Write your name here

| Surname | Other names |
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**Pearson Edexcel Certificate**
**Pearson Edexcel**
**International GCSE**

Centre Number | | | | | |

Candidate Number | | | | |

# Physics

## Unit: KPH0/4PH0
## Science (Double Award) KSC0/4SC0
## Paper: 1P

Thursday 15 May 2014 – Morning
**Time: 2 hours**

Paper Reference
**KPH0/1P 4PH0/1P**
**KSC0/1P 4SC0/1P**

**You must have:**
Ruler, calculator

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.*
- Show all the steps in any calculations and state the units.
- 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 ☒.

## Information

- The total mark for this paper is 120.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

## Advice

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

*Turn over* ▶

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P 4 2 8 7 6 A 0 1 2 8

PEARSON

## EQUATIONS

You may find the following equations useful.

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

pressure × volume = constant $p_1 \times V_1 = p_2 \times V_2$

$$\text{frequency} = \frac{1}{\text{time period}} \qquad f = \frac{1}{T}$$

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

$$\text{power} = \frac{\text{energy transferred}}{\text{time taken}} \qquad P = \frac{W}{t}$$

$$\text{orbital speed} = \frac{2\pi \times \text{orbital radius}}{\text{time period}} \qquad v = \frac{2 \times \pi \times r}{T}$$

Where necessary, assume the acceleration of free fall, $g = 10\ \text{m/s}^2$.

**Answer ALL questions.**

**1** The table shows the main sections of the electromagnetic spectrum.

| Gamma rays | X-rays | Ultraviolet | Visible | Infrared | Microwaves | Radio |
|---|---|---|---|---|---|---|

(a) (i) State two sections of the spectrum that are used for communications.

**(2)**

1 .....

2 .....

(ii) State two sections of the spectrum that are used for cooking.

**(2)**

1 .....

2 .....

(b) The arrow below the table shows the direction of

**(1)**

☒ **A** increasing wave amplitude

☒ **B** increasing wave frequency

☒ **C** increasing wave speed

☒ **D** increasing wavelength

(c) A radio station broadcasts at a frequency of 200 kHz.

The wavelength of the radio waves is 1500 m.

(i) State the equation linking wave speed, frequency and wavelength.

**(1)**

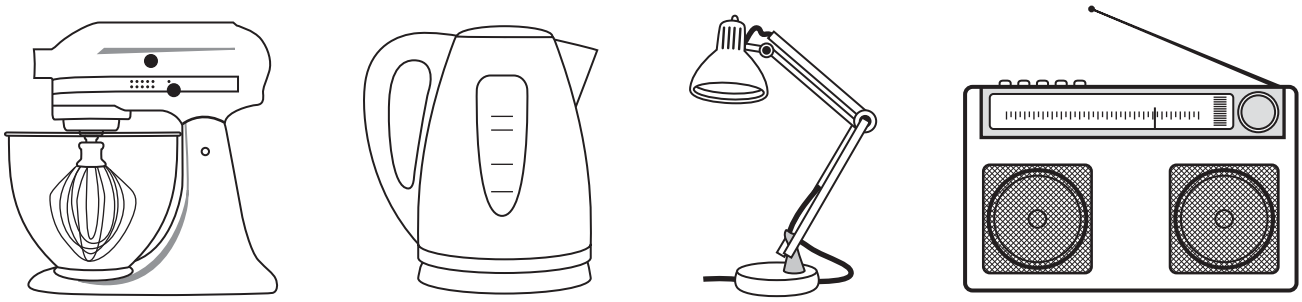
(ii) Calculate the speed of these radio waves and give the unit.

**(3)**

speed = ..... unit .....

**(Total for Question 1 = 9 marks)**

**2** The diagram shows some electrical appliances.



**A** **B** **C** **D**

(a) (i) Which appliance is designed to transfer electrical energy to thermal energy?

**(1)**

- ☒ **A** food mixer
- ☒ **B** kettle
- ☒ **C** lamp
- ☒ **D** radio

(ii) Which appliance is designed to transfer electrical energy to kinetic energy?

