Paper Reference(s) **5PH2F/01**

# Edexcel GCSE

## Physics/Additional Science
### Unit P2: Physics for Your Future
### Foundation Tier

**Tuesday 18 June 2013 – Morning**

**Time: 1 hour plus your additional time allowance**

**INSTRUCTIONS TO CANDIDATES**
**Write your centre number, candidate number, surname, initials and your signature in the boxes below. Check that you have the correct question paper.**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Centre No. | | | | | | | |
| Candidate No. | | | | | | | |
| Surname | | | | | | | |
| Initial(s) | | | | | | | |
| Signature | | | | | | | |
| Paper Reference | 5 | P | H | 2 | F | / | 0 | 1 |

X41944A

PEARSON

**Use BLACK ink or ball-point pen.**
**Answer ALL questions.**
**Answer the questions in the spaces provided – there may be more space than you need.**

## MATERIALS REQUIRED FOR EXAMINATION

**Calculator, ruler**

## ITEMS INCLUDED WITH QUESTION PAPERS

**Nil**

## INFORMATION FOR CANDIDATES

- **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 TO CANDIDATES

- **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.**

# 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** $E = F \times d$

**(Formulae continues on next page)**

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

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

$$GPE = m \times g \times h$$

$$\text{kinetic energy} = \tfrac{1}{2} \times \text{mass} \times \text{velocity}^2 \qquad KE = \tfrac{1}{2} \times m \times v^2$$

**Answer ALL questions.**

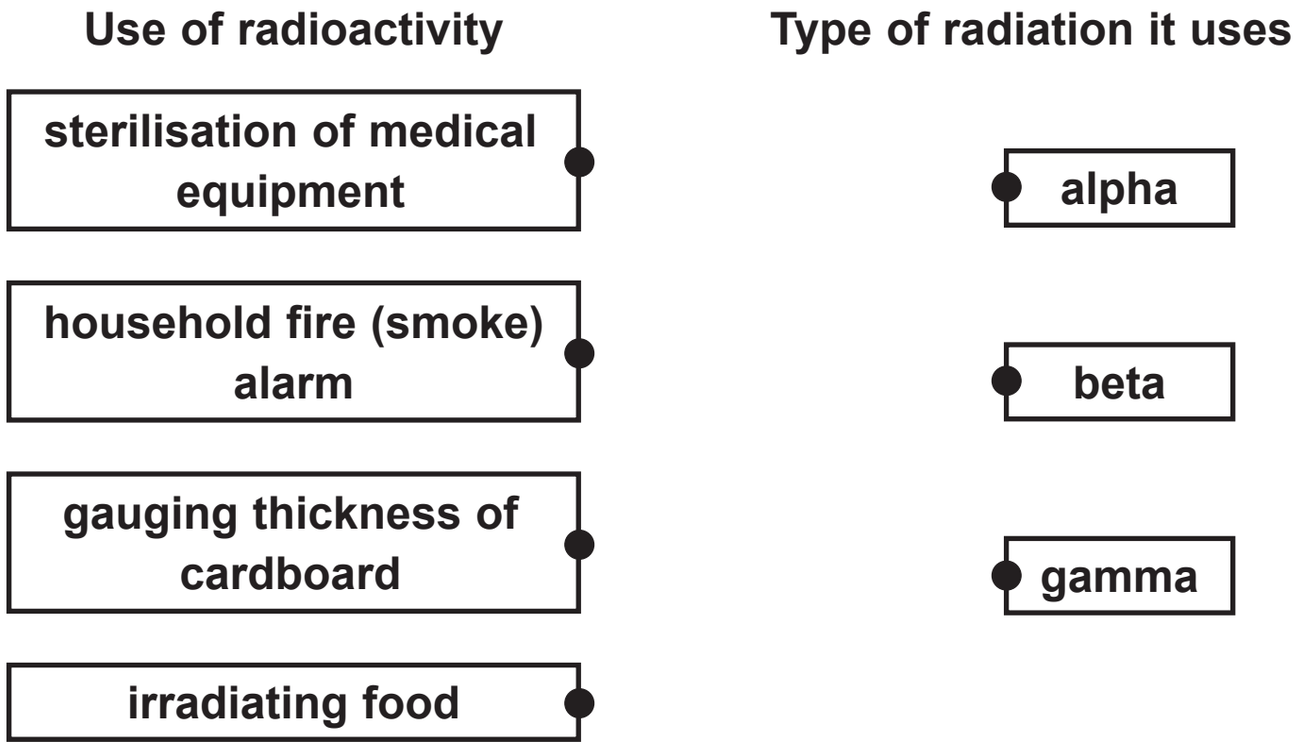
**Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.**

