

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

Physics/Additional Science

Unit P2: Physics for Your Future

Higher Tier

Tuesday 18 June 2013 – 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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PEARSON

FORMULAE

You may find the following formulae useful.

charge = current \times time

$$Q = I \times t$$

potential difference = current \times resistance

$$V = I \times R$$

electrical power = current \times potential difference

$$P = I \times V$$

energy transferred = current \times potential difference \times time

$$E = I \times V \times t$$

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

$$a = \frac{(v - u)}{t}$$

force = mass \times acceleration

$$F = m \times a$$

weight = mass \times gravitational field strength

$$W = m \times g$$

momentum = mass \times velocity

$$P = m \times v$$

$$\text{force} = \frac{\text{change in momentum}}{\text{time}}$$

$$F = \frac{(mv - mu)}{t}$$

work done = force \times distance moved in the direction of the force

$$E = F \times d$$

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

$$P = \frac{E}{t}$$

gravitational potential energy = mass \times gravitational field strength \times vertical height

$$\text{GPE} = m \times g \times h$$

kinetic energy = $\frac{1}{2} \times$ mass \times velocity²

$$\text{KE} = \frac{1}{2} \times m \times v^2$$



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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 ☒.

Static electricity

1 (a) A student wins a trophy. It is a metal cup on a black plastic base.



The student cleans the trophy.
She holds one of the metal handles and rubs the rest of the trophy with a dry cloth.

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

The plastic base becomes negatively charged because it gains

(1)

- A atoms
- B electrons
- C neutrons
- D protons

(ii) Explain why the base gains a negative charge when she rubs the trophy with the cloth.

(2)

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(iii) The metal cup does not become charged when she rubs the trophy.
Suggest why the cup does not become charged.

(2)

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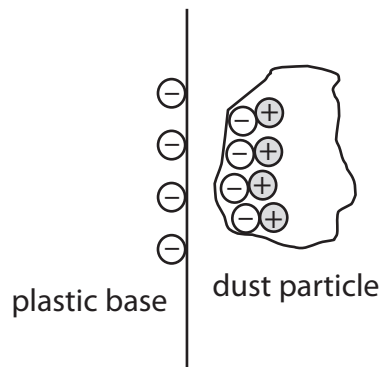


(iv) Some dust particles in the air drift near to the plastic base just after she cleans the trophy.

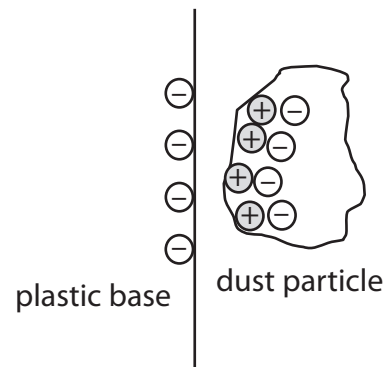
Which diagram shows the correct distribution of charges on a dust particle near to the charged plastic base?

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

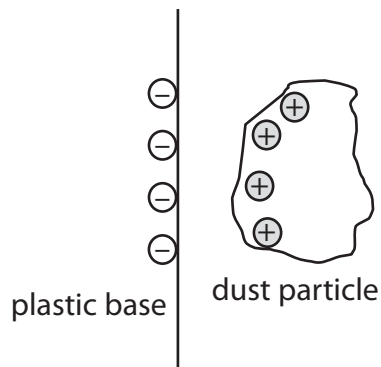
(1)



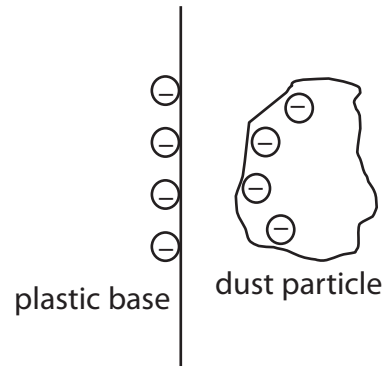
A



B



C



D

(b) Describe **one** situation where separation of electric charge can create a spark.

