New Specification

cea
Rewarding Learning

**General Certificate of Secondary Education
2018**

GCSE Physics

Unit 1

Foundation Tier

[GPY11]   *GPY11*

FRIDAY 15 JUNE, MORNING

TIME

1 hour 15 minutes.

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** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 80.
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 Question **4(a)**.

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1 **(a)** Two cars, A and B, start at the same time and drive along a straight road. The distance–time graphs for both cars are shown below.
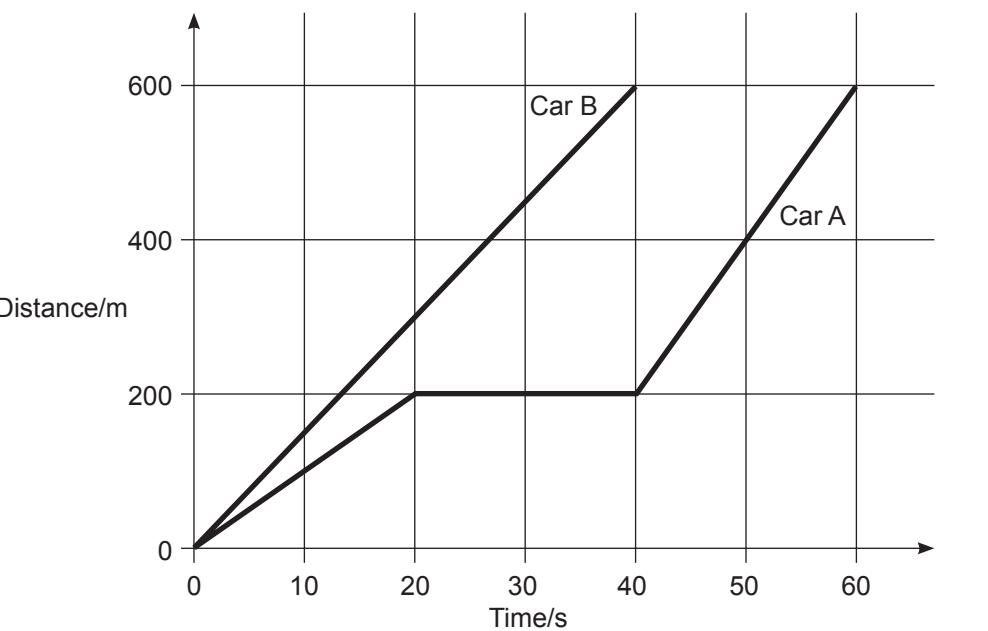
(i) How far apart are the cars after 40 s?

Distance apart = _____ m [2]

(ii) Which car, if either, did not travel with a constant speed? Explain your answer.

_____

_____ [2]

24GPY1102

(iii) Calculate the average speed of Car B.
Remember to include the correct unit with your answer.
Show clearly your calculation, starting with the equation you plan to use to get your answer.

Average speed = _____ [4]

(iv) On the grid opposite, draw the distance–time graph for a car if it had been driven a distance of 600 m in 20 seconds at a constant speed. [3]

(b) A ball is accelerating down a slope several metres long.
The slope has markings on its surface 1 m apart.

**(i)** Describe how you would use a stopclock to show that the ball is accelerating.

_____

_____

_____

_____ [2]

(ii) What would you do to improve the reliability of any measurements?