## 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 marks)**

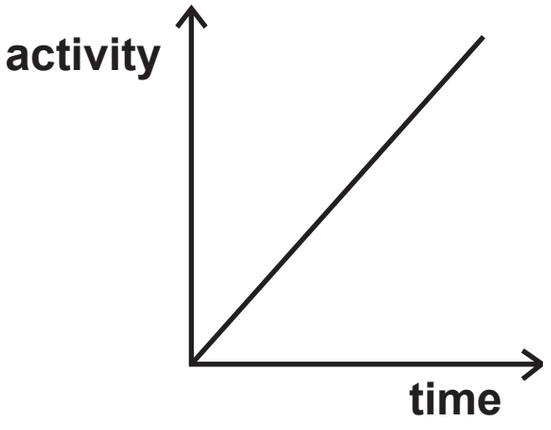



(Question continues on next page)

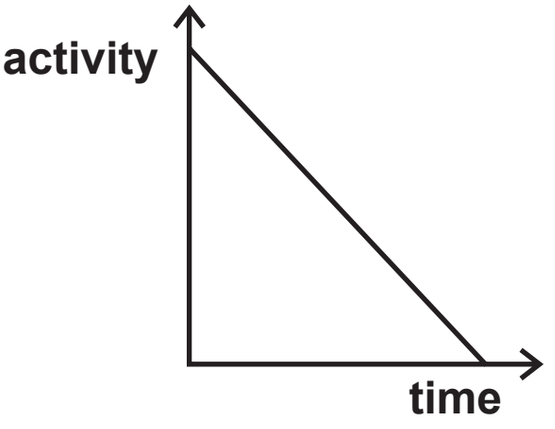
(b) **Which graph best shows how the activity of a radioactive isotope changes with time? (1 mark)**

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

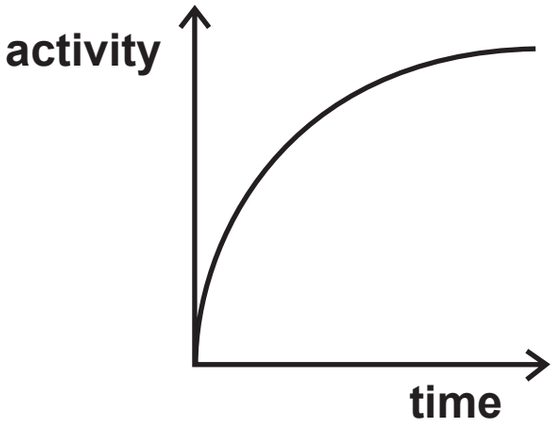
☐ **A**



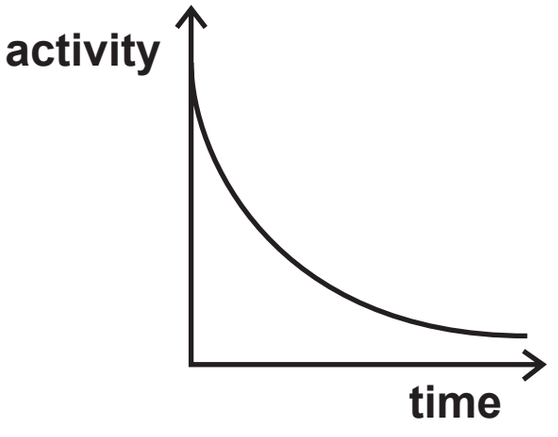

☐ **B**




☐ **C**




☐ **D**




**(Question continues on next page)**

(c) Complete the sentence by putting a cross (☒) in the box next to your answer. (1 mark)

The unit of activity of a radioactive isotope is the

☐ A americium

☐ B becquerel

☐ C einstein

☐ D radium

(Question continues on next page)

