Paper Reference(s) 5PH2H/01
Edexcel GCSE

Physics/Additional Science
Unit 2: Physics for Your Future
Higher Tier

Thursday 24 May 2012 – 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	H	/	0	1

X40248A

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.**

(Turn over)

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 $P = m \times v$

$$\text{force} = \frac{\text{change in momentum}}{\text{time}} \qquad F = \frac{(mv - mu)}{t}$$

(Formulae continue on next page)

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

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

gravitational potential energy = mass × gravitational field strength × vertical height $GPE = m \times g \times h$

kinetic energy = ½ × mass × velocity^2 $KE = \frac{1}{2} \times m \times v^2$

(Turn over)

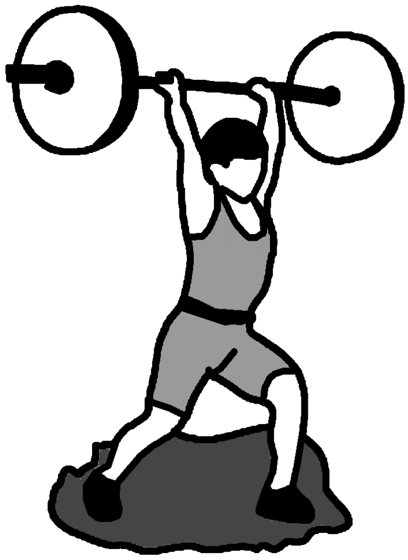
Answer ALL questions.

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 ☒.

(Questions begin on next page)

WEIGHT LIFTING

1 The picture shows a weight lifter.



(a) In one lift, he does 5040 J of work against gravity.

(i) One lift takes 4 seconds.

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

The power used to lift the weight is

(1 mark)

☐ A 1260 W

☐ B 2016 W

☐ C 12600 W

☐ D 20160 W

(Question continues on next page) (Turn over)

**(ii) The weight he lifts has a mass of 240 kg.
Gravitational Field Strength = 10 N/Kg
The energy gained by the mass is equal to the work done when lifting it.**

**Calculate the height he lifts this mass.
(3 marks)**

height = ________________ m

**(b) After lifting the mass, he must hold it steady for 3 seconds.
During this time, he does no work on the mass.**

State why he does no work on the mass in this time. (1 mark)

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(Question continues on next page) **(Turn over)**

(c) After the 3 seconds, the weight lifter drops the mass.
The velocity of the mass just before it hits the floor is 6·4 m/s.

Calculate the momentum of the mass just before it hits the floor.
State the unit. (3 marks)

momentum = ______________ unit = ______________

Q1

(Total 8 marks)

(Questions continue on next page)

ELECTROSTATICS

2 A light, polystyrene ball is coated with a thin layer of metal.
Diagram 1 shows the ball on a metal plate.
In diagram 2, the plate has been charged and the ball is rising to hit the earthed lid.