_____

_____ [1]

[Turn over

11503

24GPY1103

(c) The graph below shows how the speed of a car changes over a period of 5 s.
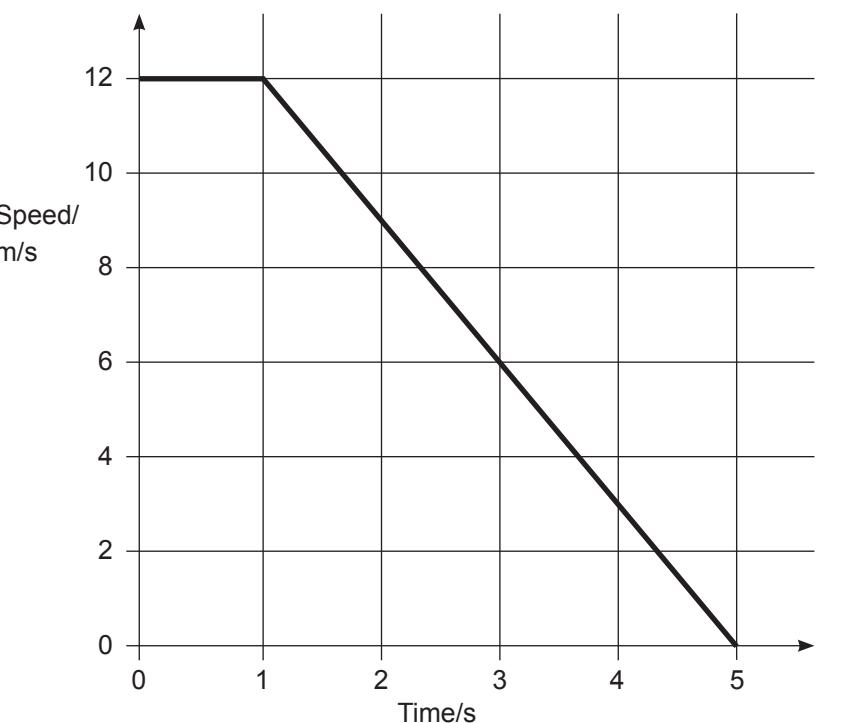
(i) Using the graph, calculate the rate of change of speed (acceleration) of the car during the **last 4 s** of the motion.
Show clearly your calculation, starting with the equation you plan to use to get your answer.

Rate of change of speed (acceleration) = _____ m/s^2 [3]

(ii) Using the graph, calculate the distance the car travels from the moment it starts to slow until it stops.
Show clearly your calculation, starting with the equation you plan to use to get your answer.

Distance = _____ m [3]

11503

24GPY1104

2 **(a)** **(i)** A student writes the following sentence about friction.

Friction is a form of energy and is measured in kilograms

What two mistakes have been made?

1. _____

2. _____ [2]

The diagram shows a car moving along a straight level road.

Source: Chief Examiner

(ii) The mass of the car is 1500 kg and it experiences an acceleration of 1.2 m/s^2.
Calculate the resultant force acting on the car.
Show clearly your calculation, starting with the equation you plan to use to get your answer.

Resultant force = _____ N [3]

[Turn over

11503

(iii) The car has a mass of 1500 kg.
Calculate the weight of the car.
Show clearly your calculation, starting with the equation you plan to use to get your answer.

Weight of the car = _____ N [2]

(b) Three identical springs are suspended from a beam and various weights are added as shown in the diagram below.

10 cm

13 cm

0 N

1 N

L

2 N
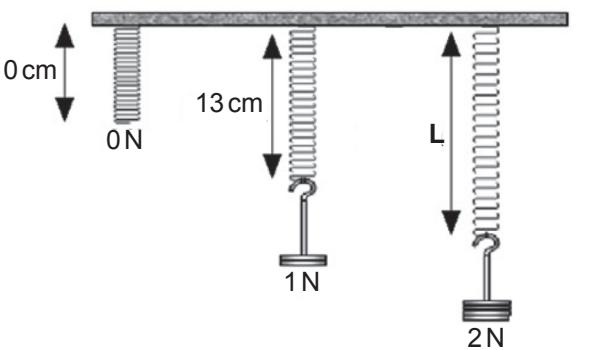
Source: Chief Examiner

(i) Using the information from the diagram, calculate the extension of the spring when a weight of 1 N is added to the spring.

Extension = _____ cm [1]

**(ii)** Calculate the total length **L** of the spring when a weight of 2 N is added to the spring.

Length = _____ cm [2]

11503

(c) (i) What is meant by the centre of gravity of an object?

_____

_____

_____ [2]

The diagram below shows a block of wood in two different positions.
The block is held in position and then released.
The centre of gravity is marked.
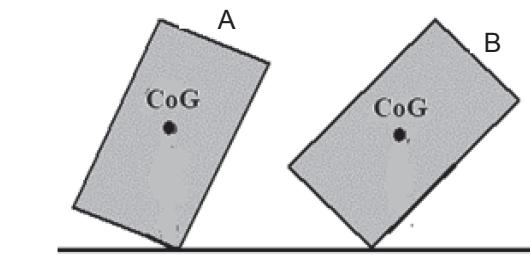
(ii) Using moments, explain why in position B the block will topple to the right
when released but in position A the block will topple to the left when
released.