**(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.**

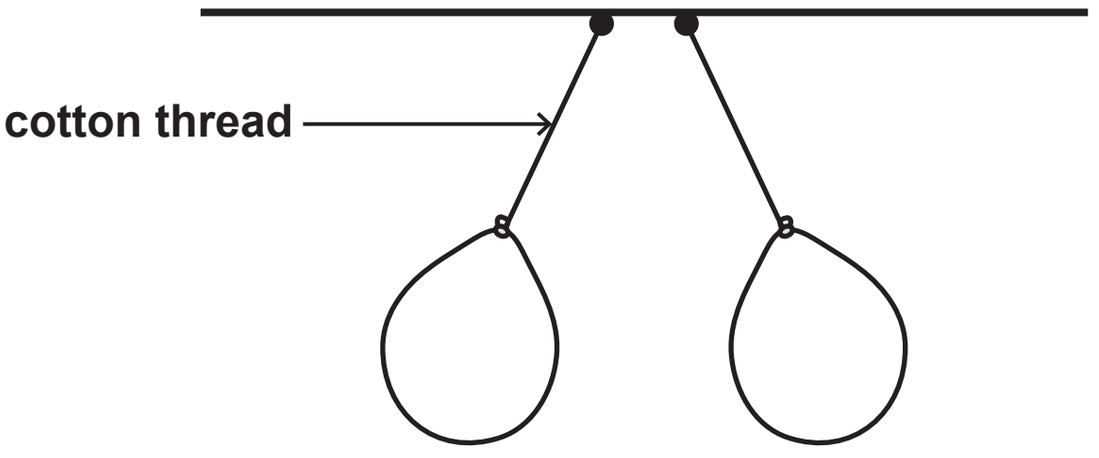
**Describe TWO precautions that scientists now take when they use radioactive materials. (2 marks)**

**(TOTAL FOR QUESTION 1 = 8 MARKS)**

**(Questions continue on next page)**

## 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 marks)**

**(Question continues on next page)**

(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. (1 mark)

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

☐ A a larger negative charge

☐ B a larger positive charge

☐ C an equal negative charge

☐ D an equal positive charge

(Question continues on next page)

(ii) Explain why the balloon became negatively charged when it was rubbed with the cloth. (2 marks)

(Question continues on next page)

(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 marks)

(Question continues on next page)

(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 mark)

_____

_____

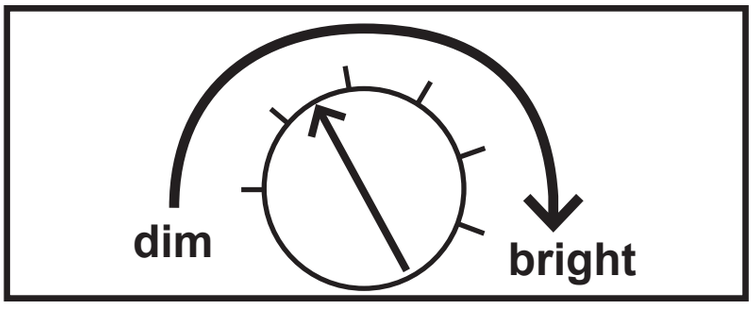
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**(TOTAL FOR QUESTION 2 = 8 MARKS)**

(Questions continue on next page)

## 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? (1 mark)

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

☐ **A** a diode

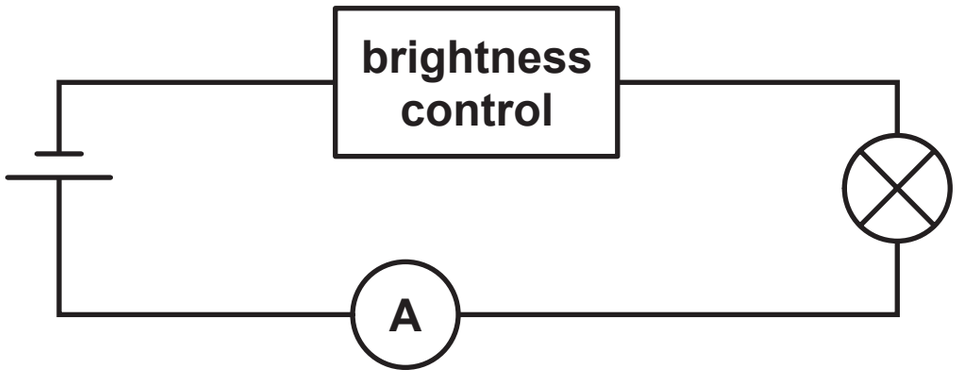
☐ **B** a light-dependent resistor

☐ **C** a thermistor

☐ **D** a variable resistor

(Question continues on next page)

(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 mark)

