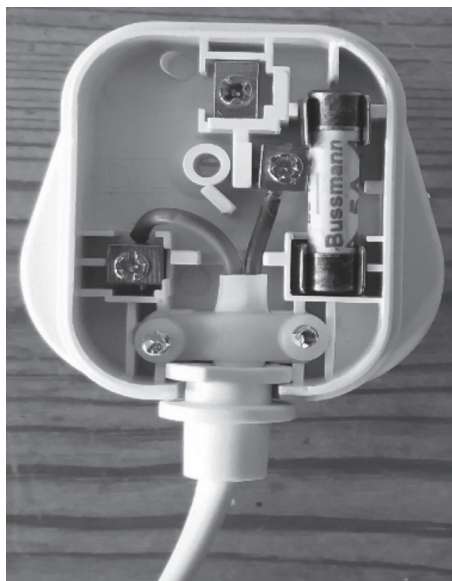
(ii) Explain fully why bananas are treated with radiation before being transported long distances.

[2]

[Turn over



- 7 (a) The photograph below shows a 3-pin plug used to connect a fan to the mains. The fan has double insulation.



Source: Principal Examiner

- (i) Explain what is meant by the term **double insulation**.

[2]

- (ii) Name the wire that is **not** needed because the fan is double insulated.

[1]



- (b) (i) The fan uses 2.3 kW of power and is connected to the 230 V mains electricity supply.

Use the equation:

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

to calculate the current being used by the fan.

(Show your working out.)

_____ A [2]

- (ii) Which fuse should be used in the plug of this fan?

Circle your answer.

1 A

3 A

5 A

13 A

30 A

[1]

- (iii) Name the wire connected to the fuse in a plug.

_____ [1]

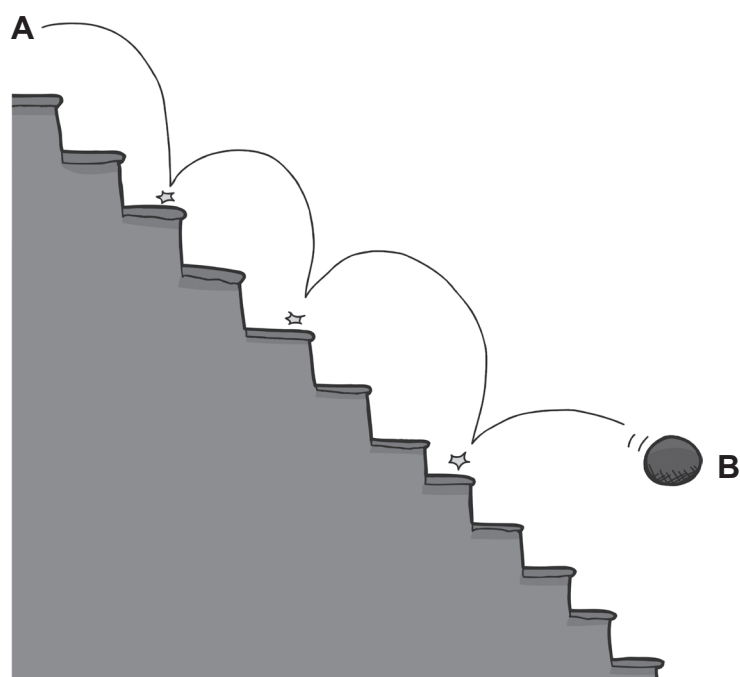
[Turn over



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

[2]

(b) The diagram below shows a ball bouncing down a staircase. It started from rest at position A.



© Getty Images



- (i) Complete the table below by adding ticks (✓) to show the form(s) of energy at positions **A** and **B**.