_____

_____

_____ [2]

[Turn over

(d) The diagram below shows a simple pressure relief valve. When the steam pressure reaches a certain value the valve opens to reduce the steam pressure.
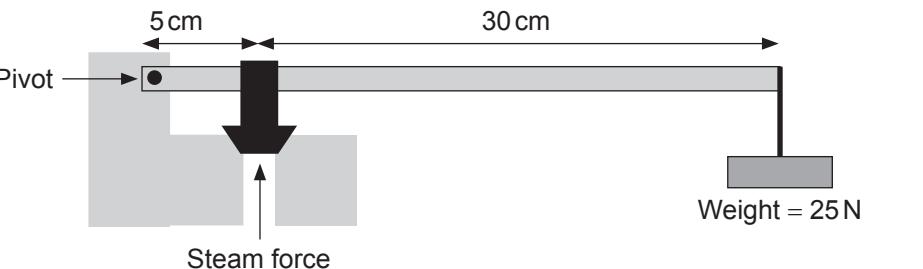
Source: Chief Examiner

(i) Using the Principle of Moments, calculate the size of the upward force exerted by the steam which will open the valve.
Show clearly your calculation, starting with the equation you plan to use to get your answer.

Upward force = _____ N [3]

(ii) At another time the force needed to open the valve was 180 N.
The area that the steam pressure acts on is 5 cm^2.
Calculate the steam pressure needed to open the valve.
Show clearly your calculation, starting with the equation you plan to use to get your answer.

Pressure = _____ N/cm^2 [3]

11503

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24GPY1109

3 **(a)** A student was asked to find the density of a liquid using the apparatus shown below.

0.00 g
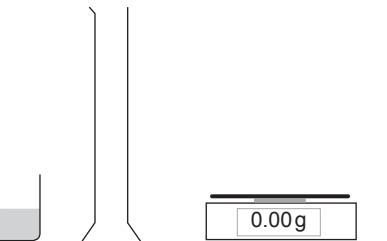
Source: Chief Examiner

(i) However, the student writes down the measurements but does not record them in an organised way, as shown below.

$$50\,cm^3 \qquad 125\,g \qquad 85\,g \qquad 40\,g$$

Place the measurements on the correct line below.
One has been done for you.

Mass of measuring cylinder = 85 g

Volume of liquid = _____

Mass of measuring cylinder and liquid = _____

Mass of liquid = _____   [2]

(ii) Using the measurements above, calculate the density of the liquid.
Include the unit for density with your answer.
Show clearly your calculation, starting with the equation you plan to use to get your answer.

Density of liquid = _____ [4]

11503

(iii) State how the student should accurately read the volume of liquid in the measuring cylinder.

_____

_____ [1]

(b) Use kinetic theory to describe carefully the difference between the motion of the molecules in water and in glass.

_____

_____

_____

_____

_____

_____ [3]

11503

24GPY1111

4 **(a)** Describe, in detail, how you would measure the personal power of a student by having the student climb a staircase or perform step-ups to a platform. **The weight of the student is known**.

In your description you should state:
- what apparatus you would use;
- what measurements you would make;
- how you would use these measurements to calculate the student's personal power.

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

Apparatus:

_____

_____

_____

_____

_____

Measurements:

_____

_____

_____

_____

_____

11503

Calculation:

_____

_____

_____

_____

_____

_____

_____ [6]

11503

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(b) A toy car is placed at the top of a slope as shown below.
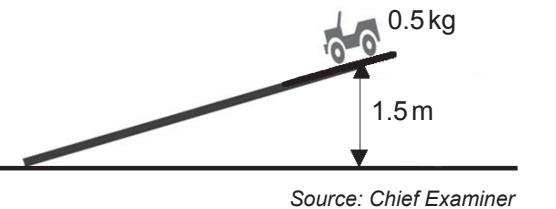
Source: Chief Examiner

(i) Calculate the potential energy of the toy car in the position shown.
**Show clearly your calculations, starting with the equation you plan to use to get your answer.**

Potential energy = _____ J [3]

(ii) At the bottom of the slope the toy car is moving with a speed of 4 m/s.
Calculate the kinetic energy of the toy car.
Show clearly your calculations, starting with the equation you plan to use to get your answer.