(Question continues on next page)

(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 marks)

resistance of the lamp = _____ Ω

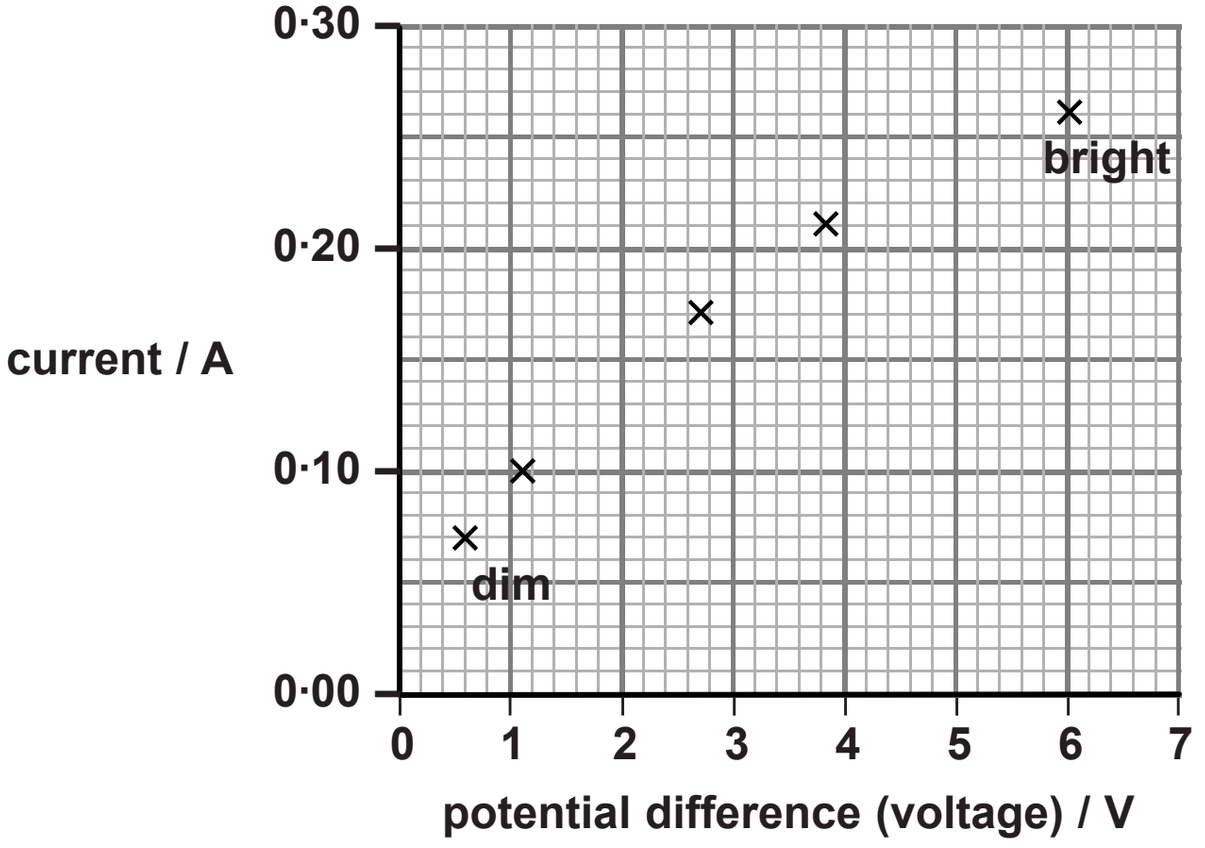
(Question continues on next page)

(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 marks)

(Question continues on next page)

(ii) Describe what this graph shows about how the current changes as the voltage changes. (2 marks)

(Question continues on next page)

(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 marks)

(TOTAL FOR QUESTION 3 = 10 MARKS)

(Questions continue on next page)

## DOUBLE ALPHA EMISSION

**4 Beryllium-9 is a stable isotope of beryllium.**

**(a) (i) State the meaning of the term STABLE.**
**(1 mark)**

_____

_____

_____

**(Question continues on next page)**

(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. (1 mark)

The number of neutrons in this nucleus is

☐ A 4

☐ B 5

☐ C 9

☐ D 13

(Question continues on next page)

(iii) **Which one of these symbols describes the nucleus of a different isotope of beryllium? (1 mark)**