(2)

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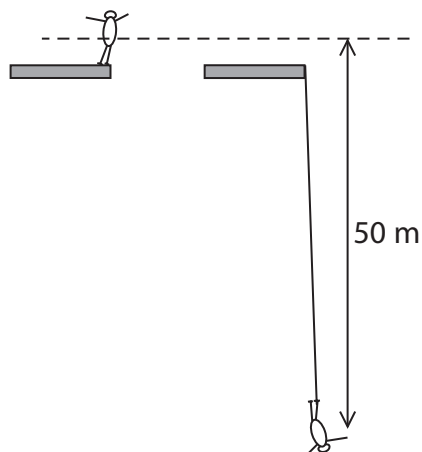
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(Total for Question 1 = 8 marks)



Bungee jumping

- 2 A 60 kg student weighs 600 N.
He does a bungee jump.



The bungee cord becomes straight and starts to stretch when he has fallen 50 m.

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

He first stops moving

(1)

- A** before all the energy has disappeared
- B** before the bungee cord starts to stretch
- C** when the bungee cord is stretched the most
- D** when the elastic potential energy is zero

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

When his speed is 10 m/s his momentum is

(1)

- A** 600 kg m/s
- B** 3 000 kg m/s
- C** 6 000 N m/s
- D** 30 000 N m/s



(c) (i) Calculate the change in gravitational potential energy as the student falls 50 m.
Give the unit.

(3)

change in gravitational potential energy = unit

(ii) State at what point in the bungee jump the student has maximum kinetic energy.

(1)

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(iii) Explain why his maximum kinetic energy is likely to be less than your answer to (c)(i).

(2)

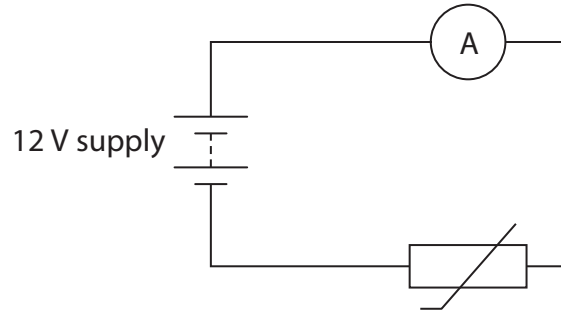
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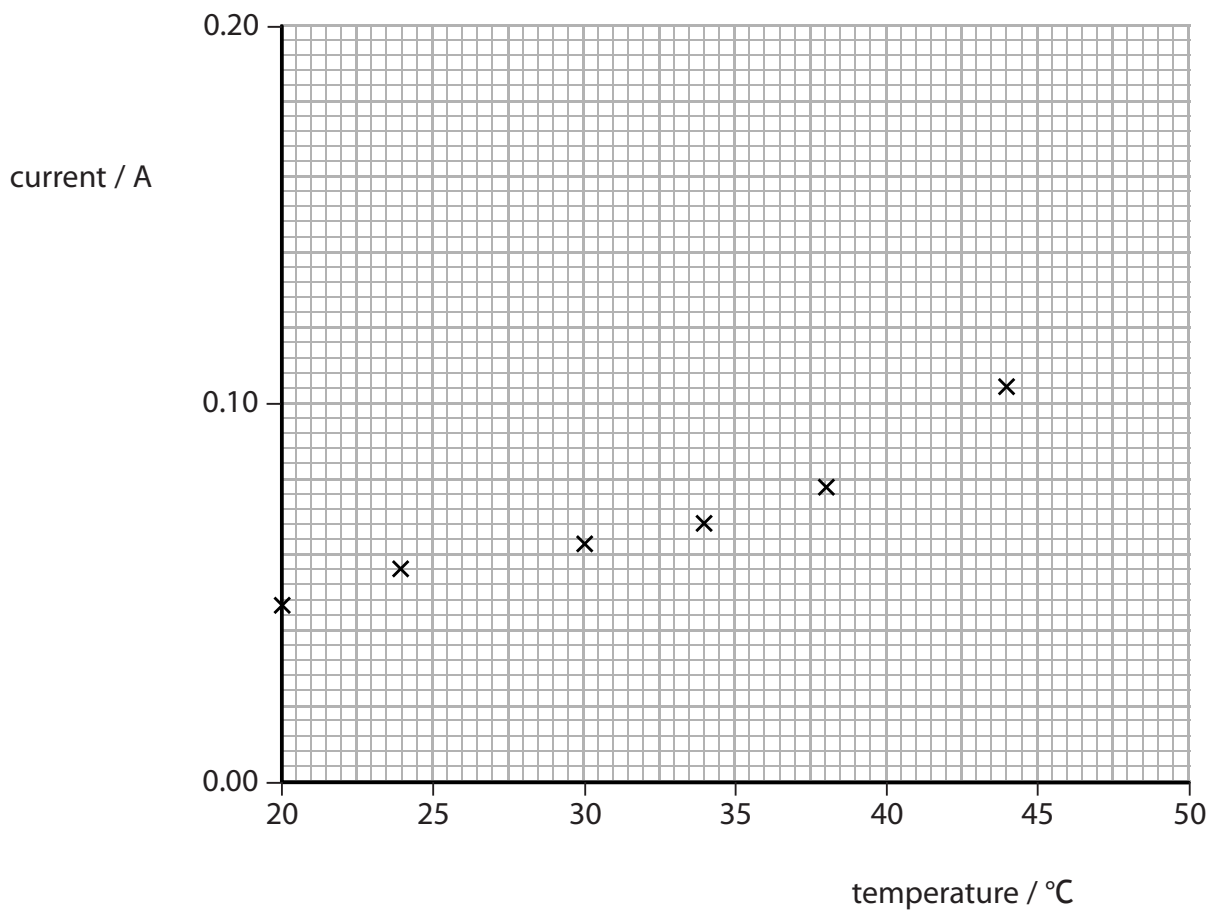