diagram 1

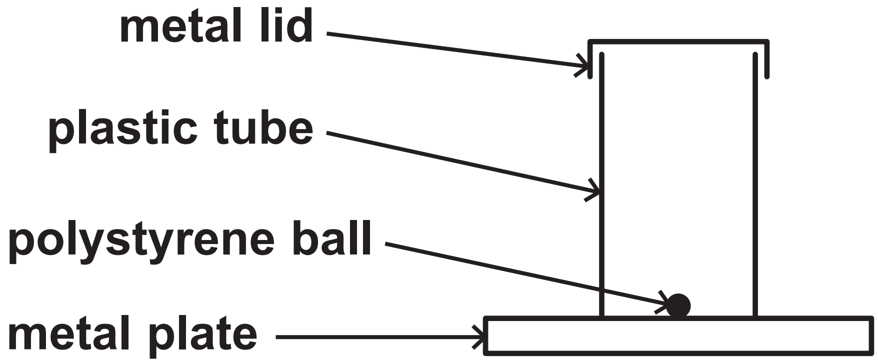
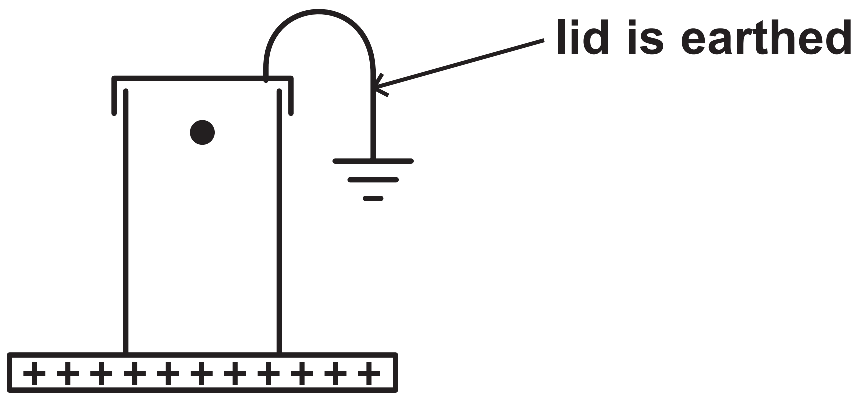


diagram 2



(a) (i) State the sign of the charge on the ball as it moves upwards. (1 mark)

(Question continues on next page) (Turn over)

(ii) Explain why the ball moves upwards. (2 marks)

(b) The ball discharges when it hits the earthed lid.

Explain how the ball loses its charge. (2 marks)

(Question continues on next page) (Turn over)

(c) The ball continues to move up and down between the charged plate and the earthed lid.

Explain why the ball continues to move up and down. (2 marks)

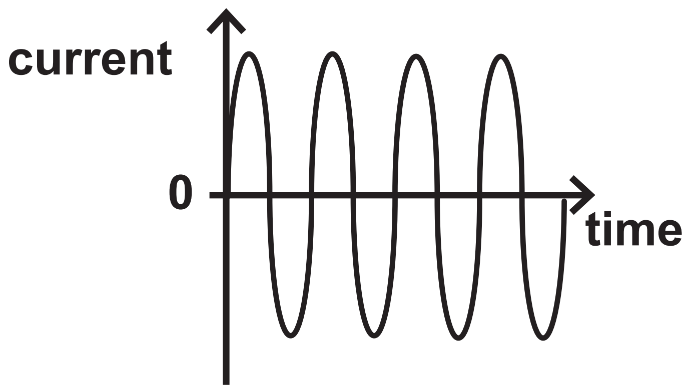
(Question continues on next page)

(d) The current in the wire connected to earth may be described by a graph.

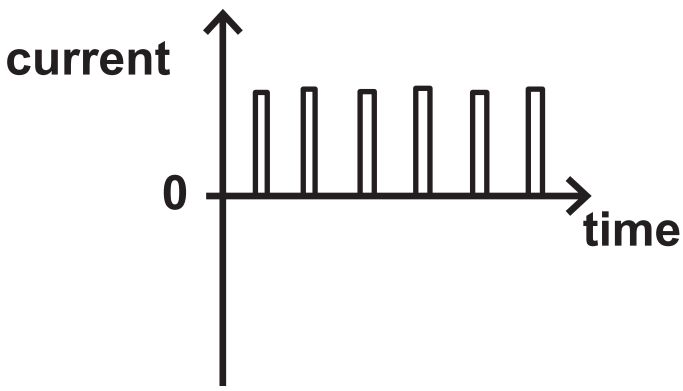
Which of these graphs best shows the current in the earth wire?