**(1)**

- ☒ **A** food mixer
- ☒ **B** kettle
- ☒ **C** lamp
- ☒ **D** radio

(b) In all the appliances, energy is conserved.

What is meant by the phrase **energy is conserved**?

**(1)**

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(c) (i) The lamp has an efficiency of 20%.

Explain what this means.

**(2)**

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(ii) Draw a labelled Sankey diagram for the lamp.

**(3)**

**(Total for Question 2 = 8 marks)**

**3** A student wants to calculate the pressure he exerts on the floor when he stands on one foot.

He records these measurements.

| | |
|---|---|
| My weight | 650 ..... |
| Area of the floor in contact with my foot | 270 $cm^2$ |

(a) (i) Complete the table by adding the unit for weight.

**(1)**

(ii) Which piece of equipment should the student use to measure his weight?

**(1)**

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(b) Suggest how the student measured the area of the floor in contact with his foot.

**(3)**

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(c) (i) State the equation linking pressure, force and area.

**(1)**

(ii) Calculate the pressure that the student's foot exerts on the floor.

**(2)**

pressure = ..... $N/cm^2$

**(Total for Question 3 = 8 marks)**

**4** Sodium-24 is a radioactive isotope.

(a) What are isotopes?

**(2)**

(b) Sodium-24 decays by emitting beta particles.

(i) Describe the nature of a beta particle.

**(1)**

(ii) Name a piece of equipment that can be used to detect beta particles.

**(1)**

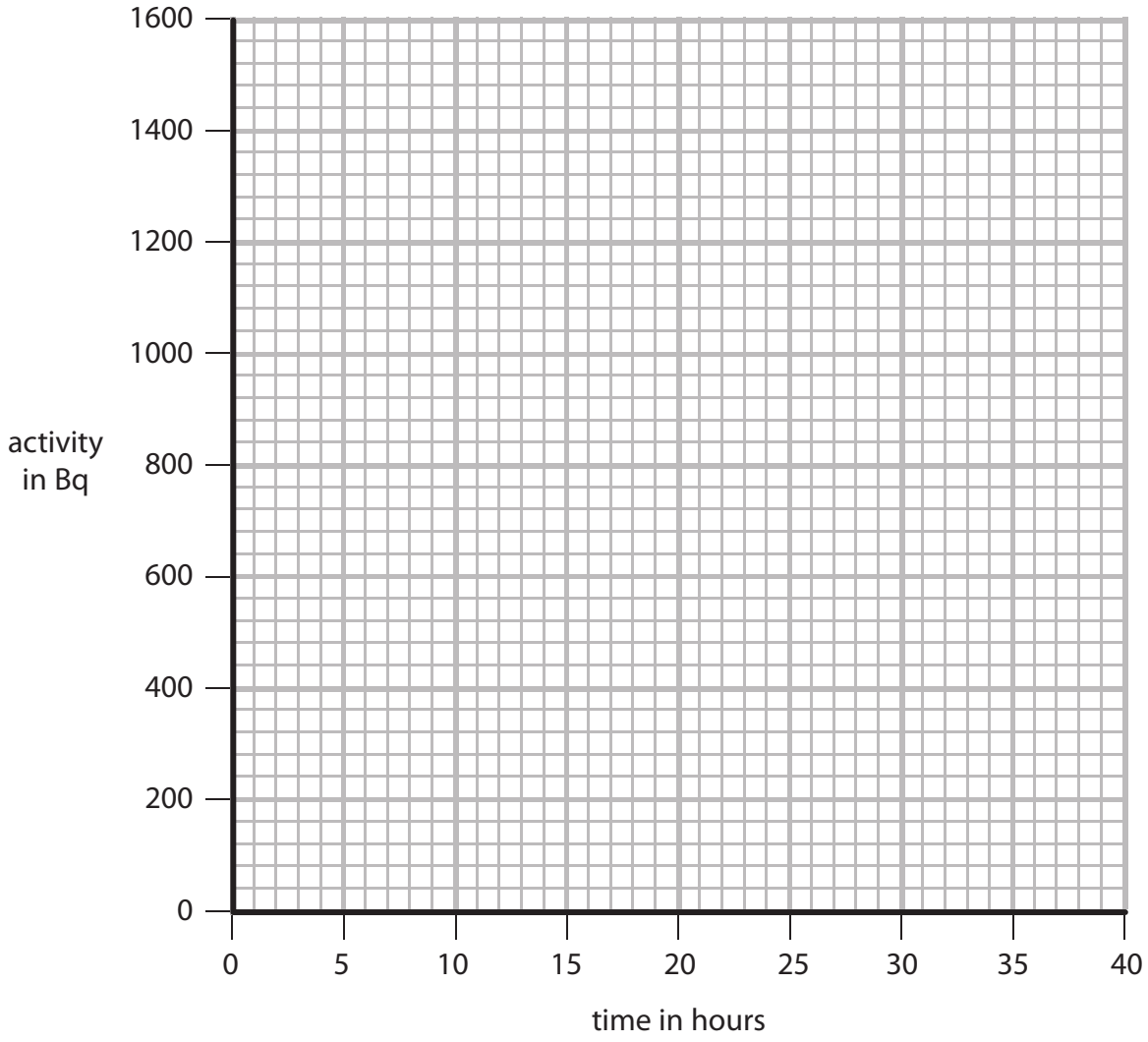
(iii) Describe how a detector can be used with sheets of lead, aluminium and paper to show that a sample of sodium-24 emits beta particles.