Electric current and temperature

- 3 (a) A designer is going to use a thermistor in a temperature gauge. He connects the thermistor into this circuit.



He heats the thermistor and measures the current at different temperatures. Here are some of the results plotted on a graph.



At 47 °C the current was 0.138 A.

- (i) Plot this value on the graph. (1)
- (ii) Draw the curve of best fit through the points. (1)



- (iii) The supply voltage is 12 V.
At 20 °C the current is 0.047 A.

Calculate the resistance of the thermistor at this temperature.

(3)

resistance = Ω

- (iv) Use this graph of current against temperature to explain the relationship between resistance and temperature for this thermistor.

(2)

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- (b) (i) When there is an electric current in a resistor, the resistor gets hot.

Explain why the resistor gets hot.

(2)

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- (ii) Suggest why the thermistor in a temperature gauge might indicate a temperature slightly higher than the actual temperature of its surroundings.

(1)

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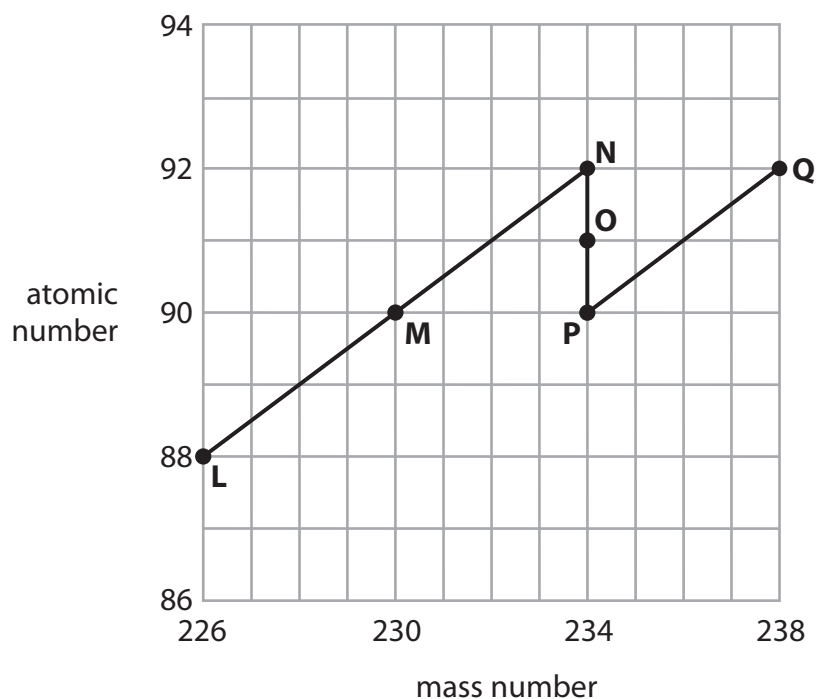
(Total for Question 3 = 10 marks)