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

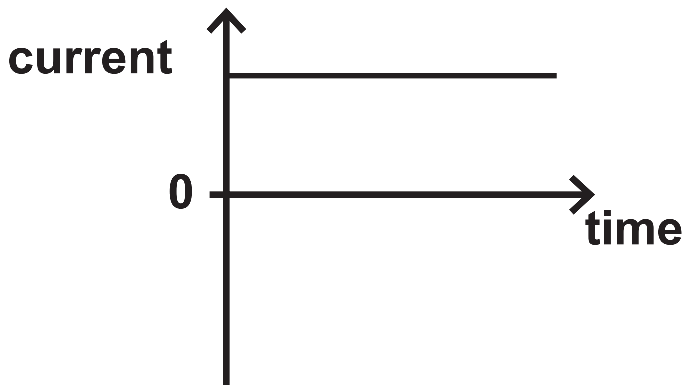
☐ A



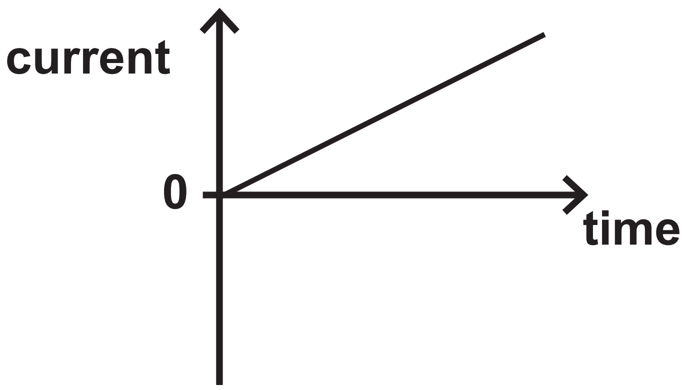
☐ B



☐ C



☐ D



Q2

(Total 8 marks) ☐

HEATING A GREENHOUSE

3 A greenhouse contains an electric heater.

(a) The heater makes good use of the heating effect of an electric current.

Give an example of a device where the heating effect of an electric current is a DISADVANTAGE. (1 mark)

(Question continues on next page)

(b) This label is attached to the heater.

230 V	500 W
50 Hz	

Use this information to calculate the expected current in the heater. (3 marks)

current = ________________ A

(Question continues on next page)

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

The potential difference across the heater can be measured either in volts or in

(1 mark)

- ☐ **A** **amps per ohm**
- ☐ **B** **amps per joule**
- ☐ **C** **coulombs per ohm**
- ☐ **D** **joules per coulomb**

(d) **When a charge flows in a resistor, the resistor becomes hot.**

Explain why the resistor becomes hot. (2 marks)

(Question continues on next page)