**(2)**

(c) A sample of sodium-24 has an activity of 1400 Bq.

On the axes, sketch a graph to show how the activity of this sample changes over the next 40 hours.
(the half-life of sodium-24 is 15 hours)

**(3)**



(d) Granite is a rock.

It contains a radioactive isotope of uranium that decays very slowly.

(i) Explain how scientists can use this radioactivity to find the age of a piece of granite.

**(4)**

(ii) Suggest why the age of a piece of granite could **not** be found using a uranium isotope with a half-life of 15 hours.

**(2)**

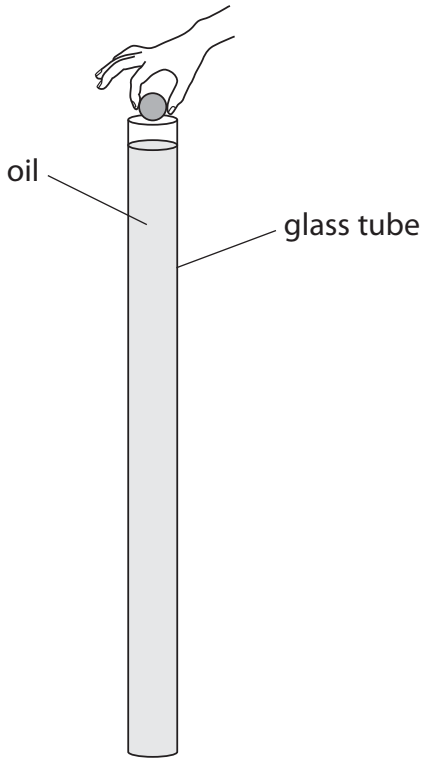
**(Total for Question 4 = 15 marks)**

**5** A student investigates terminal velocity.

She uses a tall glass tube filled with oil.

She drops a metal ball into the tube.

The ball falls through the oil.




(a) Use ideas about forces to explain how a falling object can reach a terminal velocity.

**(5)**

(b) Describe how the student could find out if the ball reaches terminal velocity as it falls through the oil.

In your answer, you should include

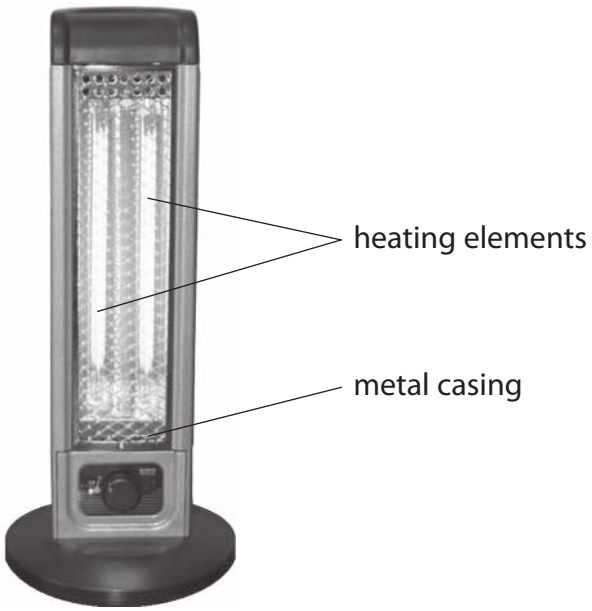
- the measuring instruments that the student will need
- the measurements that she should take
- how she could use her measurements to find out if the ball reached terminal velocity.