Uranium-238

- 4 Uranium-238 is an isotope of uranium. It may undergo either radioactive decay or nuclear fission.

A nucleus of uranium-238 is shown as **Q** in the chart.



- (a) State **two** letters from the chart which show isotopes of the same element. (1)

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- (b) Explain what happens when **Q** decays to **P**. (2)

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- (c) Explain what happens when **P** decays to **O**. (2)

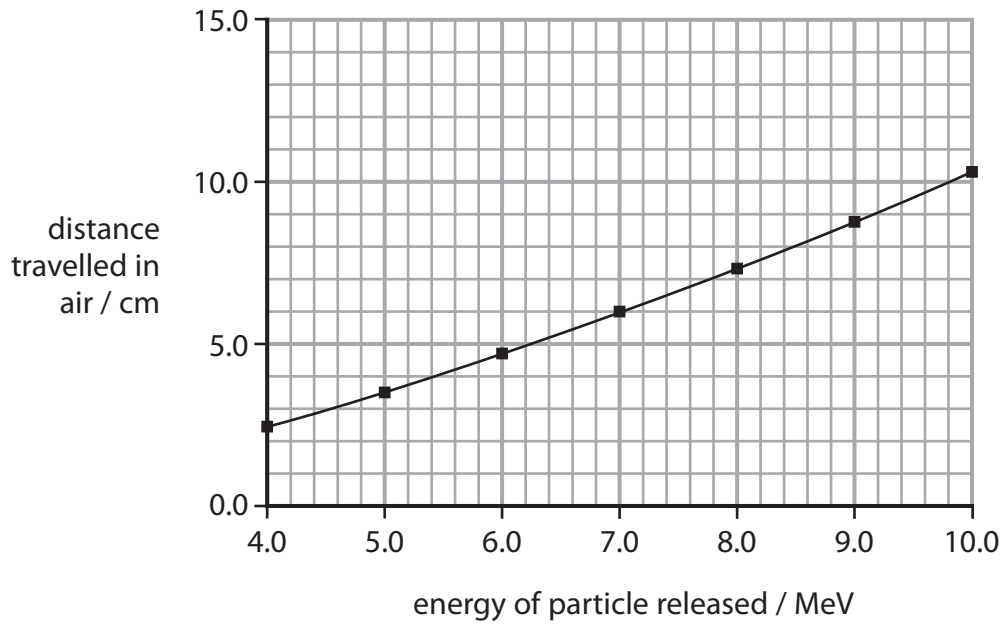
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- (d) Particles released during radioactive decay can have different energies. A suitable unit for these energies is MeV. For one type of decay, the particles released have energies between 4.0 MeV and 10.0 MeV. The graph shows how far the particles with these energies travel in air.



- (i) State the name of this type of particle.

(1)

- (ii) Use information from the graph to describe how the distance travelled in air depends on the energy of the particle.

(2)

- (e) Uranium-238 can only undergo nuclear fission by absorbing fast neutrons. The fission emits neutrons which very quickly lose their energy. Suggest why the fission of uranium-238 does not produce a chain reaction.

(2)

(Total for Question 4 = 10 marks)



Force and acceleration

5 (a) A car is travelling along a level road.



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

When the velocity of the car is constant, the force of friction on it is

(1)

- A** zero
- B** greater than the driving force
- C** smaller than the driving force
- D** the same size as the driving force

(ii) The car now accelerates in a straight line.
Its average acceleration is 12 m/s^2 .

