cea
Rewarding Learning

General Certificate of Secondary Education
2017–2018

Double Award Science: Physics

Unit P1
Foundation Tier

[GSD31]

FRIDAY 23 FEBRUARY 2018, 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.
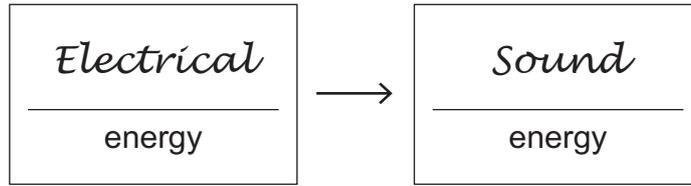Quality of written communication will be assessed in Question **8(a)**.

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

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1   A loudspeaker changes electrical energy into sound energy.

Electrical energy	→	_Sound_ energy

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Complete the boxes below to describe the **main** energy change each device brings about.

(i)   Microphone

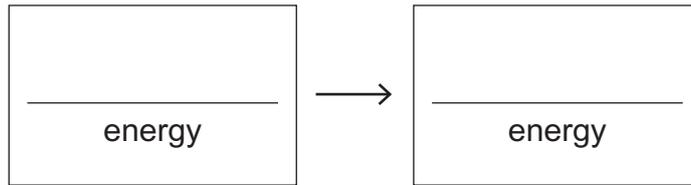| _____ energy	→	_____ energy

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[2]
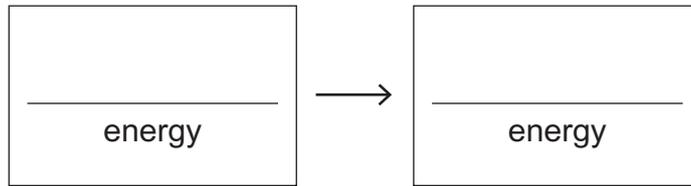
(ii)   Candle

_____ energy	→	_____ energy

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[2]

(iii) Falling ball

_____ energy	→	_____ energy

ground

[2]

11470   **3**   **[Turn over**
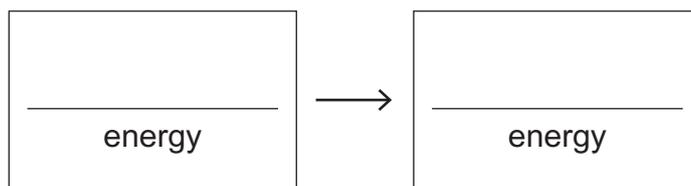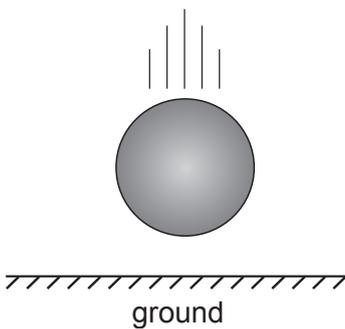
2 The energy resources shown below are either **renewable** or **non-renewable**.

coal	**hydroelectric**	**gas**
wave	**oil**	**wind**

(a) (i) List the **renewable** energy resources.

1. _____

2. _____
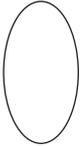
3. _____ [3]

(ii) Name the two fuels from the list that would cause greatest pollution of the atmosphere.

_____ and _____ [2]

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A car jack is used to raise a car so that the wheel can be changed.
The useful work done in lifting the car is 1200 J.

(b) (i) When using the car jack, the mechanic uses 3000 J of energy to lift the car.
Calculate the efficiency of the car jack.

