New Specification

CCEa
Rewarding Learning

General Certificate of Secondary Education
2017–2018

Double Award Science
Physics

Unit P1

Foundation Tier

MV18

[GDW31]

WEDNESDAY 23 MAY 2018, AFTERNOON

Time

1 hour, plus your additional time allowance.

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 on blank pages.
Complete in black ink only.
Answer **all nine** questions.

Information for Candidates

The total mark for this paper is 60.
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **7**.

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1 **(a)** State the main type of energy in the following.

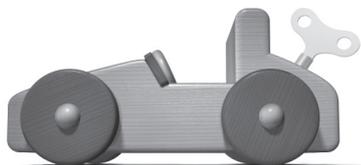**(i)** The energy from a loudspeaker.   [1 mark]

_____ energy

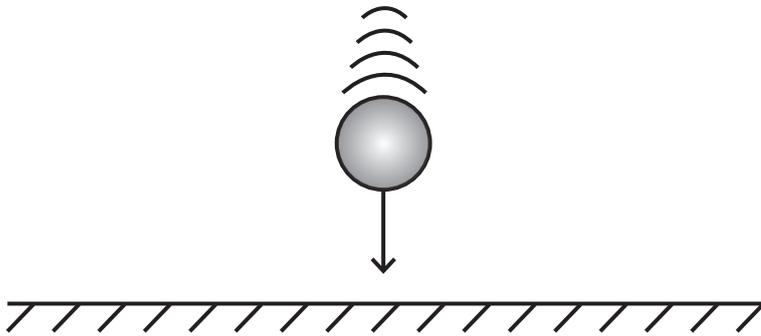**(ii)** The energy in a bowl of cereal.   [1 mark]

_____ energy

(iii) The energy in a wound up spring in a toy car.
[1 mark]

_____ energy

(b) A ball falling through the air has two types of energy. State the two types.   [2 marks]

_____ energy

and _____ energy.

2 **(a)** Explain what is meant by a renewable energy resource.
[1 mark]

_____

_____

(b) For each energy resource in the table below place a
tick (✓) to indicate whether the resource is renewable or
non-renewable.   [4 marks]

Energy resource	Renewable	Non-renewable
Sunlight		
Natural gas		
Geothermal heat		
Nuclear		

(c) (i) Machines use energy to do work.

Which of the equations below is the **best** to calculate
the efficiency of a machine? Tick (✓) your choice.
[1 mark]

$$\text{efficiency} = \frac{\text{total output energy}}{\text{energy in}}$$ ☐

$$\text{efficiency} = \frac{\text{energy in}}{\text{useful output energy}}$$ ☐

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

(ii) An electric light bulb uses 120 J of electrical energy.
It produces 24 J of light energy.
Calculate the efficiency of the light bulb.   [2 marks]

You are advised to show your working out.

Efficiency = _____

5   **[Turn over**

3 **(a)** An object has a mass of 900 g. By first finding its mass in kg, calculate its weight.   [3 marks]

You are advised to show your working out.

Weight = _____ N

(b) An object falls from rest.
What is the speed of the object 3 seconds later if there is no air resistance?   [1 mark]

Speed = _____ m/s

(c) An object falls from **rest** and reaches a speed of 28 m/s. Calculate the object's average speed.   [3 marks]

