Write your name here

Surname	Other names

Centre Number | Candidate Number

Edexcel GCSE

Physics/Additional Science

Unit P2: Physics for Your Future

Foundation Tier

Tuesday 18 June 2013 – Morning
Time: 1 hour

Paper Reference
5PH2F/01

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 4 1 9 4 4 A 0 1 2 0

PEARSON

FORMULAE

You may find the following formulae useful.

charge = current × time $Q = I \times t$

potential difference = current × resistance $V = I \times R$

electrical power = current × potential difference $P = I \times V$

energy transferred = current × potential difference × time $E = I \times V \times t$

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}} \qquad a = \frac{(v - u)}{t}$$

force = mass × acceleration $F = m \times a$

weight = mass × gravitational field strength $W = m \times g$

momentum = mass × velocity

work done = force × distance moved in the direction of the force $E = F \times d$

$$\text{power} = \frac{\text{work done}}{\text{time taken}} \qquad P = \frac{E}{t}$$

gravitational potential energy = mass × gravitational field strength × vertical height

$\text{GPE} = m \times g \times h$

kinetic energy = ½ × mass × velocity^2 $\text{KE} = ½ \times m \times v^2$

Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Radioactivity in action

1 (a) Here are four uses of radioactivity.
Draw a line from each one of them to the type of radiation it uses.

Each type of radiation may be chosen once, more than once or not at all.

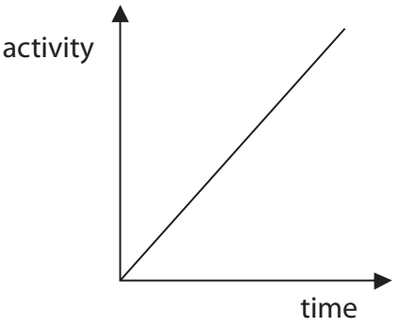
(4)

Use of radioactivity	Type of radiation it uses
sterilisation of medical equipment	alpha
household fire (smoke) alarm	beta
gauging thickness of cardboard	gamma
irradiating food	

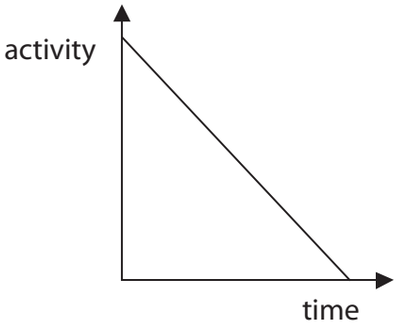
(b) Which graph best shows how the activity of a radioactive isotope changes with time?

Put a cross (☒) in the box next to your answer.

(1)



☒ **A**



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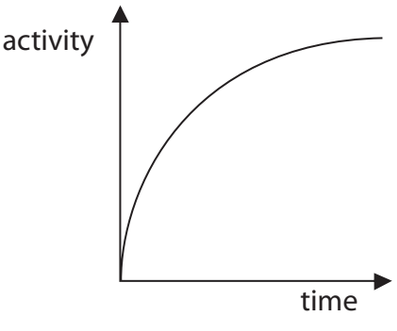
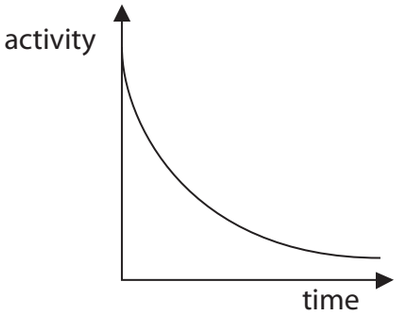


☒ **C**



☒ **D**

(c) Complete the sentence by putting a cross (☒) in the box next to your answer.

The unit of activity of a radioactive isotope is the

(1)

☒ **A** americium

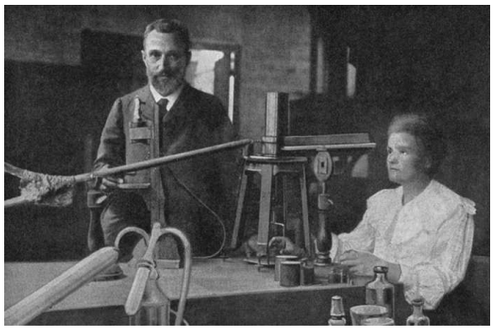
☒ **B** becquerel

☒ **C** einstein

☒ **D** radium

(d)

Marie Curie investigated radioactivity over 100 years ago.