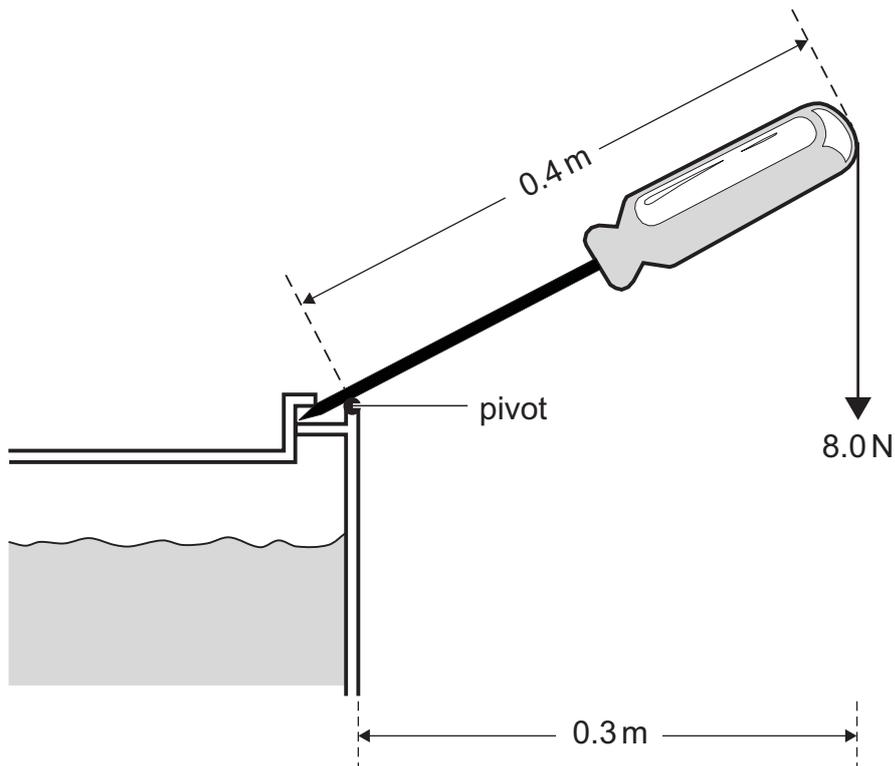**You are advised to show your working out.**

Efficiency = _____ [3]

(ii) What fraction of the input energy is wasted?

_____ [1]

5

[Turn over

3   The diagram shows a screwdriver being used to open a tin of paint.
The force exerted by the painter is 8.0 N.

0.4 m

pivot

8.0 N

0.3 m

(i)   Calculate the moment of the 8.0 N force about the pivot.
Remember to include the unit.

You are advised to show your working out.

Moment = _____ [4]

(ii)   Tick (✓) the correct box to indicate the direction of the moment
produced by the 8.0 N force.

Clockwise ☐
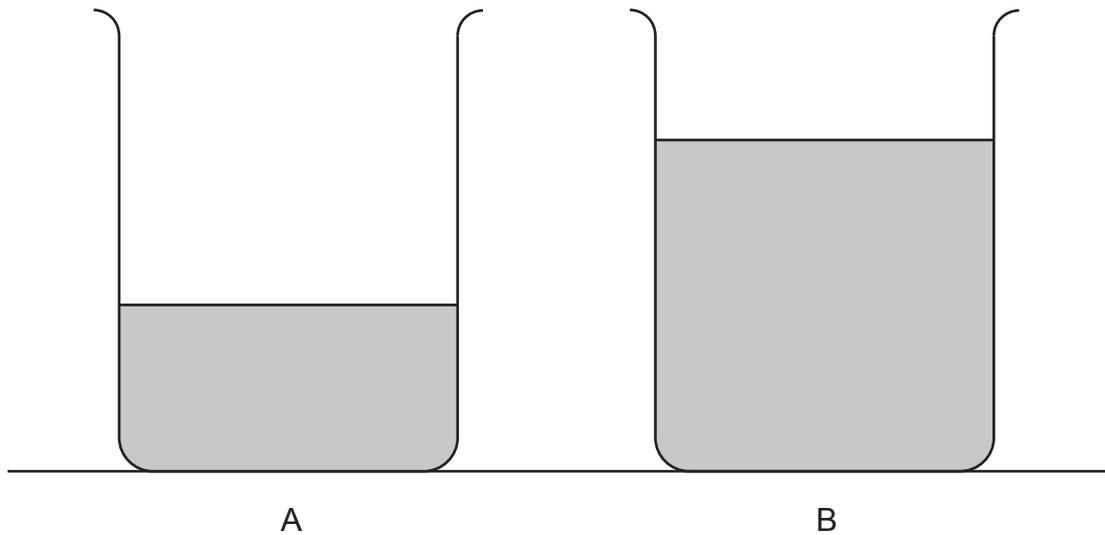
Vertically downwards ☐

Anticlockwise ☐   [1]

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4 Two beakers, A and B, are identical. One contains twice as much water as the other.