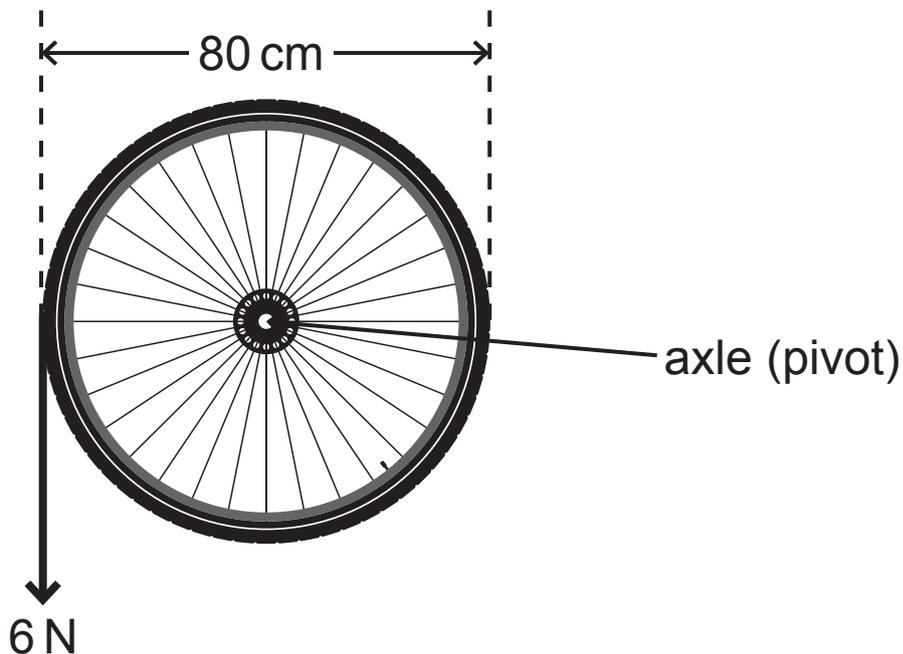**You are advised to show your working out.**

Average speed = _____ m/s

(d) Sometimes it is necessary to calculate the rate of change of speed of an object as it falls.

In the space below write, **in words**, the equation for rate of change of speed and give the unit in which it would be measured.   [2 marks]

Rate of change of speed =

Unit =

4 A wheel has a diameter of 80 cm.
The wheel is turned by exerting a downward force of 6 N as shown.

axle (pivot)

6 N

  (i) Calculate the moment, in Ncm, exerted by the 6 N force about the axle (pivot).   [3 marks]
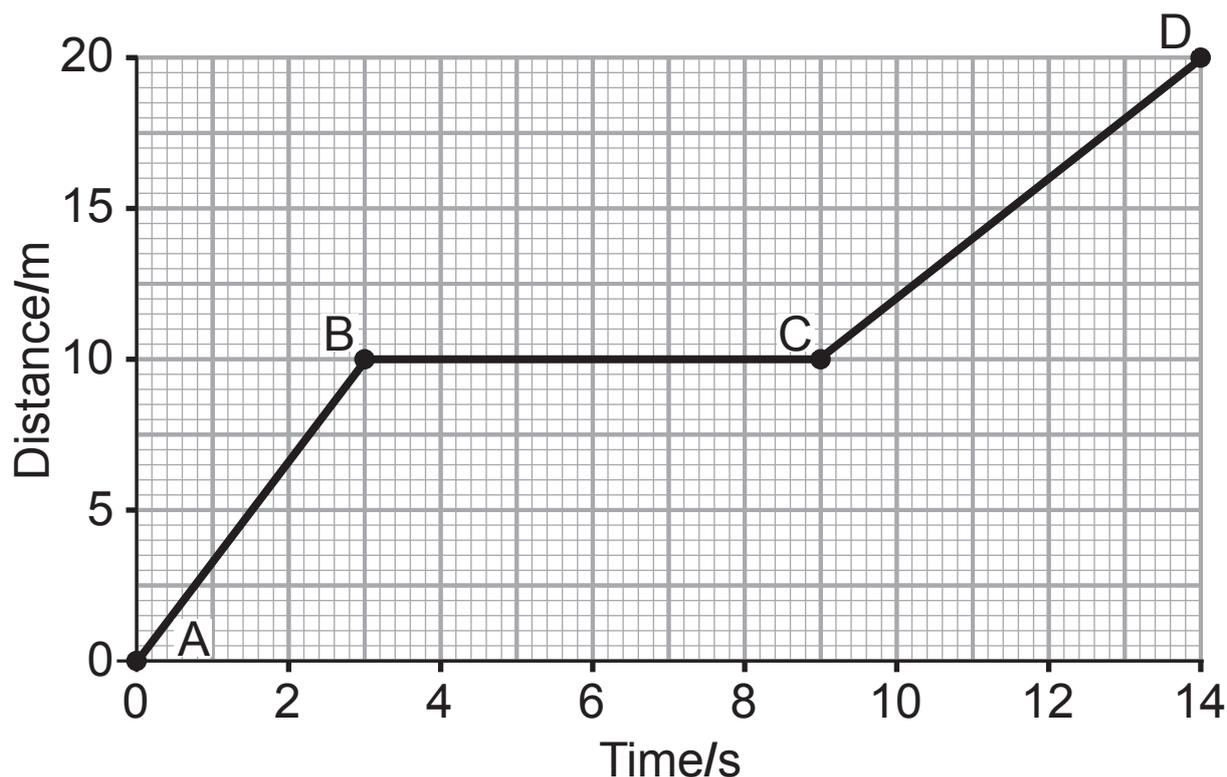
  You are advised to show your working out.

