Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016–2017

Double Award Science: Physics

Unit P1

Higher Tier

[GSD32]

GSD32

WEDNESDAY 24 MAY 2017, AFTERNOON

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 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 Questions **2(a)** and **6**.

10983

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

(a) Complete the table.

Description	Name of radiation
	Gamma
Fast moving electrons	
Helium nuclei	

[3]

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]

(ii) Which type of radiation is least penetrating?

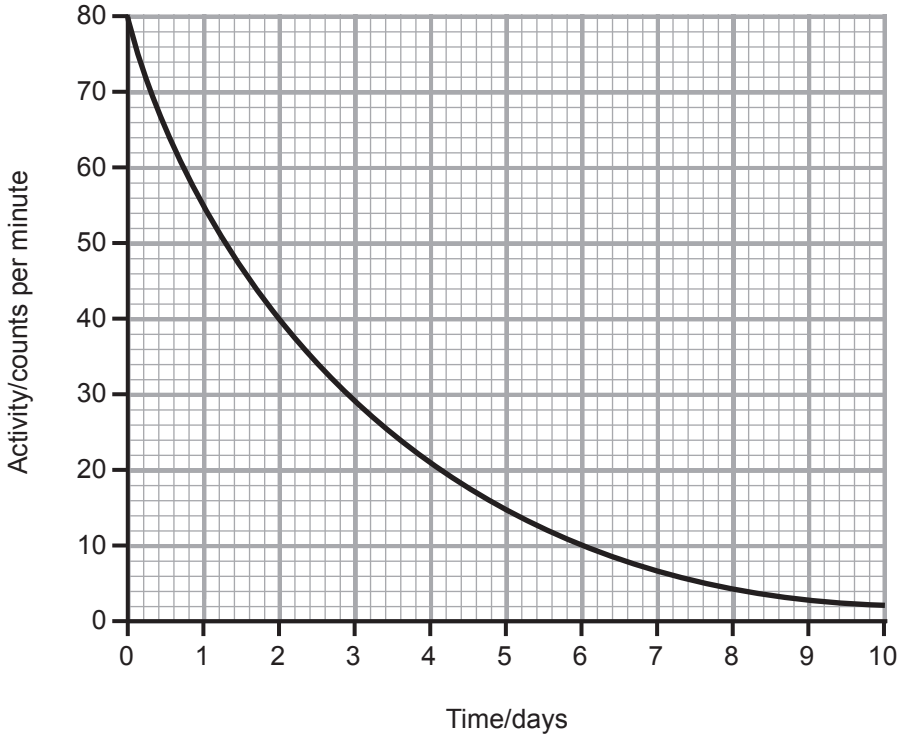
_____ [1]

(c) Explain the meaning of the term half-life.

_____

_____ [2]

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.

_____ days [1]

(ii) the activity after three half-lives.

_____ counts per minute [1]

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

_____ days [1]

[Turn over

2 **(a)** Describe, in detail, an experiment you would carry out to measure your personal power.

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.

[6]

(b) A motor raises a 20 kg mass a distance of 1.5 m in 6 seconds. Calculate the work done.

You are advised to show your working out.

Work done = _____ J [4]

[Turn over

3 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]

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

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

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

Power = _____ W [1]

(e) Does your graph show direct proportion?

Circle the correct answer Yes / No

Give a reason for your answer.