A   B

(a) (i) Which beaker is the more stable? Place a tick (✓) in the correct box.

A is more stable ☐

B is more stable ☐

A and B are equally stable ☐ [1]

(ii) Give a reason for your answer.

_____ [1]

Consider beaker B. A liquid (water) is contained in the solid (glass) beaker with a gas (air) surrounding it.

(b) Answer solid, liquid, or gas in the following.

In which substance are the molecules arranged closely together but able to change places with neighbouring molecules?
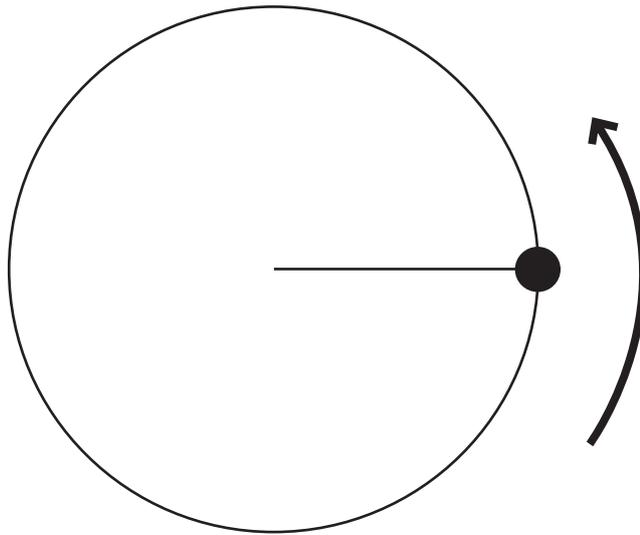
_____

In which substance are the molecules furthest apart?

_____ [2]

Examiner Only
Marks Remark

5 A steel ball is whirled on a string in a horizontal circle. The tension in the string keeps the ball moving in a circle in this particular case.

(a) What is the general name given to the force which keeps an object moving in a circle?

_____ [1]

(b) The steel ball has a mass of 0.5 kg and at a particular instant a velocity of 4.0 m/s.
Calculate the momentum of the steel ball.

You are advised to show your working out.

Momentum = _____ kg m/s [3]

6 Robert, whose mass is 70 kg, runs up a flight of stairs.

3.5 m

© DragonImages / iStock / Thinkstock

(i) State Robert's weight in newtons.

You are advised to show your working out.

Weight = _____ N [2]

(ii) The vertical height of the stairs is 3.5 m.
Calculate the work done by Robert.

You are advised to show your working out.

Work done = _____ J [3]

(iii) The time taken by Robert to run up the stairs is 5.0 s.
Use your answer to part **(ii)** to calculate the power developed by Robert.

You are advised to show your working out.

Power = _____ W [3]

[Turn over

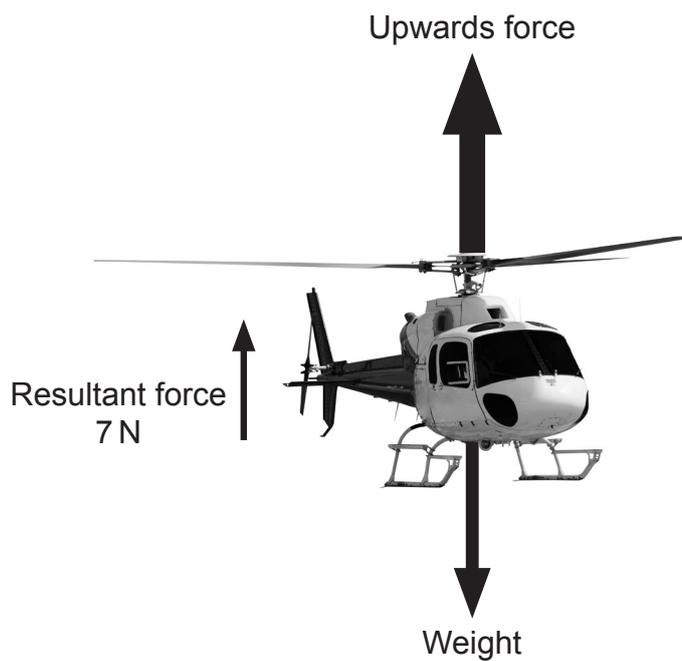**7** A remote-controlled toy helicopter, of mass 2.0 kg, accelerates upwards at 1.5 m/s^2.

