cea *Rewarding Learning*

General Certificate of Secondary Education
2016 – 2017

Double Award Science: Physics

Unit P1

Foundation Tier

MV18

[GSD31]

WEDNESDAY 24 MAY 2017, 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.
Complete in black ink only.
Answer **all ten** questions.

Information for Candidates

The total mark for this paper is 70.
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 **9(a)**.

1 A student uses her mobile phone.
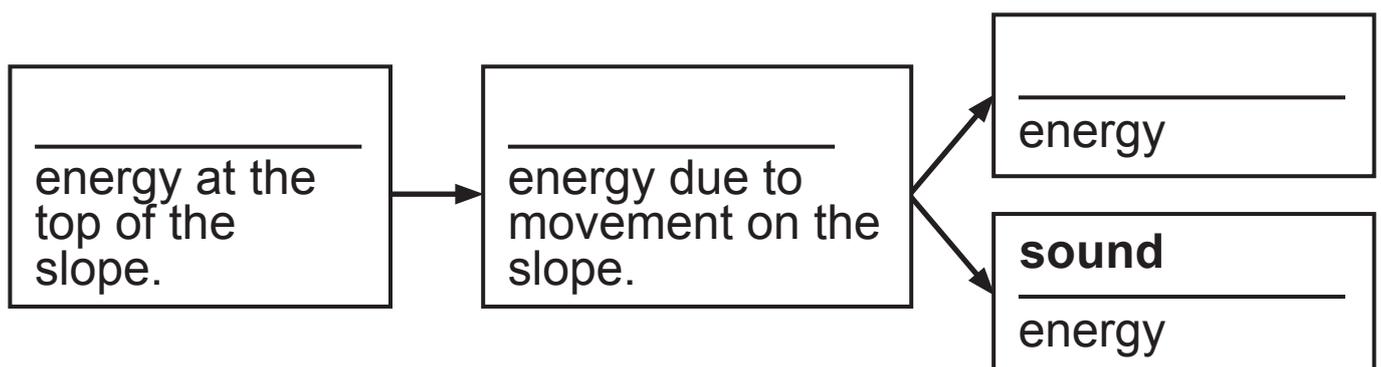

(a) Name two **useful** types of energy produced by the mobile phone.   [2 marks]

Useful: 1. _____ 2. _____

A sledge runs from rest down a slope.

(b) Complete the energy transfer diagram to show the energy changes that take place.   [3 marks]

_____ energy at the top of the slope.	→	_____ energy due to movement on the slope.	→	_____ energy
			↘	**sound** energy

2 A student wants to find the average speed of his friend as he rides in a straight line from point A to point B.

A   B

(i) What two measurements would the student have to make to allow him to calculate the average speed? In each case give the name of the measuring instrument used. The instruments should be available in a school laboratory.   [4 marks]

Measurement 1 _____

Instrument used _____

Measurement 2 _____

Instrument used _____

(ii) In the box below, write the equation, **in words**, which the student would use to calculate the average speed.
[1 mark]

Average speed =

The student calculates the average speed and finds it to be 4 m/s.

(iii) Would it be true to say that the average velocity was also 4 m/s?   [1 mark]
Remember the cyclist is travelling in a **straight line**.

Tick (✓) the correct answer.   Yes ☐

No ☐

Impossible to say ☐

3 An object of mass 500 g sits on a bench.

500 g

(i) Calculate the weight of the object. [3 marks]

You are advised to show your working out.

Weight = _____ N

(ii) In the dotted box beside the object draw an arrow to show the direction of the force that the **bench exerts on the object**. [1 mark]

(iii) State the size of the force in part **(ii)** [1 mark]

Force = _____ N

4 A builder carries blocks of total weight 500 N to the top of a wall which is 3 m high.

(i) Calculate the work done by the builder. [3 marks]
You are advised to show your working out.

Work done = _____ J

(ii) On another occasion, the builder used 5500 J of energy to do 1100 J of useful work. Calculate his efficiency. [3 marks]
You are advised to show your working out.

