Write your name here

Surname	Other names

Centre Number | Candidate Number

Edexcel GCSE

Physics/Additional Science

Unit 2: Physics for Your Future

Higher Tier

Thursday 24 May 2012 – Morning
Time: 1 hour

Paper Reference
5PH2H/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 0 2 4 8 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 $P = m \times v$

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

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 $\text{KE} = ½ \times m \times v^2$

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Questions begin on next page.

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 ☒.

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)

☒ **A** 1260 W

☒ **B** 2016 W

☒ **C** 12600 W

☒ **D** 20160 W

(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)

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)

.....

.....

(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)

momentum = ... unit = ...

(Total for Question 1 = 8 marks)

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.

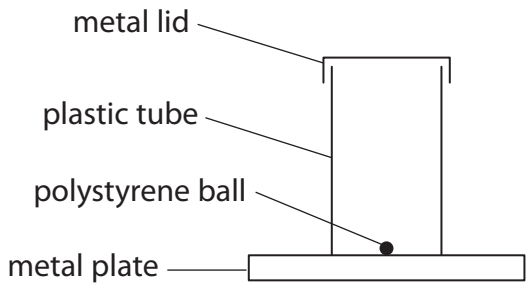

diagram 1

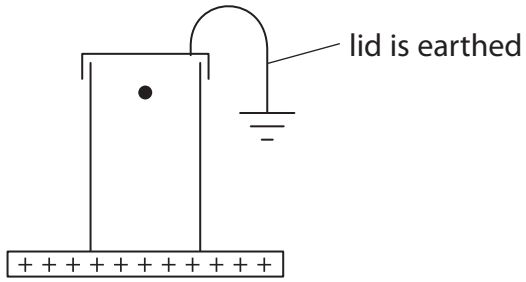

diagram 2

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

(1)

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(ii) Explain why the ball moves upwards.

(2)

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

Explain how the ball loses its charge.

(2)

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(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)

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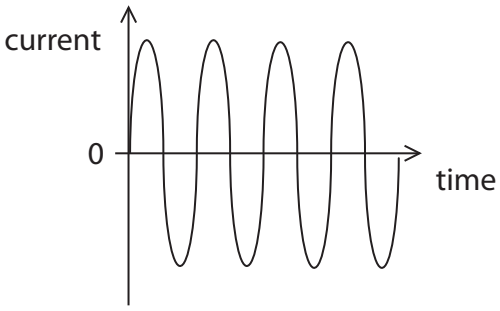
(d) The current in the wire connected to earth may be described by a graph.

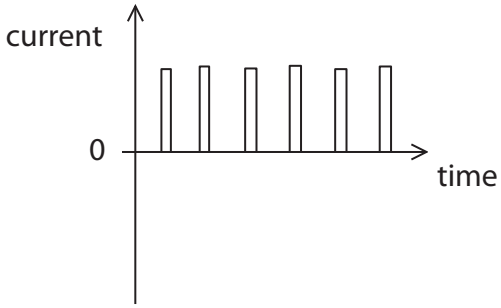
Which of these graphs best shows the current in the earth wire?

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

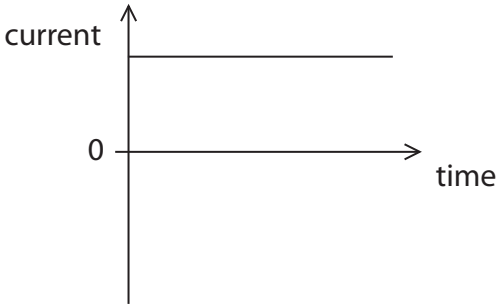
(1)



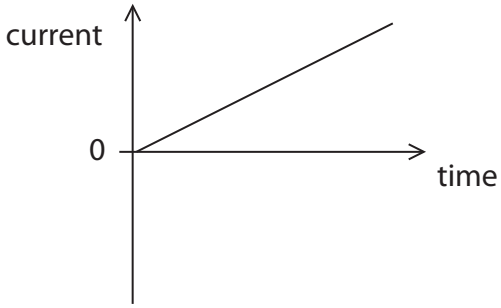
☒ **A**



☒ **B**



☒ **C**



☒ **D**

(Total for Question 2 = 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)

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(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)

current = ... A

(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)

- ☒ **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)