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

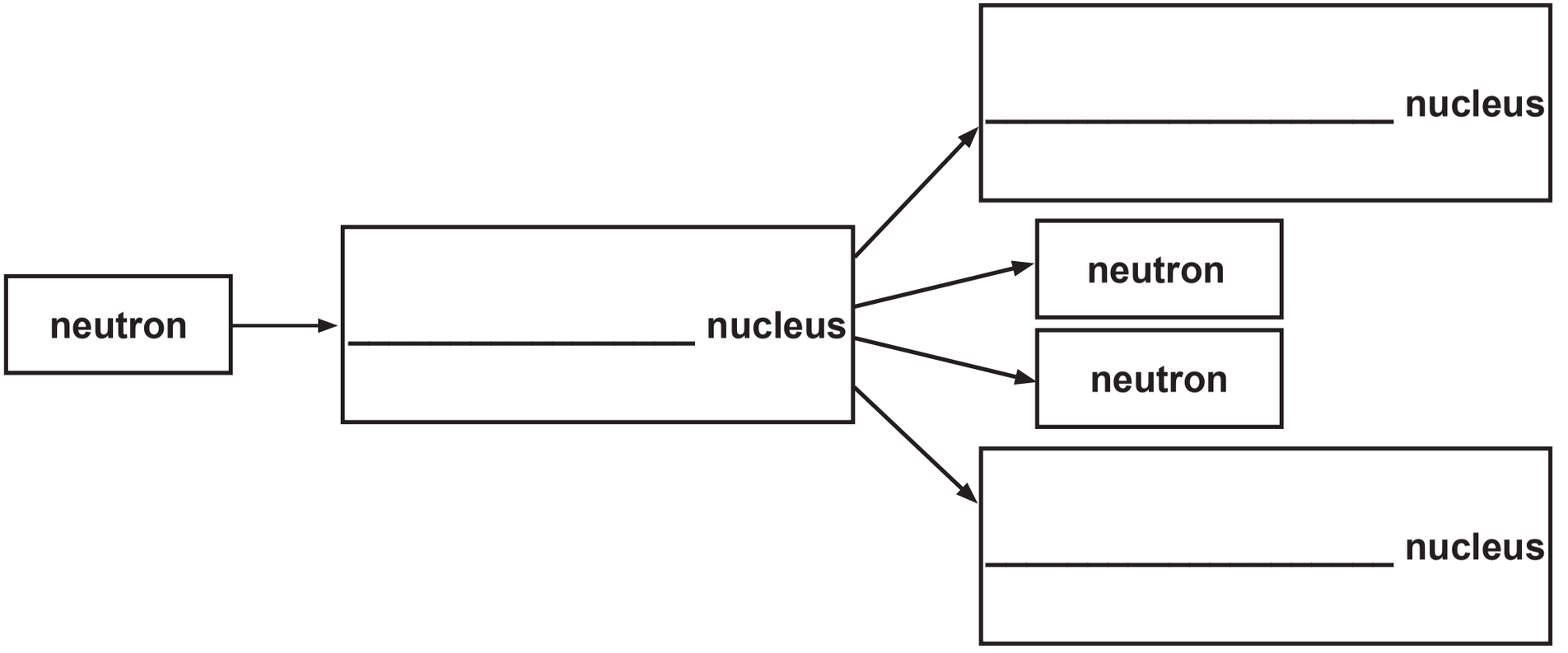
| ☐ A | ☐ B | ☐ C | ☐ D |
|---|---|---|---|
| $^{8}_{4}Be$ | $^{8}_{5}Be$ | $^{9}_{4}B$ | $^{9}_{5}Be$ |

**(Question continues on next page)**

**(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 marks)**






**(Question continues on next page)**

(ii) Compare this nuclear reaction with the fission of a uranium nucleus. (3 marks)

(Question continues on next page)