You may include a labelled diagram in your answer.

**(5)**

**(Total for Question 5 = 10 marks)**

**6** The photograph shows an electric heater.




(a) The power of the heater is 2000 W.

The heater is connected to a 230 V mains supply.

(i) State the equation linking power, current and voltage.

**(1)**

(ii) Calculate the current in the heater.

**(2)**

current = ..... A

(iii) Which of these fuses should be used with the heater?

**(1)**

- ☒ **A** 1A
- ☒ **B** 5A
- ☒ **C** 7A
- ☒ **D** 13A

(b) The two heating elements can be connected in series or in parallel.

Describe an advantage of each method.

**(2)**

series .....

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parallel .....

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(c) Some electrical appliances are fitted with an earth wire.

(i) Describe how an earth wire acts as a safety feature.

**(4)**

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(ii) Explain why this heater should be fitted with an earth wire.

**(2)**

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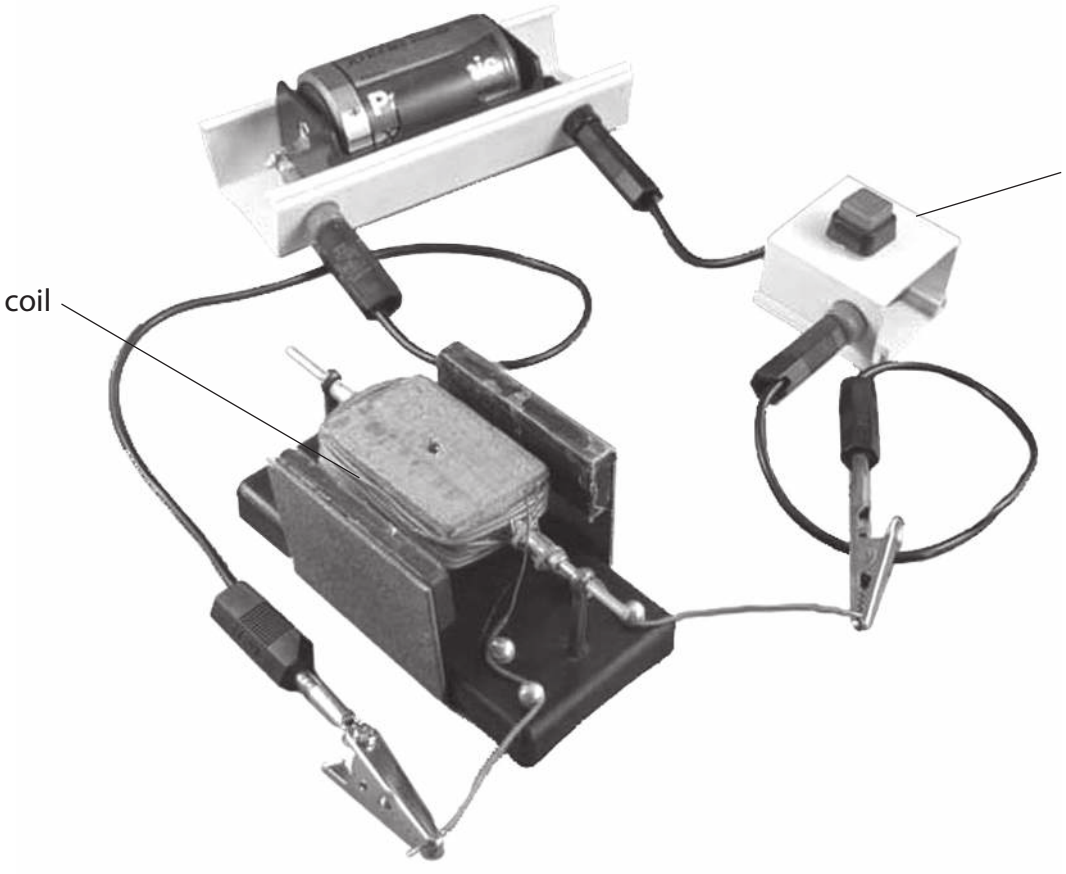
**(Total for Question 6 = 12 marks)**