She often carried radioactive materials in her pocket.
She stored them in her desk drawer.
She liked the coloured light they gave off.
Marie probably died from exposure to their radiation.

Describe **two** precautions that scientists now take when they use radioactive materials.

(2)

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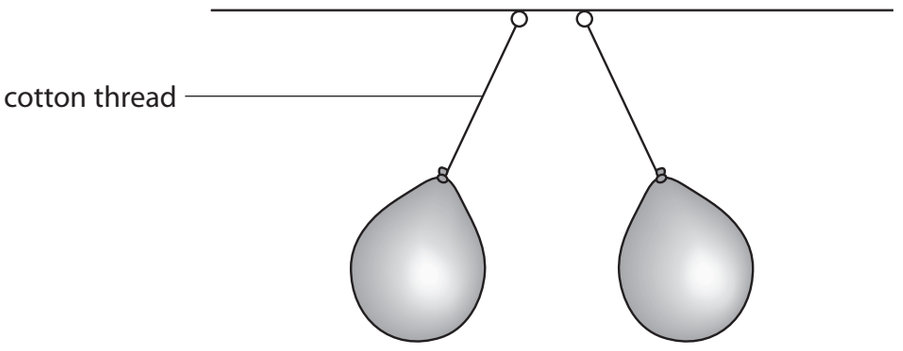
(Total for Question 1 = 8 marks)

Investigating static electricity

2 (a) A student charges two balloons and hangs them side by side.



Explain why the cotton threads are not vertical.

(2)

(b) The student rubs another balloon with a cloth.
This balloon becomes negatively charged.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

Compared to the charge gained by the balloon, the cloth gains

(1)

☒ **A** a larger negative charge

☒ **B** a larger positive charge

☒ **C** an equal negative charge

☒ **D** an equal positive charge

(ii) Explain why the balloon became negatively charged when it was rubbed with the cloth.

(2)

(iii) The student then puts this charged balloon against a metal cabinet.

Describe what happens to the charge on the balloon where it touches the metal cabinet.

(2)

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(iv) The student charges another balloon and holds it against a wall. The charged balloon sticks to the wall when he lets go.

Suggest why the balloon is attracted to the wall.

(1)

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(Total for Question 2 = 8 marks)

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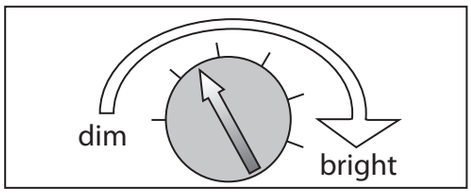
Controlling electric current

3 An inventor is designing a battery-powered torch.
She wants the torch to have a brightness control.



brightness control

(a) Which of these could she use in this control?

Put a cross (☒) in the box next to your answer.

(1)

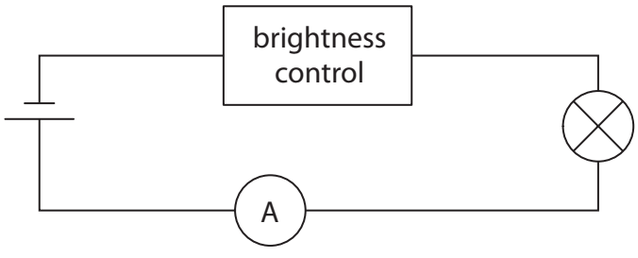
☒ **A** a diode

☒ **B** a light-dependent resistor

☒ **C** a thermistor

☒ **D** a variable resistor

(b) She builds this circuit to test the lamp in the torch.



(i) Add a voltmeter to the circuit which will measure the potential difference (voltage) across the lamp.

(1)

(ii) $R = \frac{V}{I}$

She sets the control at the "bright" position.
The current is 0.26 A and the potential difference (voltage) across the lamp is 6.0 V.

Calculate the resistance of the lamp.