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

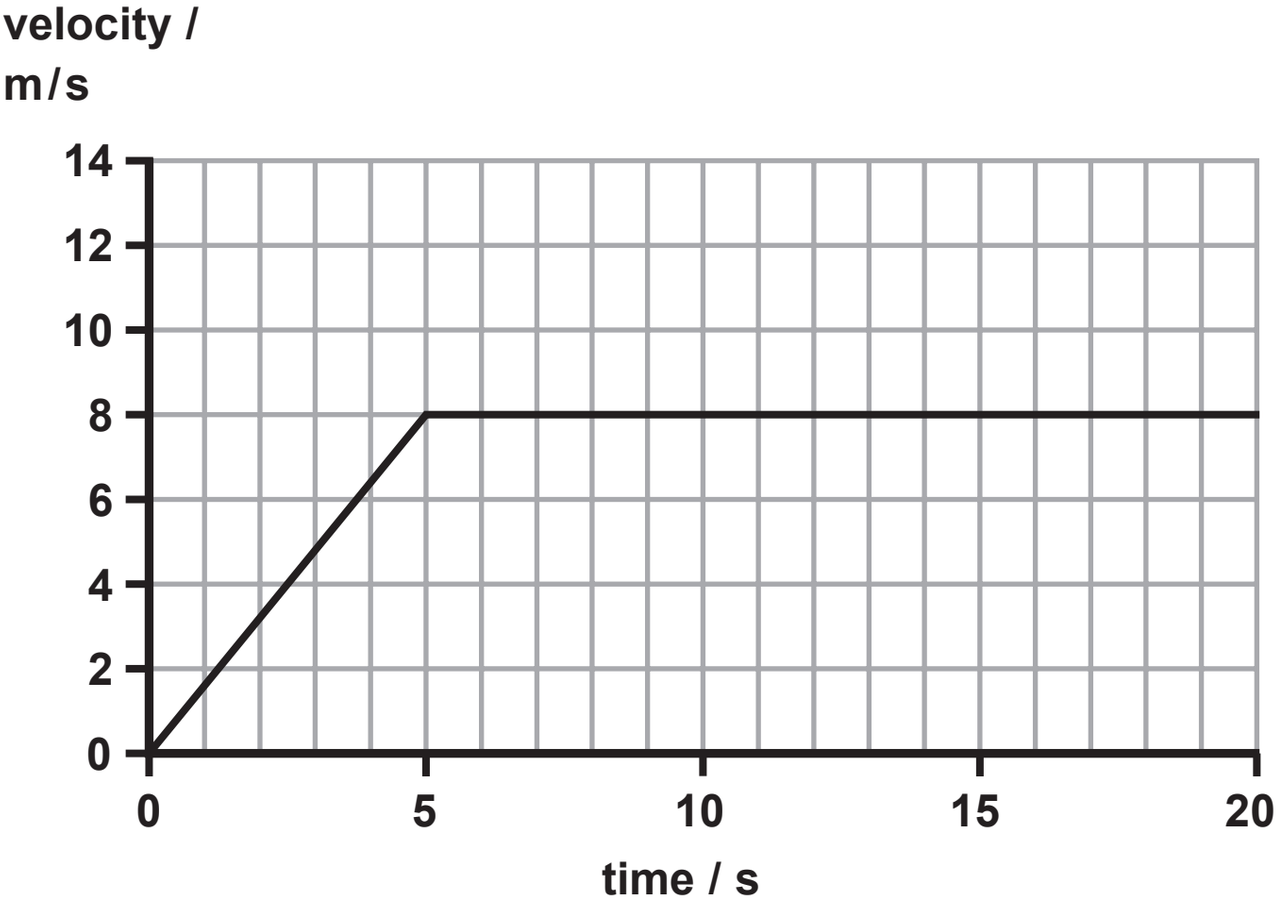
**Describe what needs to happen next to produce a chain reaction. (2 marks)**

**(TOTAL FOR QUESTION 4 = 10 MARKS)**

**(Questions continue on next page)**

## 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 mark)**

**change in velocity = _____ m/s**

**(Question continues on next page)**

(ii) Calculate the acceleration of the car during the first 5 s. (2 marks)

acceleration = _____ $m/s^2$

(iii) State the size of the resultant force between 10 s and 15 s (1 mark)

resultant force = _____ N

(Question continues on next page)

(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 marks)

resultant force = _____ N

(Question continues on next page)

*(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 marks)

(Continue your answer on next page)

**(TOTAL FOR QUESTION 5 = 12 MARKS)**

**(Questions continue on next page)**

## DROPPING EGGS

**6** A man drops 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 mark)

_____

(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 marks)

work done on egg = _____ unit _____

(Question continues on next page)

(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 marks)

momentum = _____ kg m/s

(Question continues on next page)

*(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 marks)

(Continue your answer on next page)

**(TOTAL FOR QUESTION 6 = 12 MARKS)**

**TOTAL FOR PAPER = 60 MARKS**

**END**