Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | Candidate Number

Physics/Additional Science

Unit P2: Physics for Your Future

Foundation Tier

Thursday 12 June 2014 – Morning
Time: 1 hour

Paper Reference
5PH2F/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 ▶

P43421A

1/1/1/1/1/

P 4 3 4 2 1 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

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 ☒.

Current electricity

1 A student is investigating a filament lamp.

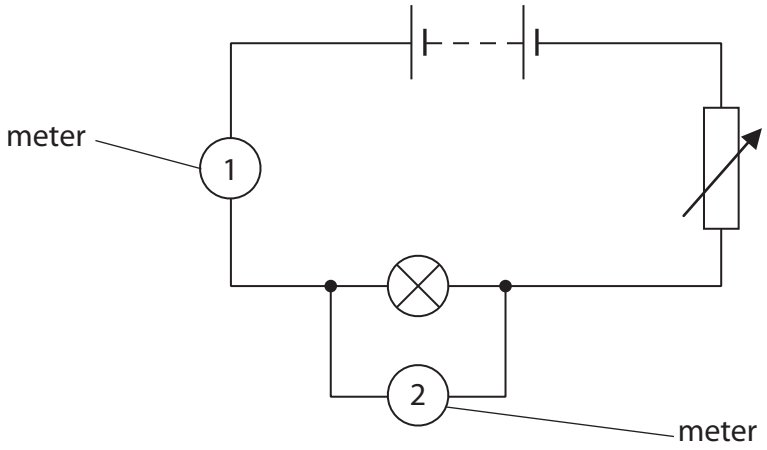
(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The current in the filament lamp is a flow of

(1)

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

(ii) The student uses this circuit in his investigation.



State what is measured by the meters.

(2)

Meter 1 measures .....

Meter 2 measures .....

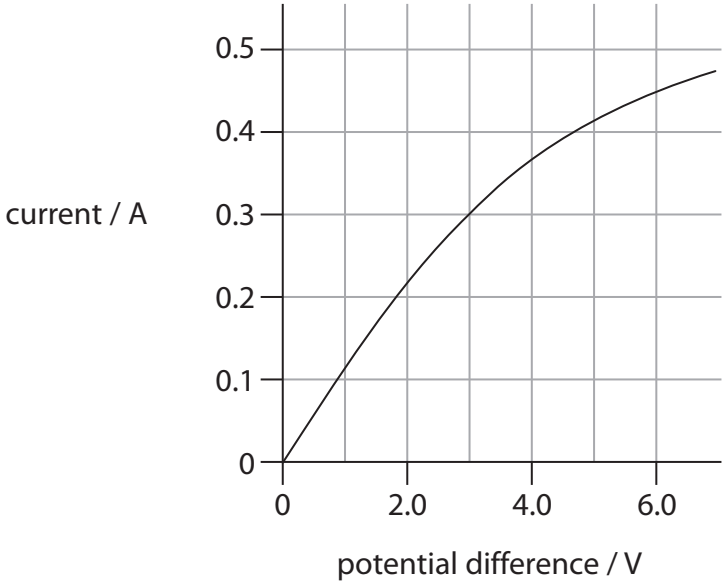
(b) The normal operating potential difference (voltage) and current of the filament lamp is 6 V, 0.4 A.

Calculate the energy supplied to the lamp under these conditions in 20 s.

(2)

energy = ... J

(c) The graph shows how current varies with potential difference (voltage) for another filament lamp.



Calculate the resistance of the lamp when the current in the lamp is 0.3 A.

resistance = potential difference ÷ current ($R = V / I$)

(3)

resistance = ... Ω

(Total for Question 1 = 8 marks)

2 In many sports events, an athlete tries to throw an object as far as possible.

(a) Sport scientists can use many words to describe the throwing of an object.
Four of these words are shown in the box.
Only one of these is a vector.

energy	momentum	power	speed

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

The vector is

(1)

☒ **A** energy

☒ **B** momentum

☒ **C** power

☒ **D** speed

(ii) Complete the sentence by using a word from the box above.

(1)

The rate of doing work is called .....

(b) A javelin has a mass of 0.8 kg. In one throw, the javelin left the athlete's hand at a velocity of 25 m/s.

(i) Calculate the kinetic energy of the javelin as it left the athlete's hand. State the unit.

(3)

kinetic energy = ... unit .....

(ii) State the amount of work done by the athlete on the javelin to get it to a velocity of 25 m/s.

(1)

work done = ...