**7** The photograph shows a small electric motor.




(a) Explain why the coil starts to spin when the switch is closed.

**(4)**

(b) (i) Suggest how to make the coil spin in the opposite direction.

**(1)**

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(ii) Suggest how to make the coil spin more slowly.

**(1)**

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**(Total for Question 7 = 6 marks)**

**8** A student investigates how the surface area of water affects how quickly it cools down.

He puts warm water into different shaped containers.

The photograph shows two of the containers.

This is the student's plan.

I will use four different containers and work out the surface area of water in each one.

I will heat some water and pour the same volume into each container.

I will put a thermometer into each container and measure the water temperatures.

After 15 minutes I will measure the temperatures again.

(a) State the independent variable in this investigation.

**(1)**

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(b) (i) State one variable that the student plans to control.

**(1)**

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(ii) Explain why it is important to control this variable.

**(2)**

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(c) Suggest a safety precaution for this investigation.

**(1)**

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(d) The table shows the student's results.

| Surface area in $cm^2$ | Starting temperature in °C | Temperature after 15 minutes in °C | Temperature difference in °C |
|---|---|---|---|
| 600 | 85 | 54 | |
| 400 | 95 | 55 | |
| 300 | 88 | 60 | |
| 150 | 85 | 60 | |

(i) Complete the table by inserting the missing temperature differences.

**(2)**

(ii) The student wants to display the data on a graph.

Give suitable labels for the axes of his graph.

**(3)**

*x*-axis .....

*y*-axis .....

(iii) The student realises that it was a mistake to have different starting temperatures.

Suggest how he could change his method to correct this mistake.

**(2)**

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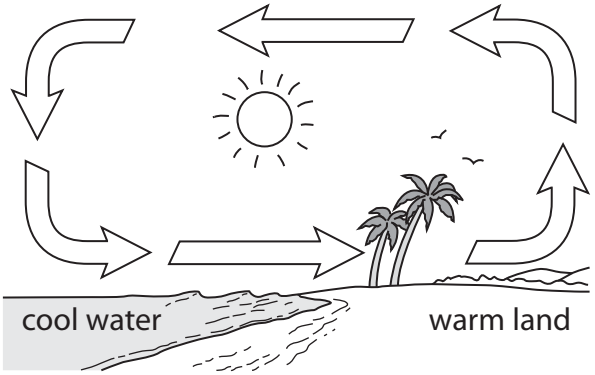
**(Total for Question 8 = 12 marks)**

**9** The diagram shows how air moves near the coast on a warm day.




(a) Explain why air moves as shown on the diagram.

**(5)**

(b) Explain how Brownian motion provides evidence that air is made of small particles.

**(3)**

**(Total for Question 9 = 8 marks)**

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**10** The Moon orbits the Earth.

(a) State a difference between the orbit of a moon and the orbit of a planet.

**(2)**

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(b) The radius of the Moon's orbit is 385 000 km.

It takes 27 days for the Moon to complete one orbit.

Calculate the orbital speed of the Moon.

Give a suitable unit.

**(3)**

orbital speed = ..... unit .....

(c) In 1971, astronaut Alan Shepard hit a golf ball on the surface of the Moon.

The golf ball had a mass of 50 g and he transferred 56 J of energy to it.

(i) State the equation linking kinetic energy, mass and velocity.

**(1)**

(ii) Calculate the initial velocity of the ball.

**(3)**

initial velocity = ..... m/s

(d) At its highest point the ball had gained 12 J of gravitational potential energy.