Kinetic energy = _____ J [3]

11503

(c) A car engine is designed to change chemical energy to kinetic energy.
The energy input and output figures for a particular car engine are given below.

300 J of chemical energy

car engine

40 J of sound energy

170 J of heat

90 J of kinetic energy
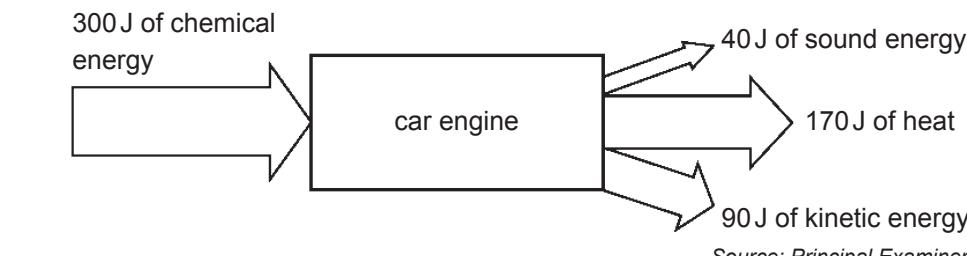
Source: Principal Examiner

Calculate the efficiency of the engine.
Show clearly your calculation, starting with the equation you plan to use to get your answer.

Efficiency = _____ [3]

[Turn over

11503

(d) The thermal conduction by copper and glass can be compared using a computer and the apparatus shown below.
The glass and copper rods are of equal length and diameter.
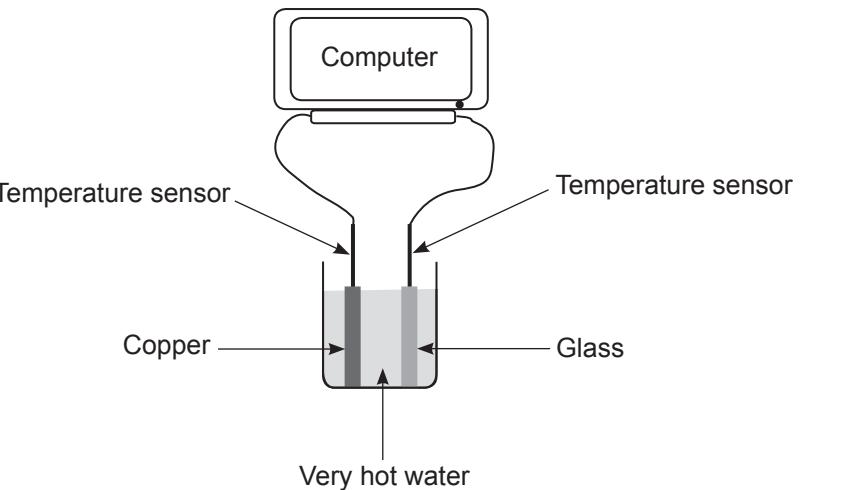
(i) Using the axes below, sketch the two graphs that would be obtained, one for the copper and one for the glass. **Label each graph.** The temperature measured by the sensors is the same until the very hot water is poured into the tank.
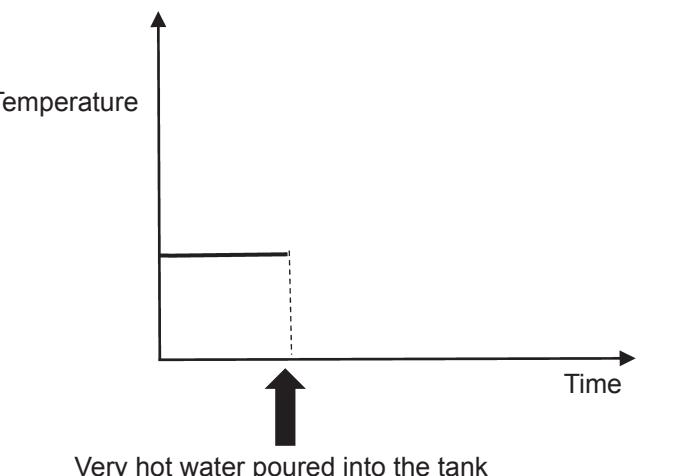
[1]

(ii) What particle is mainly responsible for the conduction of heat in metals?