Moment = _____ Ncm

  (ii) Give the direction of the moment.   [1 mark]

Direction = _____

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(Questions continue overleaf)

9

5 A distance-time graph for a cyclist is shown.

(a) (i) Describe the motion of the cyclist during BC.
[1 mark]

_____

(ii) During which region is the speed of the cyclist greatest? [1 mark]
Choose your answer by ticking (✓) the correct box.

Speed is greatest during   AB ☐

BC ☐

CD ☐

(iii) State the distance travelled in the following time intervals.   [2 marks]

Distance travelled in the first 3 seconds

_____ m

Distance travelled in the first 9 seconds

_____ m

(b) Calculate the speed of the cyclist during the first 3 seconds of her journey.   [3 marks]

Give your answer to one decimal place.

You are advised to show your working out.

Speed = _____ m/s

6 **(a)** The nucleus of an element, X, may be written as shown below.

$$^{A}_{Z}X$$

A and Z are numbers. What are the numbers called?
[2 marks]

A is the _____ number.

Z is the _____ number.

The following incomplete sentence describes radioactive decay. Complete the sentence by filling in the blank spaces. [4 marks]

(b) A nucleus decays because it is _____

and so emits _____ or

_____ particles or _____

radiation.

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A radioactive substance has 8400 **undecayed** particles and 90 minutes later 7350 particles have decayed.

(c) By first finding the number of **undecayed** particles after 90 minutes, calculate the half-life of the substance.
[3 marks]
You are advised to show your working out.

Half-life = ＿＿＿＿＿＿ minutes

13

[Turn over

7 Describe the structure of the atom.   [6 marks]

In your answer state:

- the names of the particles which make up the atom;
- where these particles are located.

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

_____

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(Questions continue overleaf)

15

[Turn over

8 A gardener pushes a lawnmower with an average force of 9 N.

By the time the lawn is mowed the gardener has walked a total distance of 600 m.

(a) Calculate the work done.   [3 marks]

You are advised to show your working out.

Work done = _____ J

On another occasion he did 72 000 J of work and took 15 **minutes** to complete the job.

(b) Calculate the power developed.   [4 marks]

You are advised to show your working out.

Power = _____ W

9 A mountaineer wears snow shoes.

The snow shoes prevent her from sinking into the snow.

(i) Explain fully, in terms of pressure, why this is so.
[2 marks]

_____

_____

_____

The mountaineer wears snow shoes of total area $0.5\,\text{m}^2$ and exerts a pressure on the snow of 1800 Pa.

(ii) Calculate the weight of the mountaineer.   [3 marks]

You are advised to show your working out.

Weight = _____ N

THIS IS THE END OF THE QUESTION PAPER

SOURCES

Q1a. Loudspeaker © igorrita / iStock / Thinkstock
Q1a. Cereal © etienne voss / iStock / Thinkstock
Q1a. Toy car © mrincredible / istock / Thinkstock
Q4. Bicycle wheel © lekkjustdoit / iStock / Thinkstock
Q8. Man mowing lawn © KatarzynBialasiewicz / iStock / Thinkstock
Q9. A mountaineer wears snow shoes © wojciech_gajda / iStock / Thinkstock

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