Calculate the increase in velocity of the car in 4.0 s.

(3)

speed = m/s



(b) This table shows data about two other cars.

car	mass	time taken to reach 30 m/s from rest
family car	1400 kg	10 s
sports car	600 kg	5 s

The owner of the family car claims that although the sports car has greater acceleration, it produces a smaller accelerating force than his family car.

Explain how these figures support his claim.

(2)

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*(c) After going to the shops, a car driver places a bag of shopping on the passenger seat. During the journey home, the driver has to use the brakes to stop very suddenly. The driver is wearing a seat belt.

Explain what happens next to the car, the driver and the shopping bag.

(6)

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(Total for Question 5 = 12 marks)



Radioactivity

- 6 (a) An underground oil pipe starts to leak oil.
To find the leak, a technician adds a gamma source to the oil flowing in the pipe.

Describe how the technician can find the position of the leak.

(2)

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- (b) Which of these is correct for half-life?

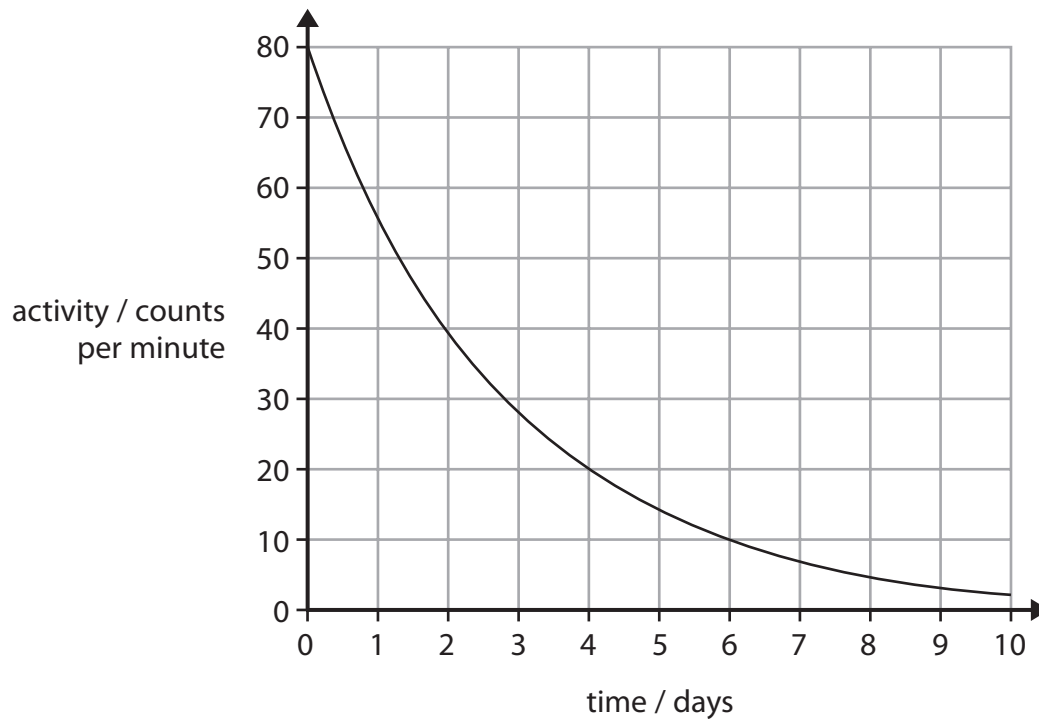
Put a cross (☒) in the box next to your answer.

(1)

- A** It is half the time for all the atoms to decay
- B** It is the time it takes for an atom to half decay
- C** It is the time it takes for half an atom to decay
- D** It is the time it takes for half the atoms to decay



- (c) The graph shows how the activity of a sample of a radioactive material changes with time.
The sample has an initial activity of 80 counts per minute.



- (i) Use the graph to find the half-life of the material.

(1)

half life = days

- (ii) Another sample of the material has an initial count rate of 40 counts per minute.

Sketch, on the same axes, the activity of this sample for the first 4 days.

(2)