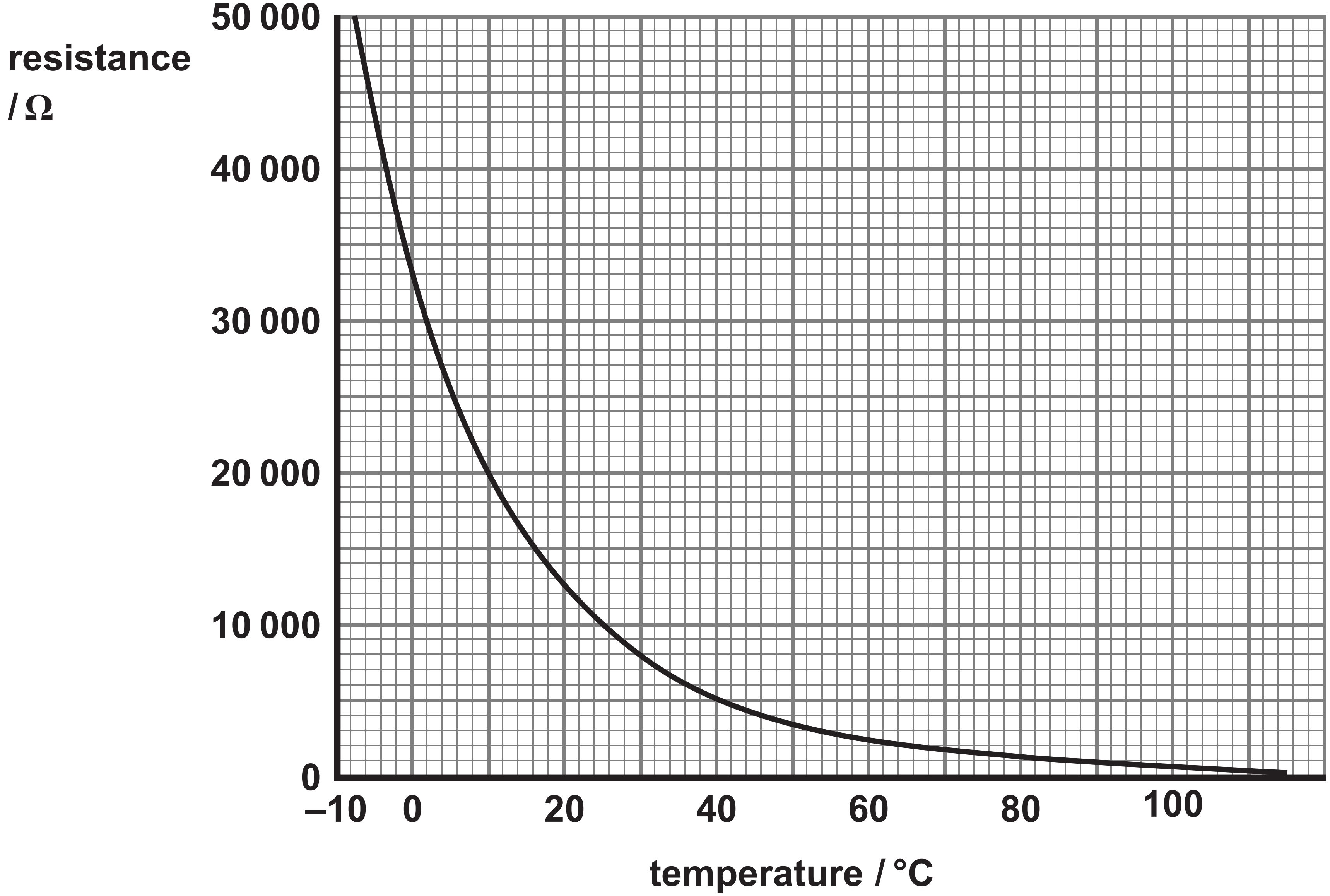
(e) A thermistor is used to control the heater. The graph on page 17 shows how the resistance of the thermistor changes with temperature.

When the temperature is 10 °C, the current in the thermistor is 0·60 mA.

Calculate the potential difference across the thermistor at 10 °C. (3 marks)

potential difference = ________________ V

(Question continues on next page)



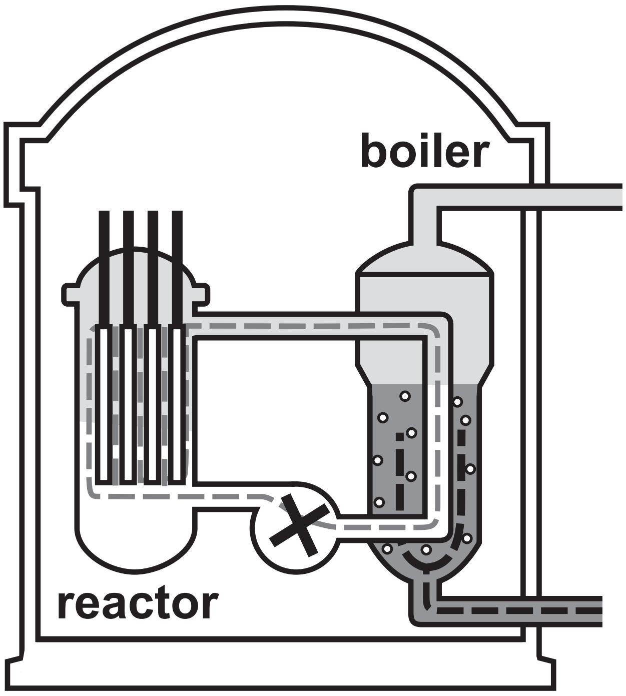
Q3

(Total 10 marks)

(Questions continue on next page)

NUCLEAR ENERGY

4 Electricity is generated in a nuclear power station.
The diagram shows the first stages in this process.



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(Turn over)

(a) The thermal energy released in the reactor is used to generate steam.