_____ [1]

11503

24GPY1116

(iii) Describe how these particles transfer heat energy through the metal.

_____

_____ [1]

(iv) Describe how heat energy is transferred through the glass.

_____

_____

_____

_____ [2]

[Turn over

11503

24GPY1117

5 **(a)** An experiment was completed to measure the half-life of a radioactive source. The corrected count rate in counts per second (cps) was recorded at set time intervals and used to plot a decay graph as shown below.

Corrected count rate/cps

Time/hours
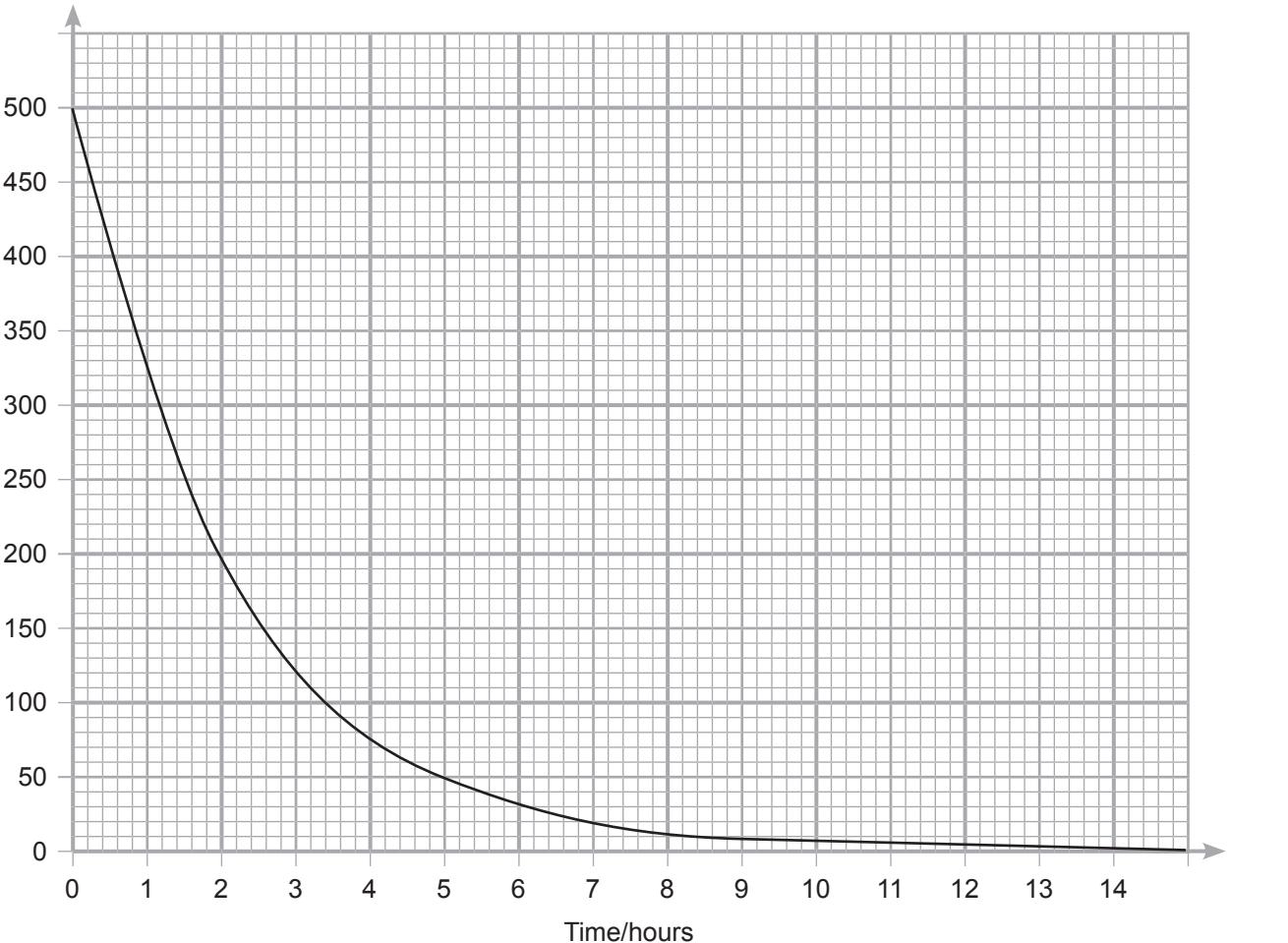
(i) Explain how the readings would have been adjusted to allow for background count.