(a) Calculate the resultant force acting on the helicopter.

You are advised to show your working out.

Resultant force = _____ N [3]

The resultant force on a different helicopter is 7 N. The helicopter has a weight of 25 N.

Upwards force

Resultant force
7 N

Weight

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10

(b) (i) Is the upwards force greater than, less than or equal to the weight of the helicopter? Indicate your answer below by ticking (✓) the correct box.

Greater than ☐

Less than ☐

Equal to ☐ [1]

(ii) Calculate the total upwards force on this helicopter.

Upwards force = _____ N [1]

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8 **(a)** Describe an experiment you would carry out to measure the density of olive oil.

In your description you should include:

- the apparatus used;
- the measurements you take;
- the formula you would use to find the density;
- a precaution you would take to ensure an accurate result.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [6]

Water was poured into a measuring cylinder, up to the mark shown.
Metal pieces of total mass 50 g were dropped into the water and the level rose.

cm³		cm³
—100		—100
—90		—90
—80		—80
—70		—70
—60		—60
—50		—50
—40		—40
—30		—30
—20		—20
—10		—10

water only   water and
                    metal pieces
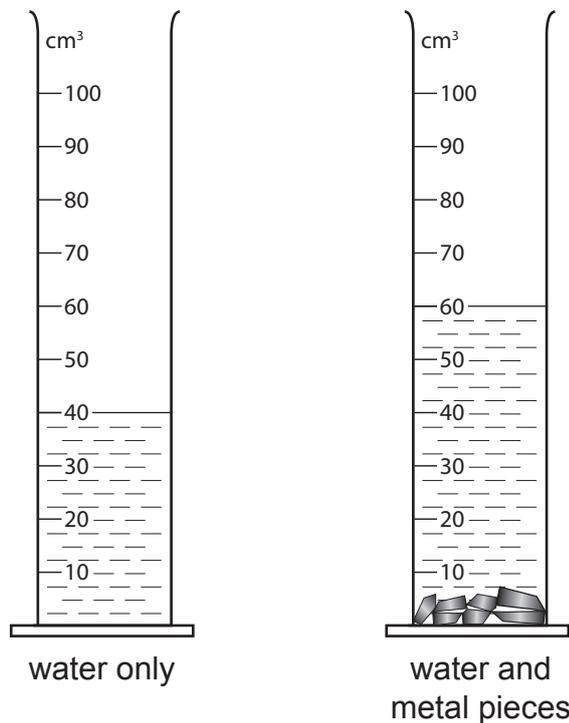
(b) (i) What is the volume of the metal pieces?

Volume = _____ cm³ [1]

(ii) Calculate the density of the metal.

You are advised to show your working out.

Density = _____ g/cm³ [2]

9 **(a)** An atom is made up of protons, neutrons and electrons.
Complete the table below to show the relative electrical charge and the location of each particle.
Two of the boxes have already been done for you.

Particle	Relative electrical charge	Location in the atom
Proton	$+1$	in the nucleus
Neutron		
Electron		

[4]

(b) Historically, two theories have been put forward to describe atomic structure.

Give the name of:

(i) the current theory

_____ [1]

(ii) the older theory

_____ [1]

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Examiner Only

Marks	Remark

Nuclear reactors are used in power stations to release energy through nuclear fission.

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(c) (i) Name two fuels commonly used in fission nuclear reactors.

1. _____

2. _____ [2]

(ii) Give the name of the particle which must be absorbed by a nucleus to start nuclear fission.

Particle = _____ [1]

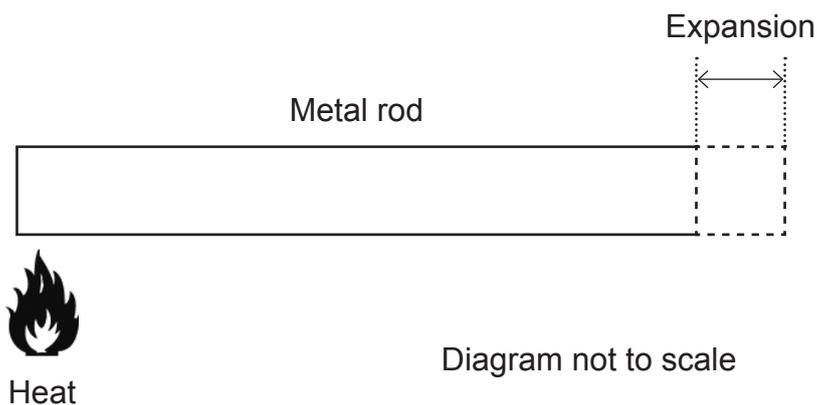**(iii)** Give one way a worker in a nuclear power station can reduce the dangers of radiation.