(iii) A good javelin thrower will try to extend their arm as much as possible before releasing the javelin.

Explain why this allows them to do more work on the javelin.

(2)

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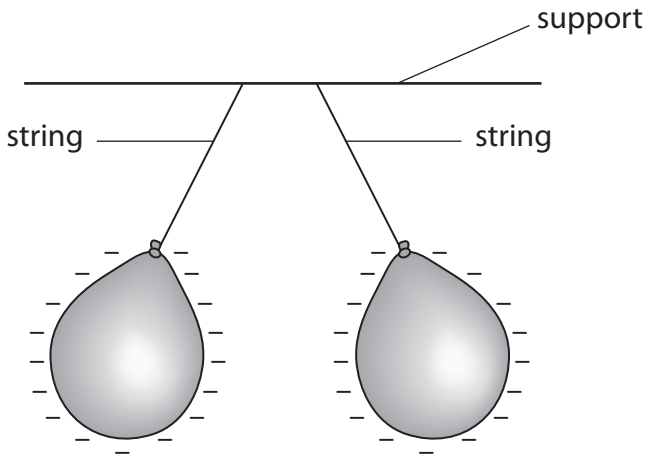
(Total for Question 2 = 8 marks)

Static electricity

3 (a) A student ties two balloons to a support with some string.
The student rubs both balloons with a dry cloth which gives the balloons a negative charge.
The diagram shows the balloons after they were rubbed.



Use words from the box to complete the sentences.

(4)

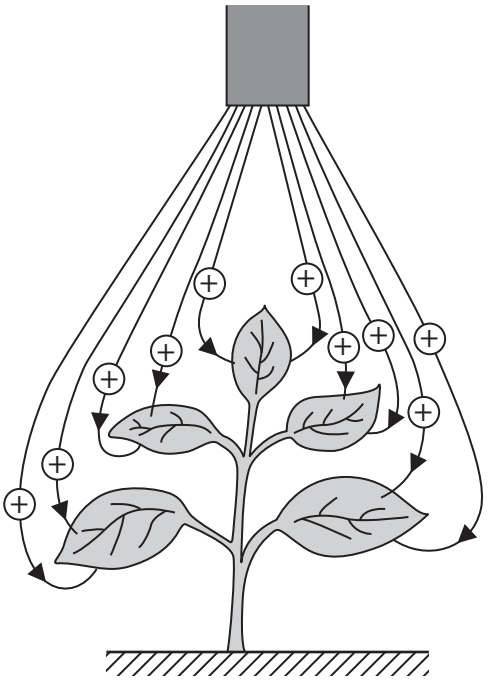
attract	charge	electrons	negative	neutral
neutrons	positive	protons	repel	support

The balloons ..... each other because they have the same .....

The cloth is left with a ..... charge.

The charged particles that are transferred from the cloth to the balloons are called .....

(b) The diagram shows an electrostatic insecticide spray being used on a plant.
The plant is initially uncharged.
Each droplet of spray is given a positive charge.



(i) Explain the advantages of using an electrostatic insecticide spray compared to an uncharged insecticide spray.

(3)

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(ii) There is a current of 0.008 A in the sprayer for a time of 10 minutes.

Calculate the charge supplied to the sprayer in this time.

(3)