	Potential energy	Kinetic energy
A		
B		

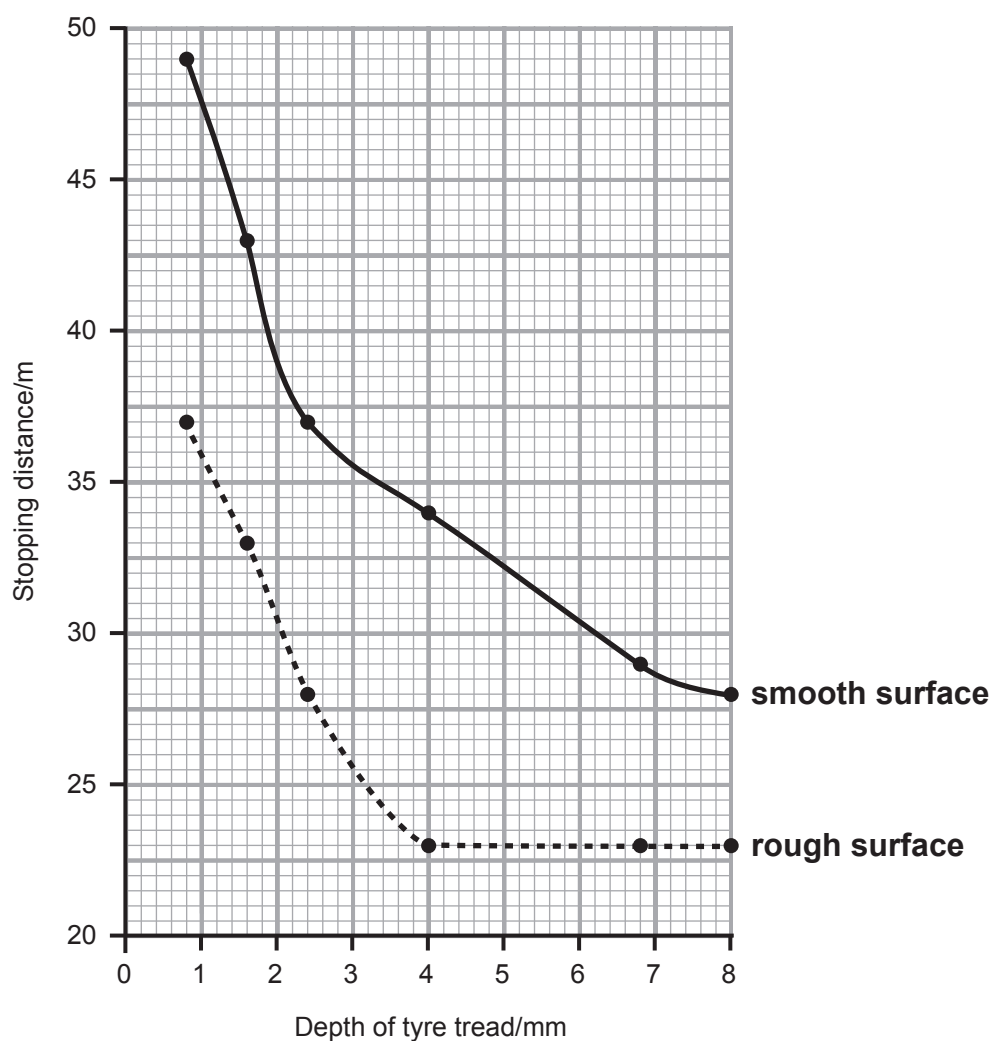
[2]

- (ii) Name **one** form of energy that is wasted as the ball bounces down the staircase.

[1]



- 9 The graph below shows how stopping distance for a car is affected by the depth of the tyre tread on two different road surfaces.



Source: Principal Examiner

- (a) Describe and explain how the depth of tyre tread and road surface affect stopping distance and how this is important for road safety.

Your answer should include:

- conclusions that can be made from this graph;
- a definition of friction;
- a link between friction and stopping distance; and
- a link between stopping distance and road safety.



[illegible]

(b) Complete the sentences below to show the effect, if any, of driving on a wet road compared to a dry road.

[2]

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

Total Marks	
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Examiner Number

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