_____ [1]

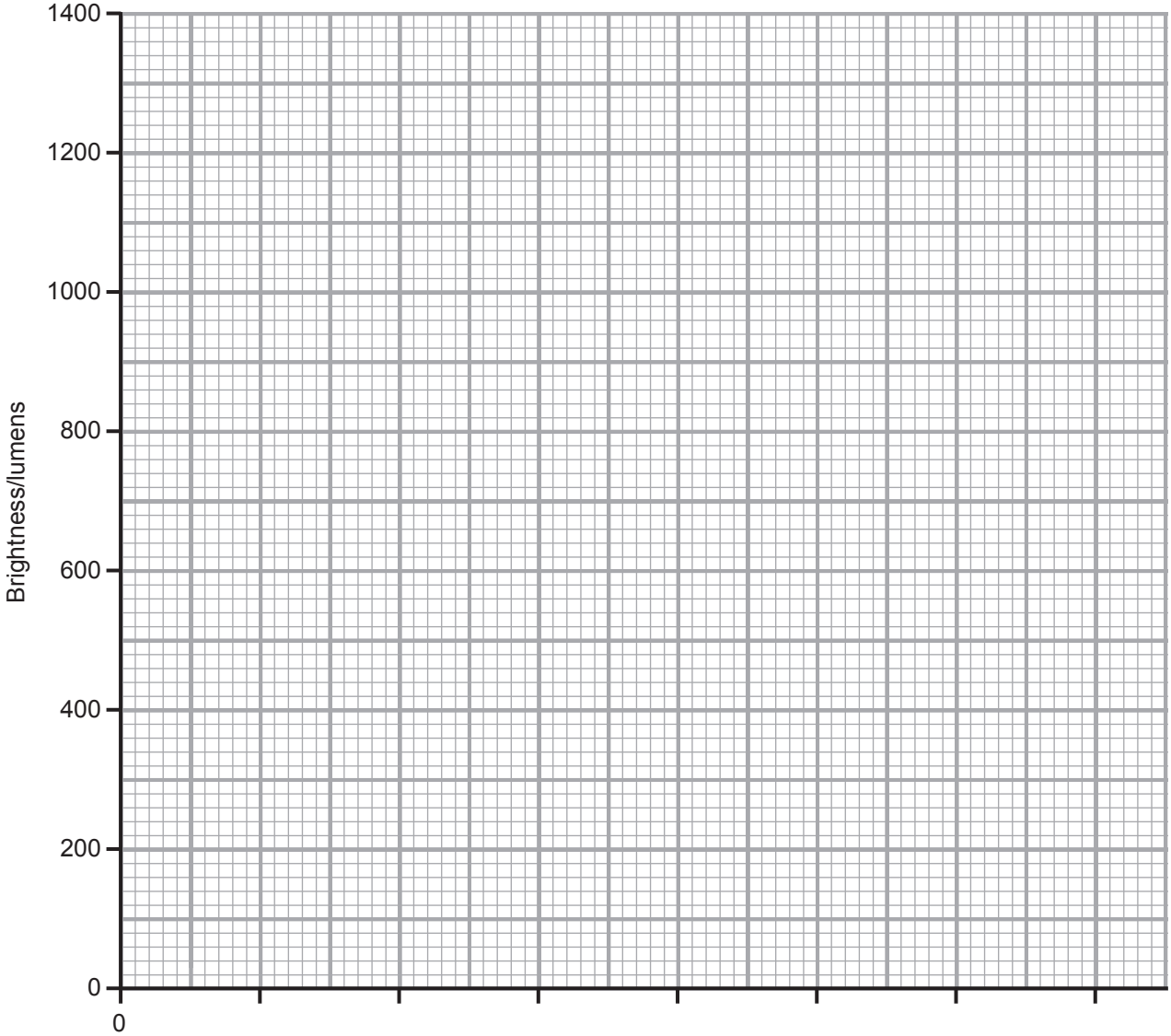
A room needs a brightness of at least 1100 lumens.

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

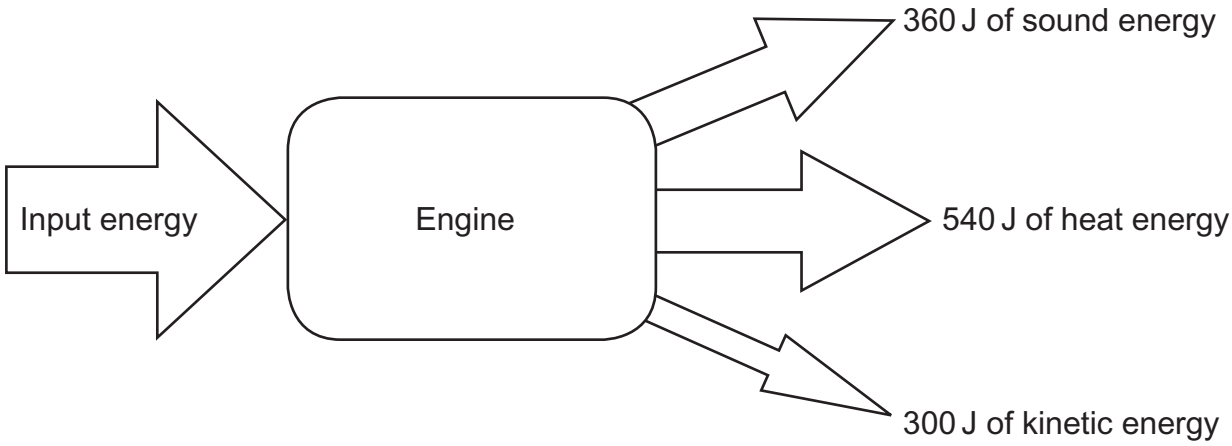
Power = _____ W [1]