Efficiency = _____

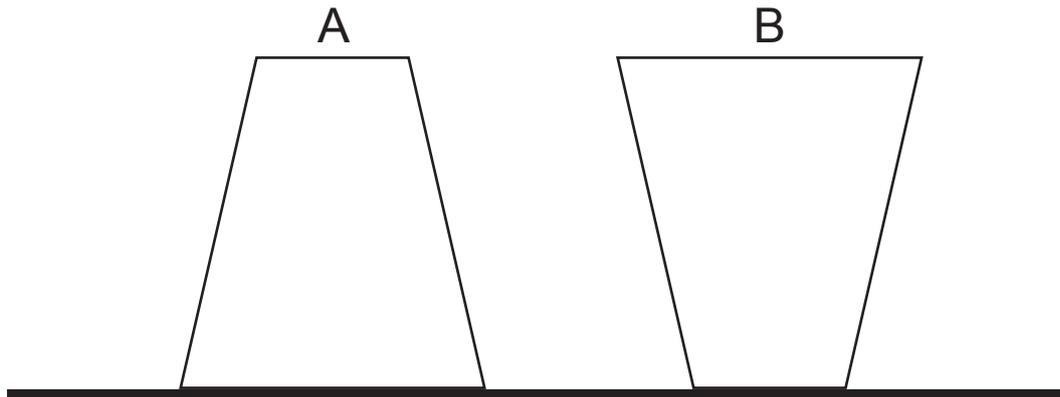**(iii)** In what unit, if any, would you measure efficiency?
Circle the correct answer. [1 mark]

joules **No units** **watts**

5 Two identical objects, A and B, sit on a surface.

(a) Explain the meaning of the term 'centre of gravity'.
[2 marks]

_____

_____

(b) (i) Which object, if any, is the more stable? Tick (✓) the correct box. [1 mark]

A is more stable ☐

B is more stable ☐

Both are equally stable ☐

(ii) Give a reason for your answer, in terms of centre of gravity. [1 mark]

_____

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(Questions continue overleaf)

6 You are given a number of nuts and bolts but you don't know what material they are made from. The nuts and bolts are all made from the same material.

The nuts and bolts have a total mass of 300 g and their total volume is found to be 40 cm^3.

(i) Calculate the density of the metal from which the nuts and bolts are made.   [3 marks]
You are advised to show your working out.

Density of metal = _____ g/cm^3

The nuts and bolts are made from either aluminium, bronze or steel. The densities of these metals are listed below.

Metal	Density/ g/cm^3
Aluminium	2.8
Bronze	8.8
Steel	7.6

(ii) Study the table and identify the metal from which the nuts and bolts were probably made.   [1 mark]

Metal = _____

(iii) Screws made from the same material as the nuts and bolts, have a smaller mass and smaller volume. How would the density of these screws compare with the density of the nuts and bolts?   [1 mark]

_____

7 An atom is made up of three basic particles.

(a) In the table identify the three basic particles which make up the atom.
State the relative charge for each particle.

In the second column give the relative charge of your chosen particles.   [6 marks]

Name of particle	Relative charge

(b) (i) What are isotopes?   [2 marks]

_____

_____

Four unknown nuclei are listed below.

$$^{30}_{15}A \qquad ^{32}_{17}B \qquad ^{33}_{16}C \qquad ^{30}_{16}D$$

(ii) Which, if any, of the nuclei shown are isotopes?
[1 mark]

_____

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(Questions continue overleaf)

13

[Turn over

8 Radioactive materials emit three different types of radiation. The table gives some information about the three types.

(a) Complete the table.   [3 marks]

| Description	Name of radiation
	Gamma
Fast moving electrons	
Helium nuclei	

The different types of radiation have different penetrating powers but the radiation is eventually stopped.