_____ [1]

[Turn over

10 A student carries out an investigation into the expansion of a metal rod as it is heated.

Expansion

Metal rod

Diagram not to scale

Heat

He measures the expansion. He predicts that the expansion of the metal rod is proportional to the temperature rise of the metal rod.

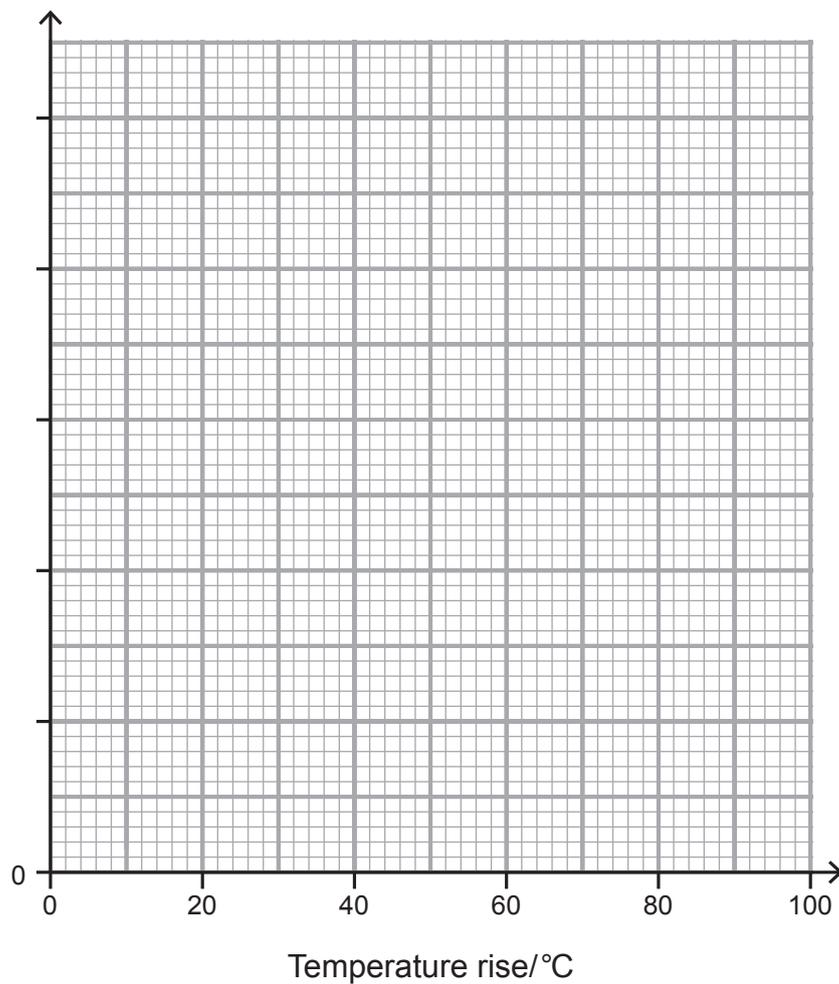The data he obtains is shown in the table below.

Temperature rise/°C	0	20	40	60	80	100
Expansion/mm	0.0	0.5	1.0	1.5	2.0	2.5

You are asked to plot a graph of Expansion (vertical axis) against Temperature rise.

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

(ii) Plot a graph of Expansion versus Temperature rise. [2]

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

Marks	Remark

Temperature rise/°C

(iv) Does the graph support the student's prediction?

YES   or   NO

Circle the correct answer.

Explain your answer.

_____

_____ [2]

(v) The length of the rod at 0 °C is 800 mm.
Find the length of the metal rod when the temperature rise is 56 °C.
Give your answer correct to one decimal place.

You are advised to show your working out.

Length = _____ mm [3]

THIS IS THE END OF THE QUESTION PAPER

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