charge = ... C

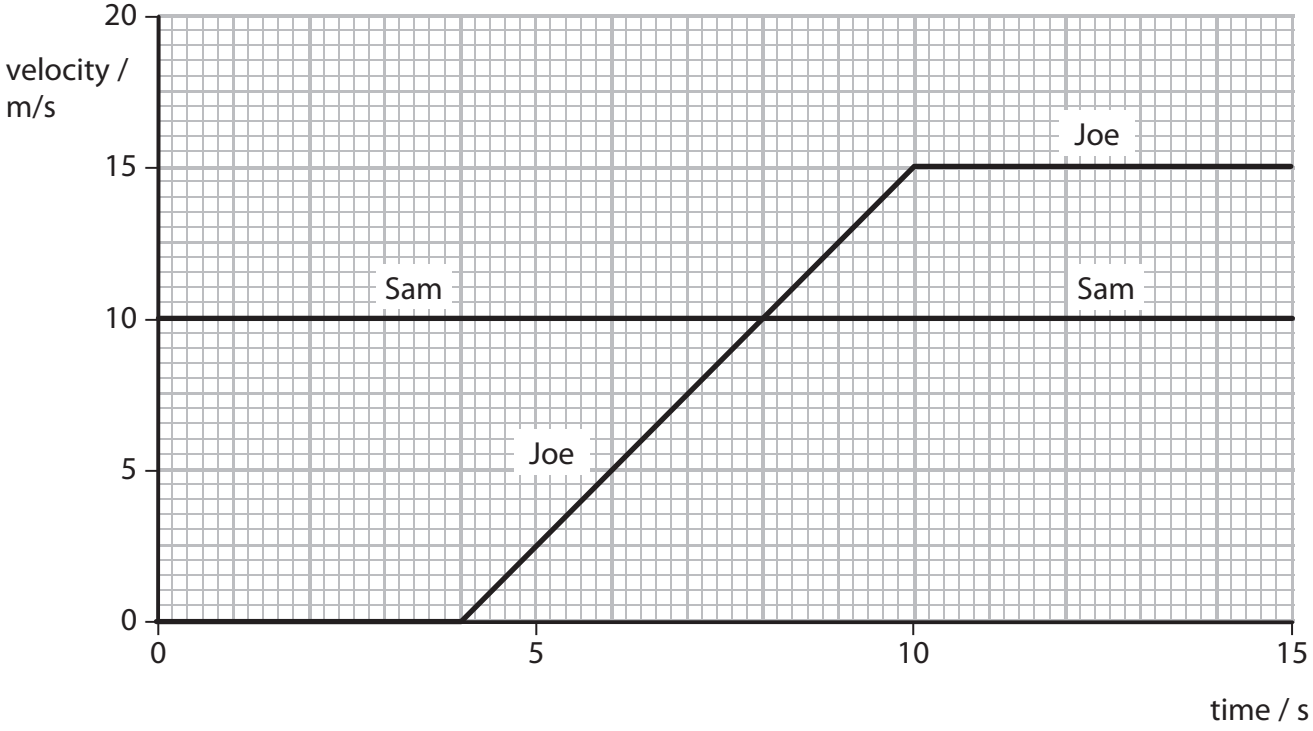
(Total for Question 3 = 10 marks)

4 Sam and Joe are on their bikes. They are on a flat, straight road.

(a) Joe is stationary when Sam rides past at a constant velocity of 10 m/s.

Joe waits for 4 s and then follows Sam.

This is a velocity/time graph of their motion.



(i) How far did Sam travel during these 15 s?

distance = velocity × time

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

(1)

☒ **A** 1.5 m

☒ **B** 10 m

☒ **C** 100 m

☒ **D** 150 m

(ii) At which of these times is the resultant force on Joe bigger than the resultant force on Sam?

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

(1)

☒ **A** at 3 s

☒ **B** at 7 s

☒ **C** at 11 s

☒ **D** at 15 s

(iii) For how many seconds was Joe accelerating?

(1)

number of seconds = ... s

(iv) Calculate Joe's acceleration during this time.

(2)

Joe's acceleration = ... m/s^2

(b) The diagram shows the horizontal forces acting on Joe at one point while he is accelerating.

(i) Calculate the size of the resultant horizontal force acting on Joe and his bike.

(2)

size of resultant force = ... N

(ii) The total mass of Joe, his heavy bag, and his bike is 55 kg.

Calculate the total weight.

Gravitational field strength, g = 10 N/kg

(1)

total weight = ... N

(c) On another day, Joe is riding the same bike on the same piece of road.

This time he does not have the heavy bag on his back.

He finds that it is easier to accelerate.

Explain why Joe finds it easier to accelerate.

(2)

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(Total for Question 4 = 10 marks)