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

Power = _____ W [1]



4 The diagram below shows an energy flow diagram for a car engine.



One third of the heat energy produced is usefully used to heat the inside of the car.

(i) Show that the **total useful** output energy is 480 J.

[1]

(ii) By first finding the total input energy, calculate the efficiency of the car.

You are advised to show your working out.

Efficiency = _____ [4]

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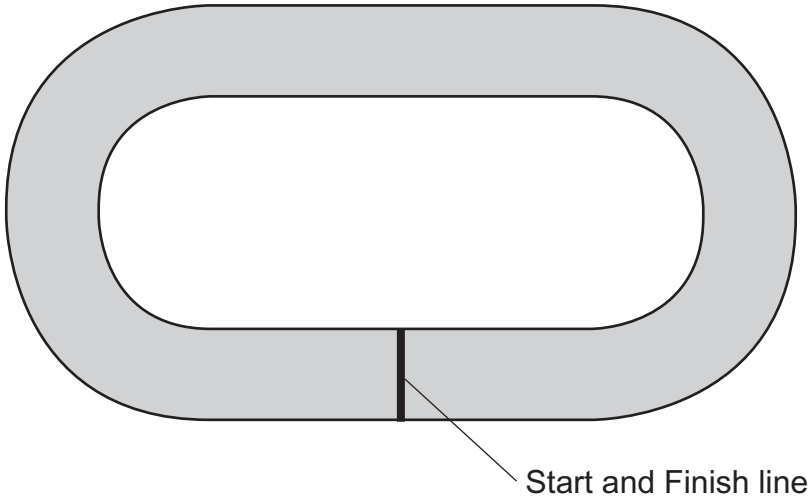
(Questions continue overleaf)

5 Olympic cyclists race in a velodrome. The shape of the velodrome is shown below.



(a) In a race, a cyclist does 4 laps with an average distance of 260 m **per lap**.
If the cyclist's average speed is 16 m/s, calculate how long his race will last.

You are advised to show your working out.

Time = _____ s [4]

In another event, a cyclist of unknown mass rides a cycle of mass 6 kg and accelerates at 1.5 m/s^2.
The cyclist exerts a forward thrust of 109 N and the total forces opposing motion add up to 10 N.

© Caia Image / Science Photo Library

(b) By first finding the resultant force, calculate the **cyclist's** mass.

You are advised to show your working out.

Resultant force = _____ N

Mass of cyclist = _____ kg [5]

[Turn over

6 Write an account of radioactive decay.

Your account should include:

- what happens during radioactive decay;
- the precautions which should be taken by people using radioactive sources.

Do not mention the names of the ionising radiations.

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

[6]

7 A nail gun fires a nail of mass 6 g with a speed of 20 m/s.

© marty8801 / iStock / Thinkstock

(i) Calculate the initial kinetic energy of the nail.

You are advised to show your working out.

Kinetic energy = _____ J [3]