(i) State the kinetic energy of the ball at its highest point.

**(1)**

kinetic energy = ..... J

(ii) State the equation linking gravitational potential energy, mass, *g* and height.

**(1)**

(iii) Calculate the maximum height that the ball reached.
(gravitational field strength on the Moon, *g* = 1.6 N/kg)

**(2)**

maximum height = ..... m

(e) Suggest why the ball travelled further on the Moon than it would have done on Earth.

**(2)**

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**(Total for Question 10 = 15 marks)**

**11** In a nuclear reactor, a uranium-235 nucleus absorbs a neutron and fission occurs.

(a) Complete the equation below that shows a typical fission reaction.

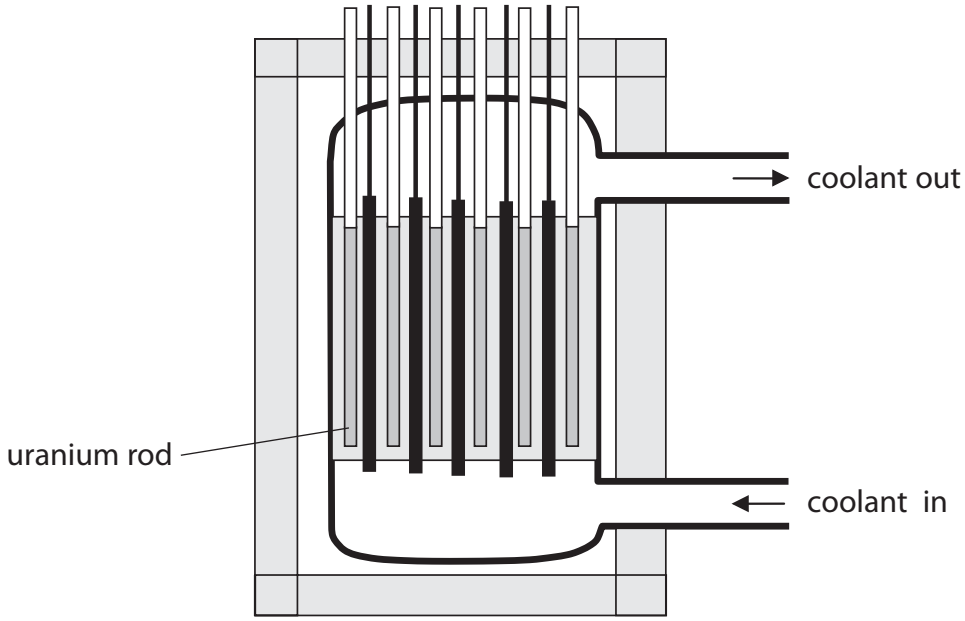
**(2)**

$$^{235}_{92}\text{U} + ^{1}_{0}\text{n} \rightarrow ^{142}_{\ \ }\text{Ba} + ^{\ \ }_{36}\text{Kr} + 3\,^{1}_{0}\text{n}$$

(b) Explain how nuclear fission can lead to a chain reaction.

**(3)**

(c) The diagram shows a nuclear reactor.




(i) On the diagram, label the control rods and the shielding.

**(2)**

(ii) Explain why the shielding is needed.

**(2)**

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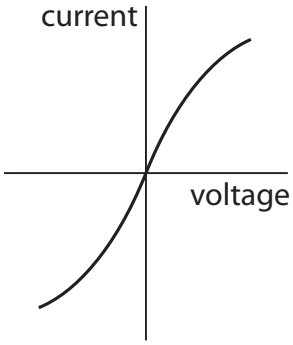
**(Total for Question 11 = 9 marks)**

**12** The graph shows how current and voltage vary for a filament lamp.




(a) Draw a circuit diagram to show how you should connect the equipment needed to make the measurements needed to plot the graph.

**(4)**

(b) The resistance of the filament lamp changes as the voltage is increased.

(i) How can you tell this from the graph?

**(1)**

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(ii) Explain these changes in resistance.

**(3)**

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**(Total for Question 12 = 8 marks)**

**TOTAL FOR PAPER = 120 MARKS**

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