Describe how the steam is used to generate electricity. (2 marks)

(Question continues on next page)

(b) Energy is released by a nuclear chain reaction.

Describe how the fission of a uranium-235 nucleus can start off a chain reaction.
You may draw a diagram to help with your answer.
(3 marks)

(Continue your answer on next page)

(Turn over)

(Question continues on next page)

(c) One of the products of the fission of uranium-235 is barium-142.

Which of these could be a product of the same reaction?

Put a cross (☒) in the box next to your answer. (1 mark)

☐ A krypton-91

☐ B krypton-95

☐ C krypton-98

☐ D krypton-100

(d) Barium-142 emits beta radiation.
Beta radiation is ionising.

Explain what happens when beta radiation ionises. (2 marks)

(Question continues on next page) (Turn over)

(e) A fusion reaction does not have radioactive products.
However, it needs large amounts of energy to make it happen.

Explain why large amounts of energy are needed to make a fusion reaction happen. (2 marks)

Q4

(Total 10 marks)

(Questions continue on next page)

PARACHUTING

5 Christine is a free-fall parachutist.

A velocity–time graph for her jump is shown on page 25.

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

On the graph, the greatest acceleration is at

(1 mark)

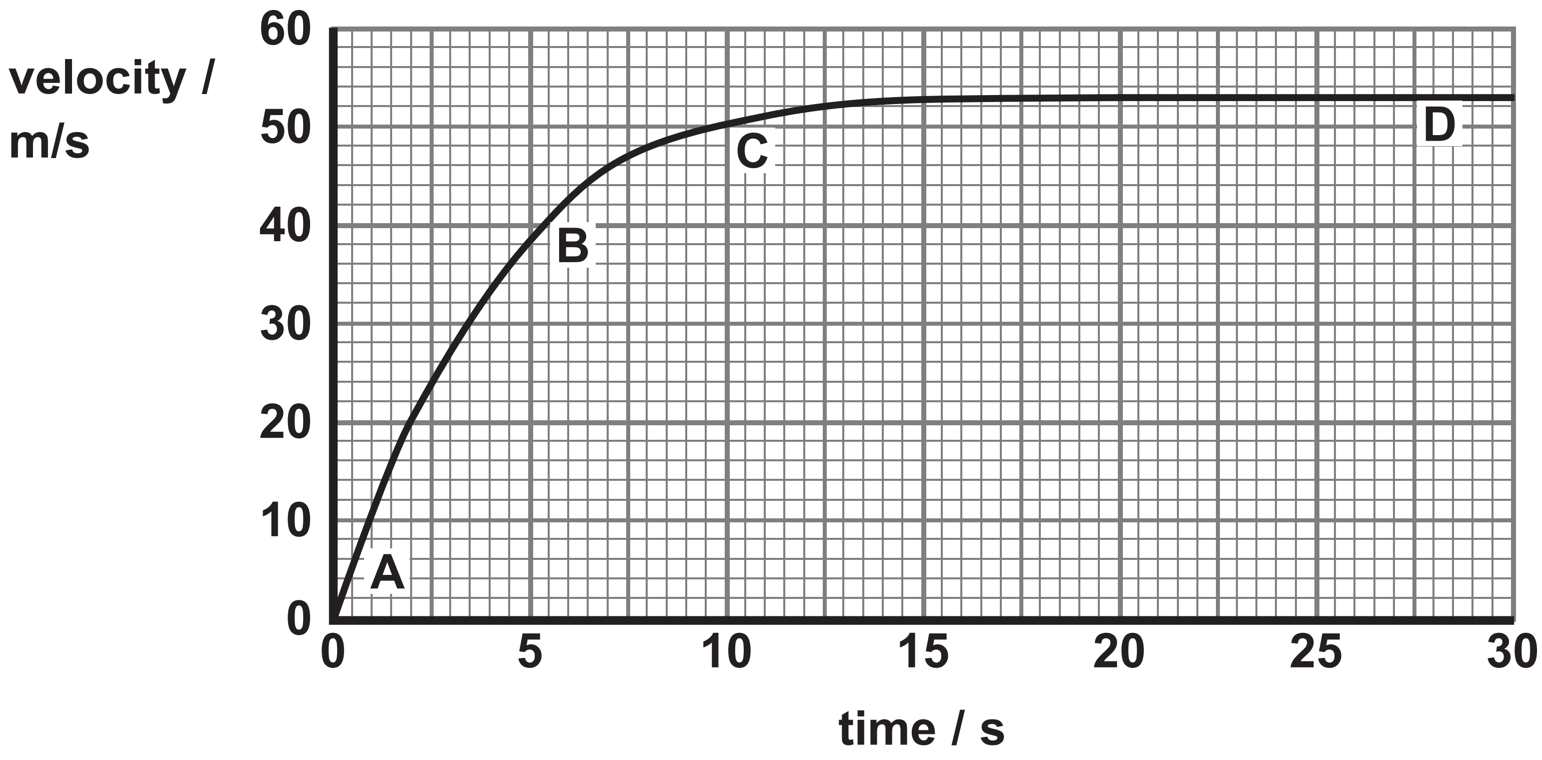
☐ A

☐ B

☐ C

☐ D

(Question continues on next page)



(Question continues on next page)

(Turn over)

(b) Estimate how far Christine falls in the first 2 s.
(3 marks)

Christine falls = _______________ m

(c) Explain the difference between velocity and speed.
(2 marks)

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(Question continues on next page)

(Turn over)

*(d) The graph shows how Christine's velocity changes from the time she leaves the plane until she reaches terminal velocity.

Explain, in terms of forces, why her velocity changes as shown in the graph. (6 marks)

(Continue your answer on next page)

(Turn over)

Q5

(Total 12 marks)

(Questions continue on next page)

RADIOACTIVITY AND HEALTH

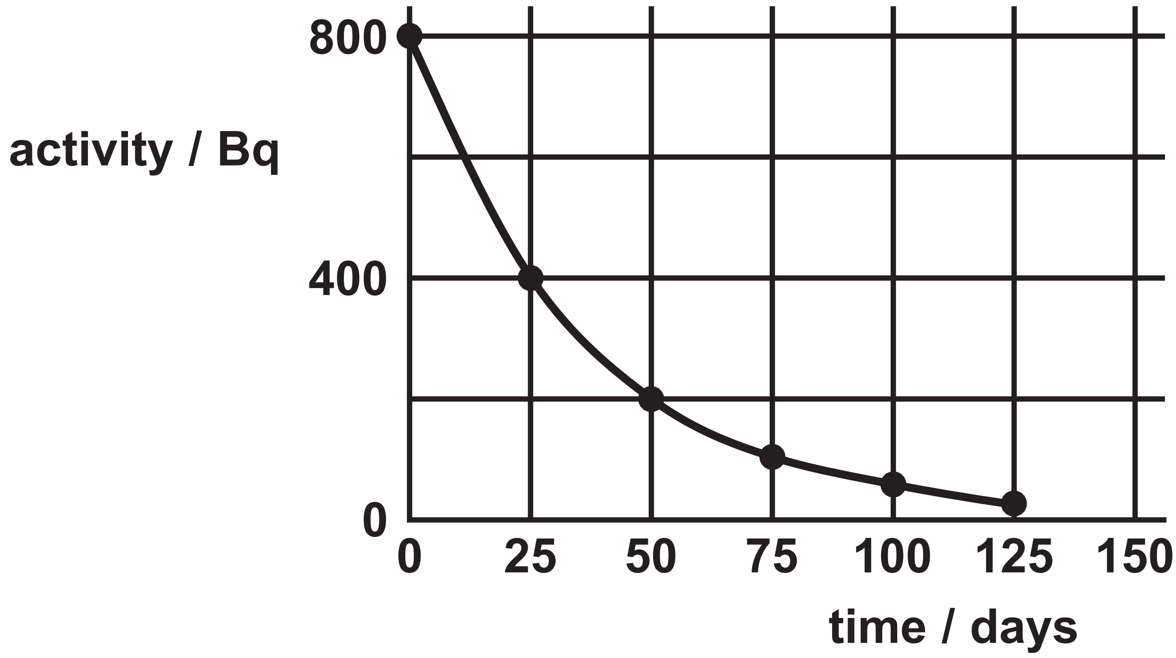
6 (a) Radioactive materials can be a risk to health. Some food contains radioactive material.