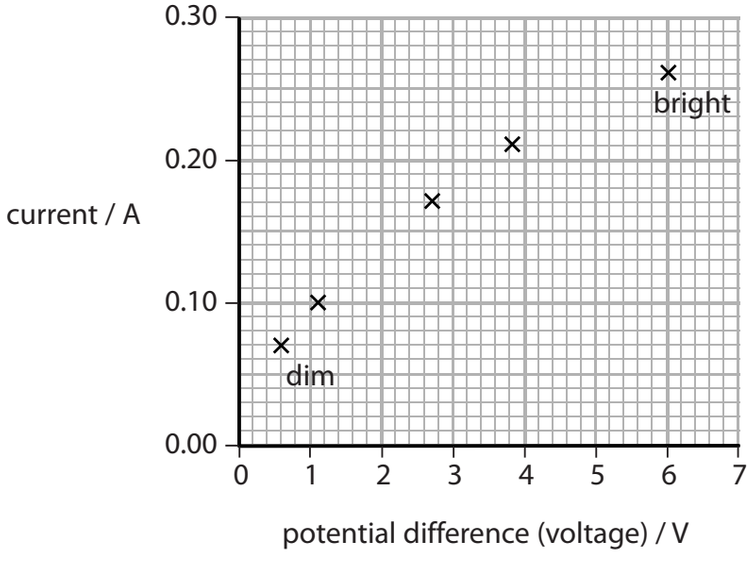
(2)

resistance of the lamp = ... Ω

(c) The inventor takes readings of the potential difference (voltage) across the lamp and the current at different positions of the control from "dim" to "bright".

	dim → bright					
voltage / V	0.6	1.1	2.0	2.7	3.9	6.0
current / A	0.07	0.10	0.14	0.17	0.21	0.26

She plots a graph of the readings.



(i) Complete this graph by plotting the missing point and drawing the curve of best fit.

(2)

(ii) Describe what this graph shows about how the current changes as the voltage changes.

(2)

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(iii) The lamp gives no light when the brightness control is at its lowest setting.

Suggest why the torch would still need an on/off switch as well as the brightness control.

(2)

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(Total for Question 3 = 10 marks)

Double alpha emission

4 Beryllium-9 is a stable isotope of beryllium.

(a) (i) State the meaning of the term **stable**.

(1)

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(ii) Beryllium-9 has an atomic number of 4 and a mass number of 9.
A nucleus of this isotope can be described using this symbol.

$$^{9}_{4}\mathrm{Be}$$

Complete the sentence by putting a cross (☒) in the box next to your answer.

The number of neutrons in this nucleus is

(1)

☒ **A** 4

☒ **B** 5

☒ **C** 9

☒ **D** 13

(iii) Which one of these symbols describes the nucleus of a different isotope of beryllium?

Put a cross (☒) in the box next to your answer.

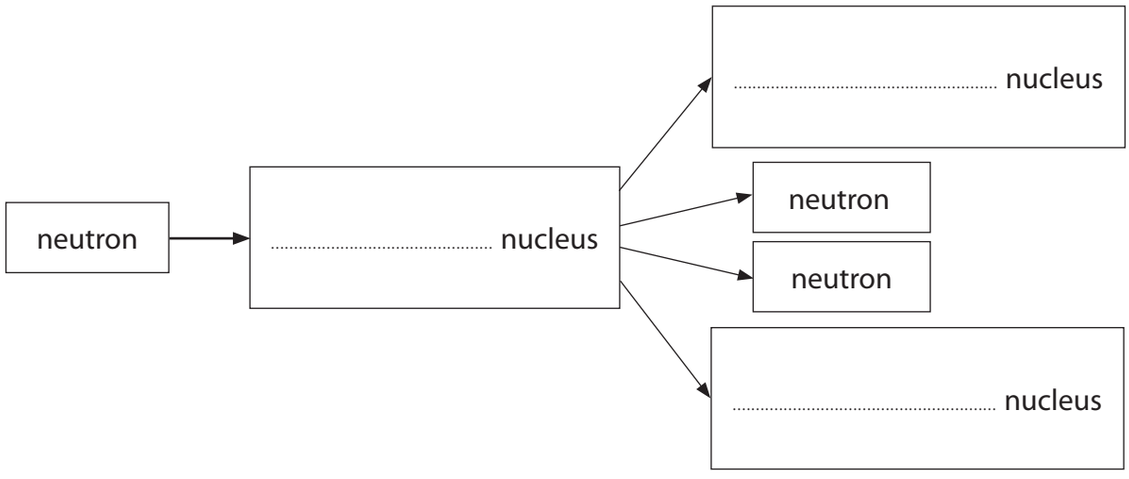
(1)

$^{8}_{4}\mathrm{Be}$	$^{8}_{5}\mathrm{Be}$	$^{9}_{4}\mathrm{B}$	$^{9}_{5}\mathrm{Be}$
☒ **A**	☒ **B**	☒ **C**	☒ **D**

(b) A beryllium-9 nucleus absorbs a neutron.
After a short time the new nucleus splits into two neutrons and two alpha particles.