_____

_____ [1]

11503

24GPY1118

(ii) Using the graph find a value for the half-life of the radioactive source.
You are advised to show clearly how you get your answer.

Half-life = _____ hours [2]

(b) The diagram below shows a nuclear process that releases energy.
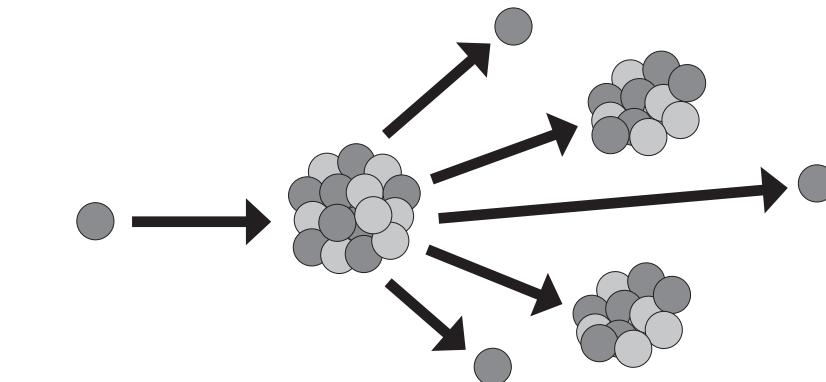
Source: Chief Examiner

(i) Name this nuclear process. _____ [1]

**(ii)** Describe what is happening. _____

_____ [1]

(iii) Name a peaceful use for this form of energy. _____

_____ [1]

[Turn over

11503

(c) The diagram below shows another nuclear process that releases energy.

The element

Isotopes of

Energy
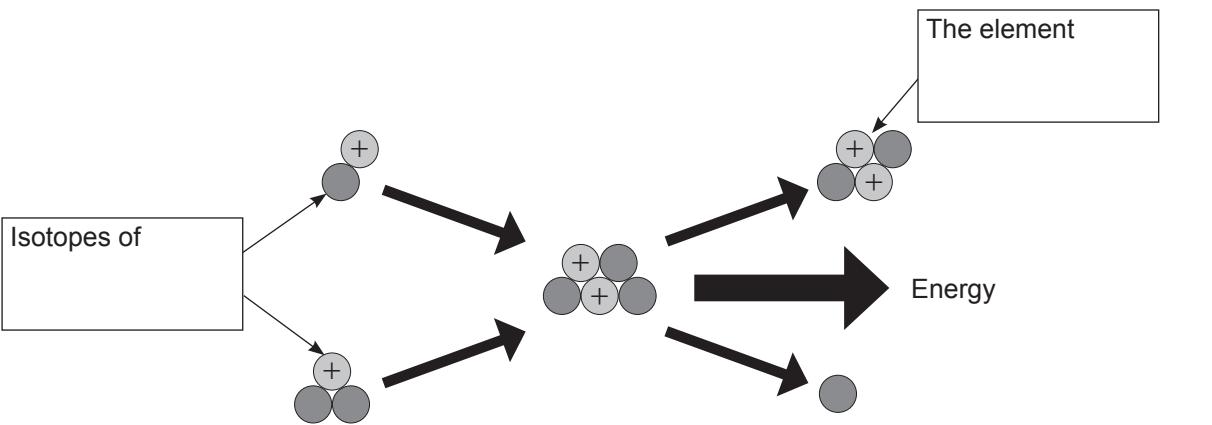
Source: Chief Examiner

(i) Name this nuclear process. _____ [1]

(ii) Name the element whose isotopes take part in this reaction and the element formed.
Write their names in the boxes above. [2]

(iii) Where does this nuclear process occur naturally?

_____ [1]

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