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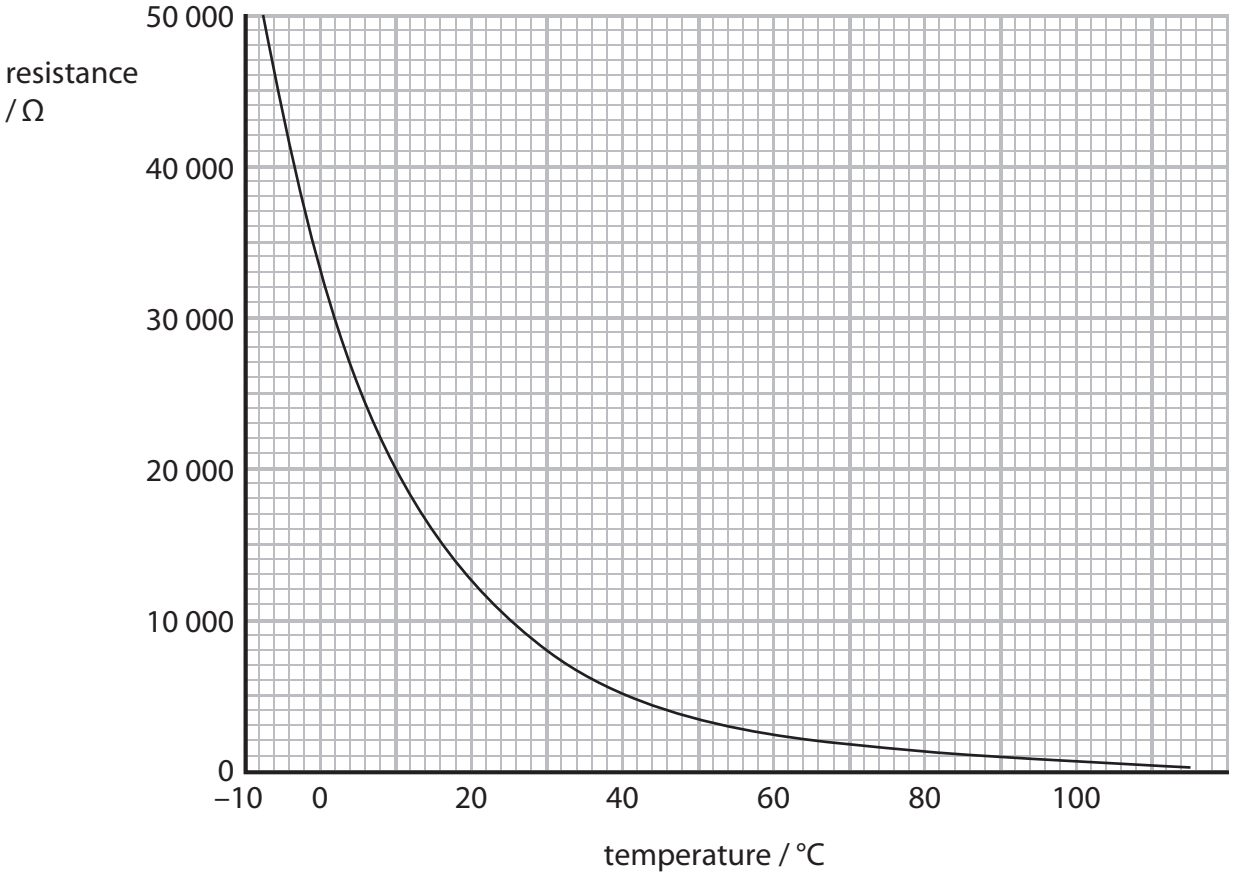
(e) A thermistor is used to control the heater.
The graph shows how the resistance of the thermistor changes with temperature.



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.

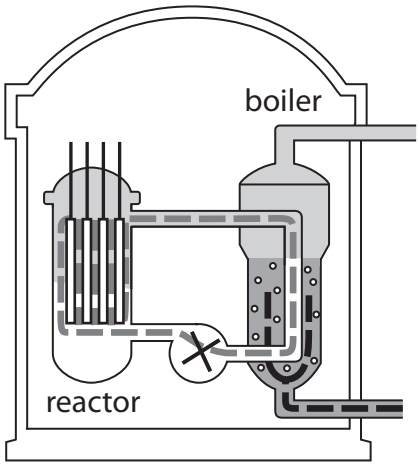
(3)

potential difference = ... V

(Total for Question 3 = 10 marks)

Nuclear energy

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



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

Describe how the steam is used to generate electricity.