(i) Complete the flow chart for this reaction.

(2)



(ii) Compare this nuclear reaction with the fission of a uranium nucleus.

(3)

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(iii) A fission reaction can be the start of a chain reaction.

Describe what needs to happen next to produce a chain reaction.

(2)

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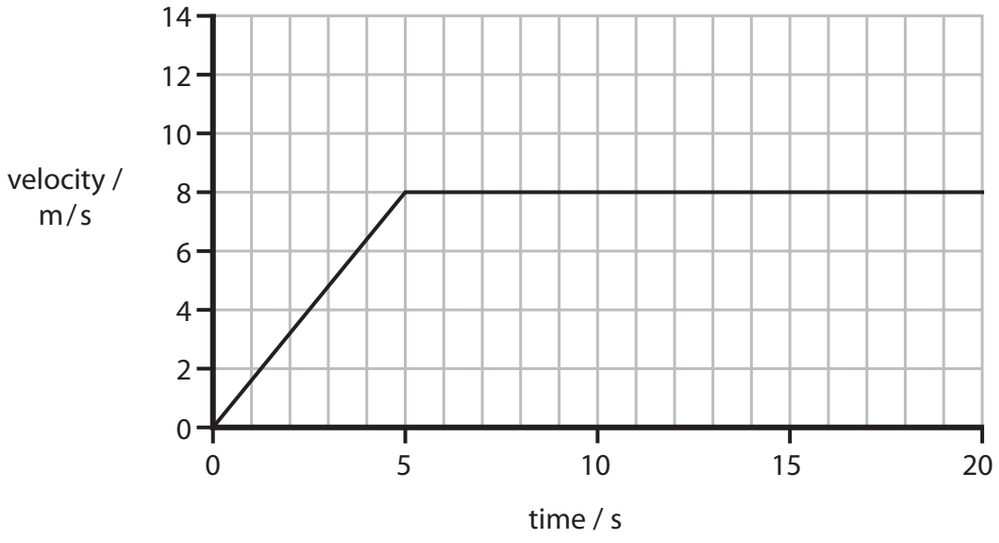
(Total for Question 4 = 10 marks)

Forces and motion

5 (a) Here is the velocity-time graph for a car for the first 20 s of a journey.



(i) Calculate the change in velocity of the car during the first 5 s.

(1)

change in velocity = ... m/s

(ii) Calculate the acceleration of the car during the first 5 s.

(2)

acceleration = ... m/s^2

(iii) State the size of the resultant force between 10 s and 15 s

(1)

resultant force = ... N

(b) The mass of a car is 1200 kg.

Calculate the resultant force on the car required to produce an acceleration of 0.8 m/s^2.

(2)

resultant force = ... N

*(c) A car, travelling at 20 m/s, with just the driver inside takes 70 m to stop in an emergency.
The same car is then fully loaded with luggage and passengers as well as the driver.

Explain why it will take a different distance to stop in an emergency from the same speed.

(6)

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(Total for Question 5 = 12 marks)

Dropping eggs

6 The photograph shows a man dropping an egg inside a padded box from a height.

He is investigating to see if the padding stops the egg from breaking.

(a) State the type of energy which the egg gains as it falls.

(1)

.....

(b) The weight of the egg is 0.6 N.

Calculate the work done on the egg to lift it up by 20 m. State the unit.

(3)

work done on egg = ... unit .....

(c) The velocity of the container was 18 m/s as it hit the floor.
The mass of the container was 0.5 kg.

Calculate the momentum of the container.

(2)

momentum = ... kg m/s

*(d) A student stands on the ground with an egg in his hand.
He throws the egg vertically upwards.
The egg rises to a height of 10 m.
Then the egg falls and lands on the ground.

Describe the energy changes of the egg during this sequence of events.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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