Explain why people can eat this food without serious risk. (2 marks)

(Question continues on next page)

(Turn over)

(b) A radioactive material can be used to help diagnose heart disease.
The graph shows the decay curve for this material.



(Question continues on next page)

(i) A scientist measures the activity of a sample of this material as 400 Bq.
Some time later, he measures the activity as 100 Bq.

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

The time between the two measurements is about

(1 mark)

- ☐ A 25 days
- ☐ B 50 days
- ☐ C 75 days
- ☐ D 100 days

(Question continues on next page)

(Turn over)

(ii) Estimate the activity that should appear on the graph for a time of 150 days. (1 mark)

activity at 150 days = ____________ Bq

(c) Half-life is an important factor to consider when choosing isotopes for medical treatments.

Explain what HALF-LIFE means. (2 marks)

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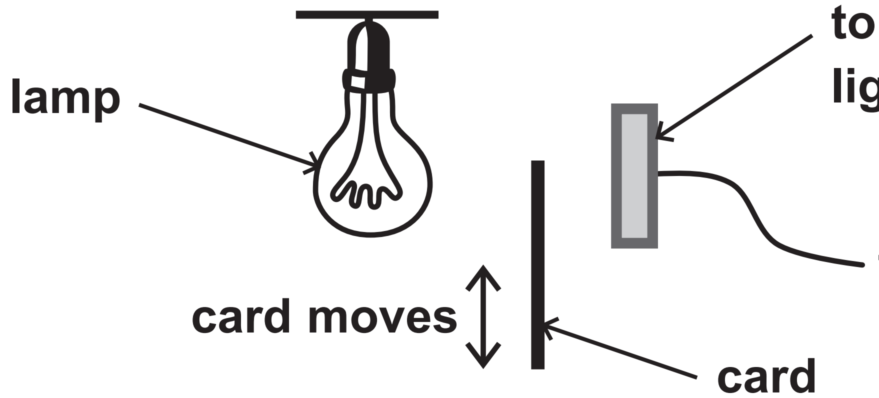
(Question continues on next page)

(Turn over)

*(d) A teacher decides to model how a machine checks the level of the liquid in medicine bottles.
The machine uses a radioactive source to sound an alarm when the level of liquid becomes too low.

He sets up the arrangement shown.



The piece of card can be moved up and down between the lamp and the detector.
Each part of the teacher's arrangement corresponds to a part of the machine.

By comparing the parts of the teacher's arrangement to the parts of the machine, discuss how effective this model is. (6 marks)

(Begin your answer on next page)

(Continue your answer on next page)

Q6

(Total 12 marks)

TOTAL FOR PAPER = 60 MARKS

END