(2)

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(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)

(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)

☒ **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)

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(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)

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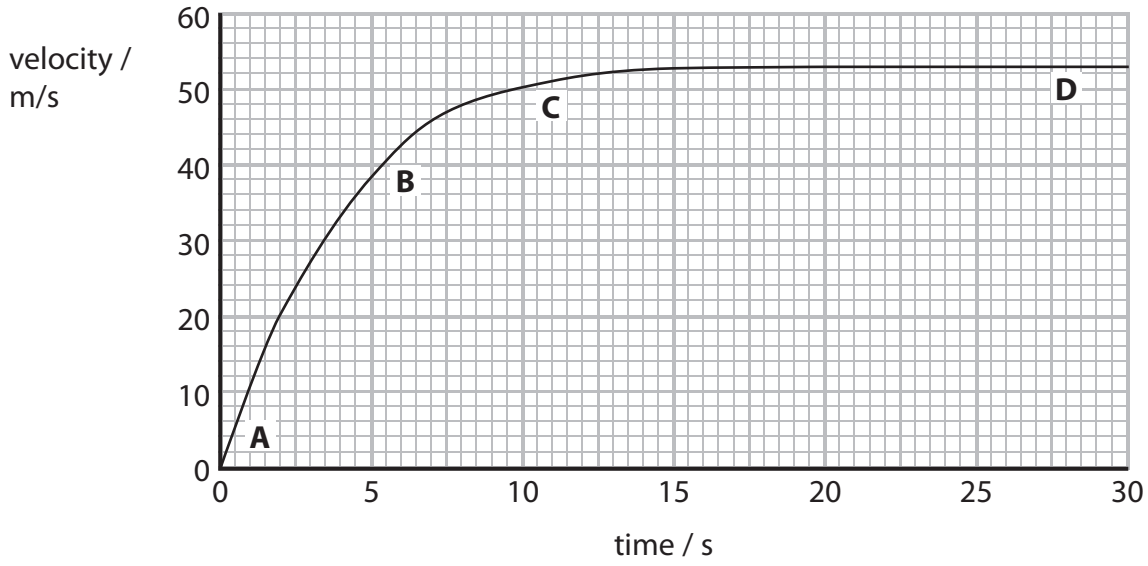
(Total for Question 4 = 10 marks)

Parachuting

5 Christine is a free-fall parachutist.

This is a velocity–time graph for her jump.



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

On the graph, the greatest acceleration is at

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

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

(3)

Christine falls = ... m

(c) Explain the difference between velocity and speed.

(2)

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*(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)

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(Total for Question 5 = 12 marks)

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)

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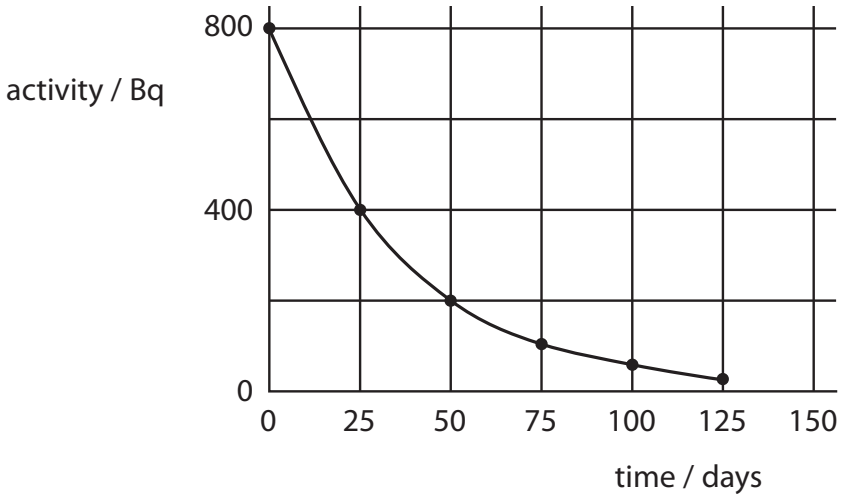
(b) A radioactive material can be used to help diagnose heart disease.
The graph shows the decay curve for this material.



(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)

☒ **A** 25 days

☒ **B** 50 days

☒ **C** 75 days

☒ **D** 100 days

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

(1)

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)

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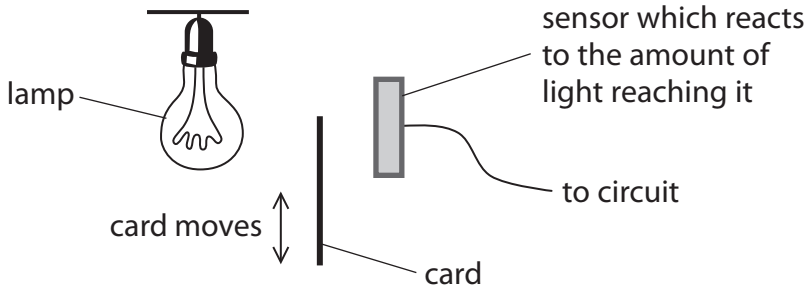
*(d) A teacher decides to model how a machine checks the level of the liquid in medicine bottles.
The machine uses a radioactive source to sound an alarm when the level of liquid becomes too low.

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)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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