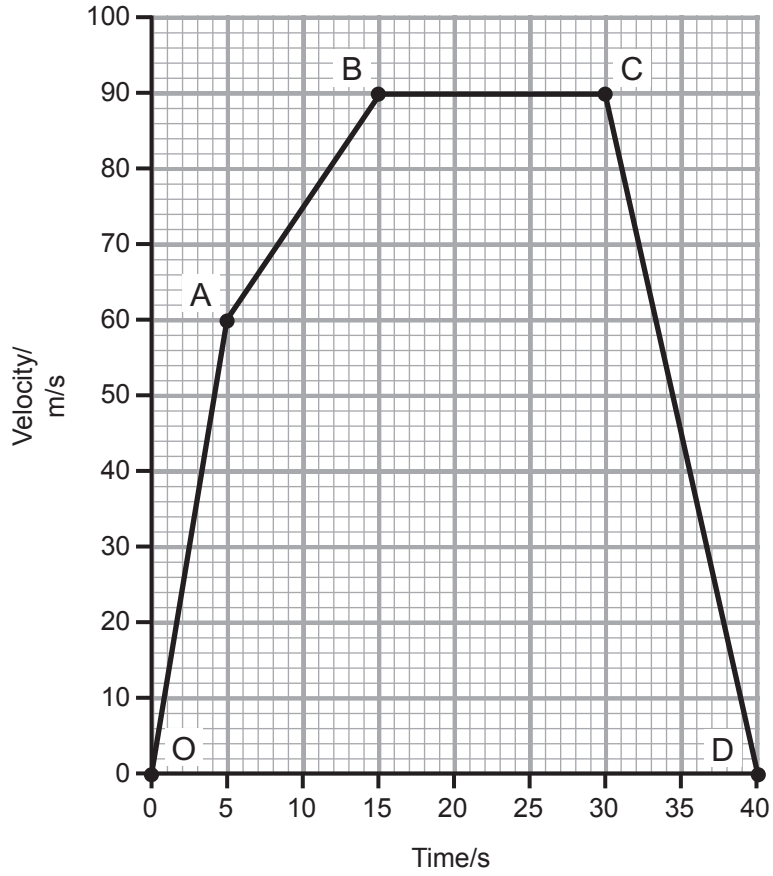
(ii) The nail gun now fires a different nail with the speed of 20 m/s and imparts an initial momentum of 0.16 kg m/s. Calculate the mass of the new nail.

You are advised to show your working out.

Mass = _____ kg [3]

[Turn over

8 The graph shows how the velocity of a racing car changes with time.



(a) Complete the sentence below.

The velocity includes both the speed and

the _____ of the racing car. [1]

(b) How far did the racing car travel in the last 10 seconds of its motion?

You are advised to show your working out.

Distance = _____ m [3]

(c) During which part of the motion, OA, AB, BC or CD is there no resultant force acting on the racing car?

Answer _____ [1]

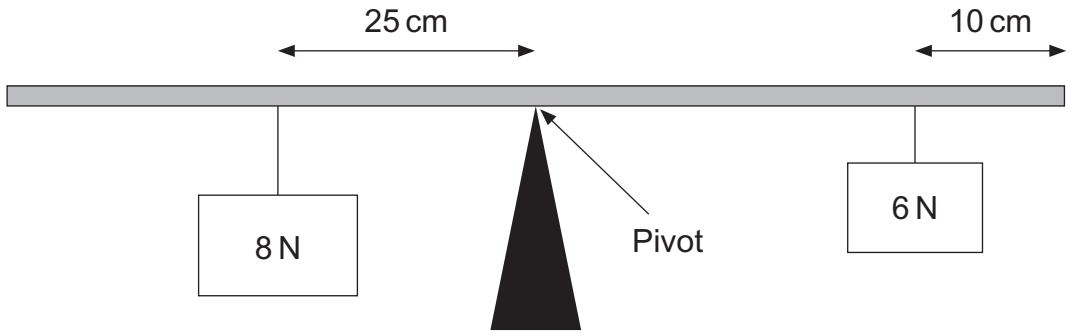
(d) Find the acceleration of the racing car in the time interval, t = 5 s to t = 15 s.

You are advised to show your working out.

Acceleration = _____ m/s^2 [3]

[Turn over

9 The **mid-point** of a uniform metre stick sits on a pivot but is **not** balanced, as shown below.



Calculate the clockwise and anticlockwise moments about the pivot.

You are advised to show your working out.

Clockwise moment = _____ Ncm

Anticlockwise moment = _____ Ncm

Use your answers to find how far and in which direction must the 8 N force be moved in order that the metre stick may be balanced.

You are advised to show your working out.

Distance moved = _____ cm

Direction = _____

[6]

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For Examiner's use only	
Question Number	Marks
1	
2	
3	
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Total Marks	

Examiner Number