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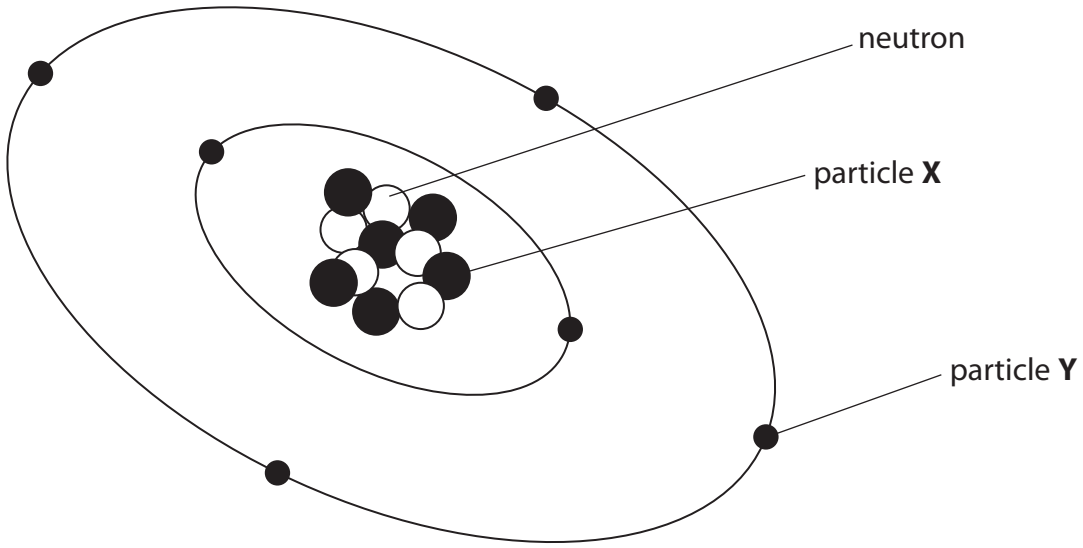
Radioactive material

5 (a) The diagram represents an atom of carbon.



NOT to scale

(i) State the name of particle **X**.

(1)

.....

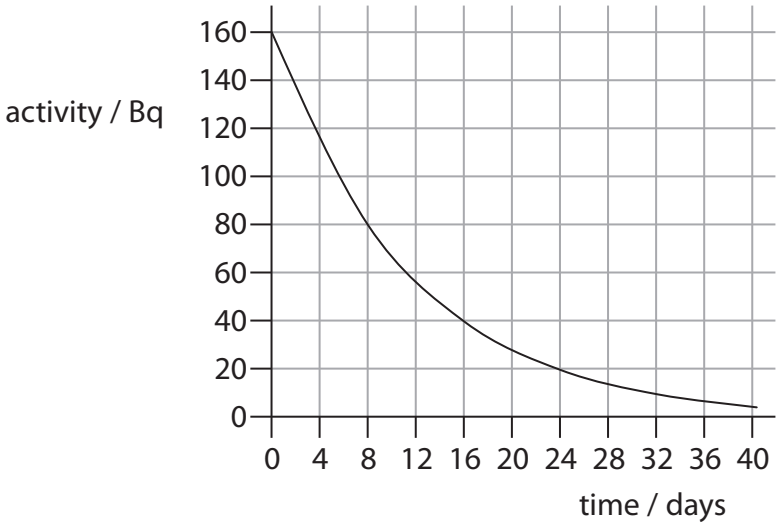
(ii) State the name of particle **Y**.

(1)

.....

(b) Iodine-131 is a radioactive isotope of iodine.

The graph shows how the activity of a sample of iodine-131 decreases with time.



(i) Use the graph to calculate the half-life of iodine-131.

(2)

half-life = ... days

(ii) Another sample of iodine-131 has an activity of 800 Bq.

Calculate how long it will take before its activity decreases to 200 Bq.

(2)

time = ... days

*(c) There are plans to build more nuclear power stations to supply electricity to the National Grid.

Discuss the advantages and disadvantages of using nuclear power to generate electricity.

(6)

(Total for Question 5 = 12 marks)

Nuclear fusion and nuclear fission

6 (a) The nucleus of a hydrogen atom can be represented by this symbol:

$$^{1}_{1}H$$

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

The symbol shows that the nucleus consists of

(1)

☒ **A** 1 proton and 1 neutron

☒ **B** 1 proton only

☒ **C** 1 neutron only

☒ **D** 1 neutron and 1 electron.

(ii) Two other isotopes of hydrogen are deuterium (D) and tritium (T).

Their nuclei can be represented by these symbols:

$$^{2}_{1}D \qquad\qquad ^{3}_{1}T$$

State how these symbols show that they are isotopes of hydrogen.

(1)

.....

.....

(b) Nuclear fusion can occur if a deuterium and a tritium nucleus can be brought close enough to each other.

This fusion produces a helium nucleus and releases a neutron.

(i) Compare the charges of a helium nucleus and a neutron.

(2)

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(ii) Nuclear fusion is an important process.
Scientists have said '*without nuclear fusion, there would be no life on Earth*'.

Explain why nuclear fusion is important to life on Earth.

(2)

.....

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Question 6 continues on the next page.

*(c) Neutrons are also released during nuclear fission.
Describe how the neutrons released in nuclear fission are used to produce a controlled chain reaction in a nuclear reactor.

(6)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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