(b) (i) Give the name of a substance which provides best protection against gamma radiation.   [1 mark]

_____

(ii) Which type of radiation is least penetrating? [1 mark]

_____

(c) Explain the meaning of the term half-life.   [2 marks]

_____

_____

The graph shows how the activity of a radioactive substance changes with time.
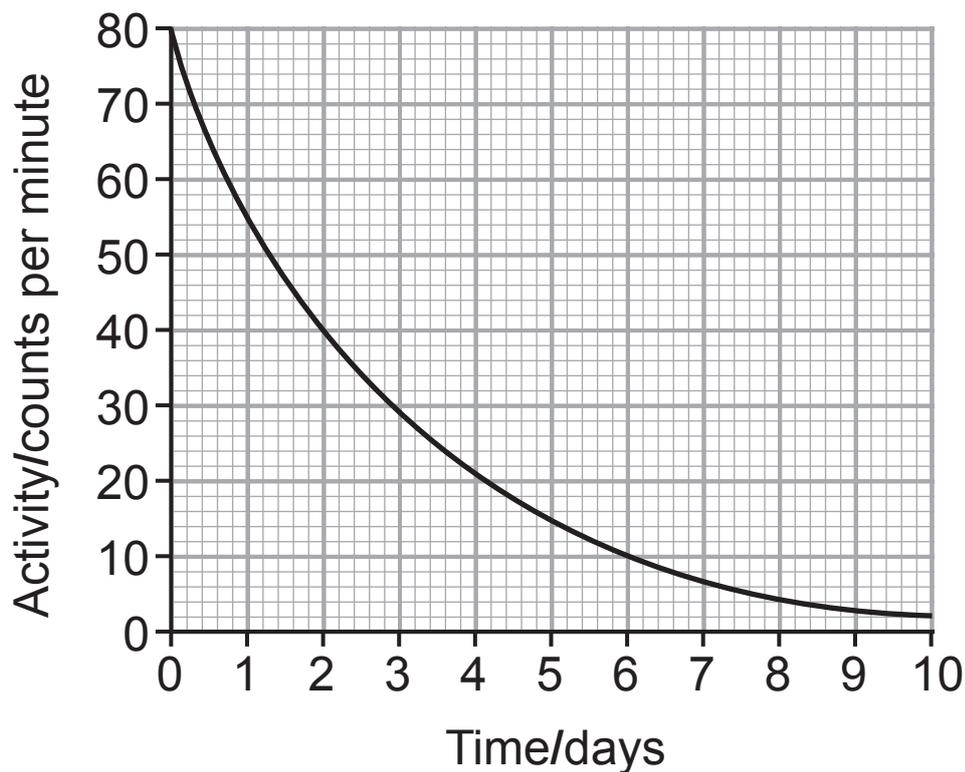
(d) Use the graph to find

(i) the half-life of this substance.   [1 mark]

_____ days

(ii) the activity after three half-lives.   [1 mark]

_____ counts per minute

(iii) how long it takes for the activity to fall from 40 counts per minute to 10 counts per minute. [1 mark]

_____ days

9 **(a)** Describe, in detail, an experiment you would carry out to measure your personal power.   [6 marks]

Your description should include:

- the measurements you take;
- the measuring instruments you use.

Do not include the equation for working out power.

You will be assessed on your written communication skills including the use of specialist scientific terms.

_____

_____

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(b) Calculate the power of a motor which does 300 J of
work in six seconds.   [3 marks]

You are advised to show your working out.

Power = _____ W

[Turn over

10 The brightness of an electric light bulb is measured in lumens. The number of lumens depends on the power of the bulb.

The brightness was measured for five bulbs with different power ratings and the results were recorded.

Brightness/lumens	400	600	800	1000	1200
Power/W	30	40	50	60	70

You are asked to plot a graph of brightness against power.

(a) Choose a suitable scale for the horizontal axis and label it.   [3 marks]

(b) Plot the points on the grid of brightness against power. [2 marks]

(c) Draw the best straight line through the points. [1 mark]

(d) Extend your graph until it cuts the horizontal axis and record the value of the power when the brightness is zero.   [1 mark]

Power = _____ W

(e) Does your graph show direct proportion?

Circle the correct answer   Yes   /   No

Give a reason for your answer.   [1 mark]
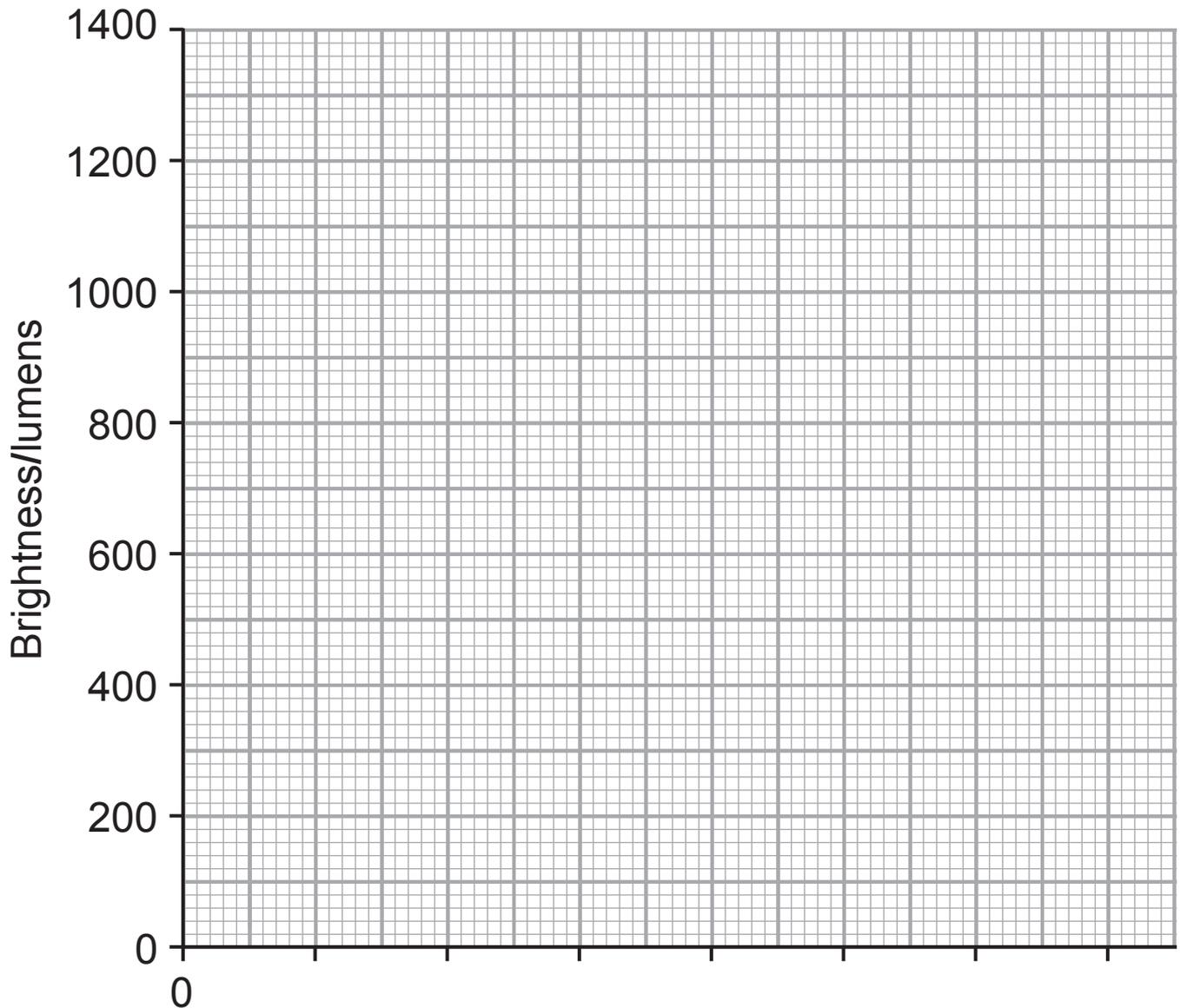
A room needs a brightness of at least 1100 lumens.

(f) **(i)** **Use the graph** to find the power needed to produce this brightness. [1 mark]

Power = _____ W

(ii) Use the table to find the power of the bulb which provides a brightness of at least 1100 lumens. [1 mark]

Power = _____ W

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