Write your name here

Surname	Other names

Pearson
Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Physics/Additional Science

Unit P2: Physics for Your Future

Higher Tier

Friday 16 June 2017 – 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.
- 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 × 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 ☒.

Nuclear energy

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

(1)

In a nuclear power station, thermal energy is transferred into electrical energy using

☒ **A** a turbine and a generator

☒ **B** a moderator and a turbine

☒ **C** a moderator and a generator

☒ **D** a turbine and a transformer

(ii) In many nuclear power stations, nuclei of uranium-235 undergo fission.

State **three** different products released in the fission of a uranium-235 nucleus.

(3)

1 .....

2 .....

3 .....

(iii) Describe how the fission of a nucleus of uranium-235 can lead to a chain reaction.

(2)

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(b) Scientists are designing a different type of nuclear power station.

This power station will use the fusion of isotopes of hydrogen to make helium.

Explain why large amounts of energy are needed to make this nuclear fusion reaction take place.

(2)

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(Total for Question 1 = 8 marks)

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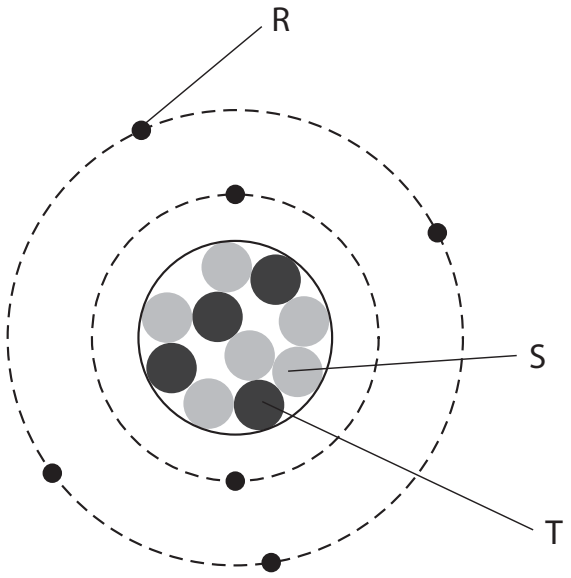
Electric charge

2 (a) The diagram represents the particles in an atom. The atom is neutral.



Draw one line from each particle box to the correct label box.

(2)

particle	label
electron	R
neutron	S
proton	T

(b) When a battery is connected to a lamp, charge flows through the connecting wires in the circuit.

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

(1)

In the connecting wires

☒ **A** positive charge flows towards the positive terminal of the battery

☒ **B** positive charge flows towards the negative terminal of the battery

☒ **C** negative charge flows towards the positive terminal of the battery

☒ **D** negative charge flows towards the negative terminal of the battery

(c) Polyethylene terephthalate (PET) and polyvinyl chloride (PVC) are two common types of plastic that can be recycled from household waste. They need to be separated in the recycling plant.

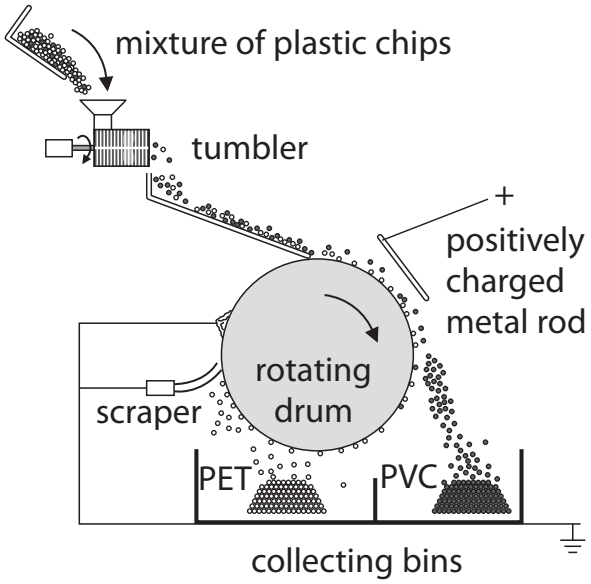
The waste plastics are crushed into small chips and tumbled together.
The PET chips become positively charged.
The PVC chips become negatively charged.

(i) Explain how the PET chips become positively charged and the PVC chips become negatively charged.

(2)

(ii) The mixture is dropped onto a rotating drum.

The mixture sticks to the outside of the drum.



The mixture goes past a metal rod that has a positive charge.
PVC chips leave the drum and fall into the collecting bin on the right.

Explain why the PVC chips leave the drum.

(2)

(iii) The PET chips are carried round until they reach the scraper.
They fall into the collecting bin on the left.
Both of the bins and the scraper are connected to earth.

Suggest why the bins and scraper are connected to earth.

(1)

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.....

(Total for Question 2 = 8 marks)

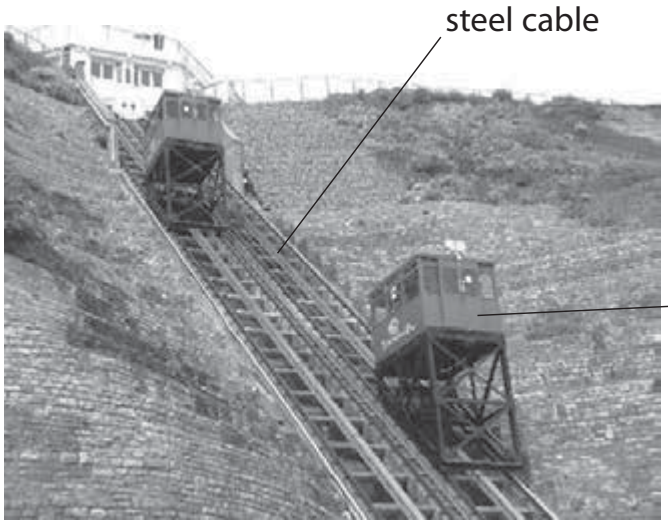
3 (a) A motorcyclist is climbing a hill at a constant speed of 13 m/s.

Calculate the time it takes for the motorcyclist to travel 29 m.

(2)

time = ... s

(b) The picture shows a railway that carries passengers up and down a cliff at the seaside.



© geograph.org.uk

The top ends of the two passenger cabins are joined by a steel cable around a pulley at the top of the cliff.

When one cabin goes down, the other cabin goes up.

Explain how this design makes good use of energy transfers in the system.

(2)

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(c) A car is travelling along a level road when the driver applies the brakes to stop it. The work done to stop the car is 510 000 J.

The car has a mass of 1400 kg.

(i) State the value of the kinetic energy of the car when the brakes were first applied.

(1)

kinetic energy = ... J

(ii) Calculate the velocity of the car when the brakes were first applied.

(3)

velocity = ... m/s

(iii) The brakes applied an average force of 15 000 N.

Calculate the distance it takes for the brakes to stop the car.

(2)

distance = ... m

(Total for Question 3 = 10 marks)

4 (a) A technician is testing a filament lamp from a car.

He connects the lamp to a test circuit with a 1.5 V d.c. power supply.

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

(1)

The power supply transfers

☒ **A** 1.5 joules per coulomb

☒ **B** 1.5 joules per ohm

☒ **C** 1.5 amps per coulomb

☒ **D** 1.5 volts per joule

(ii) The circuit shows the lamp and the power supply.

The technician adds a meter to measure the current in the circuit.

Add an appropriate meter symbol to the circuit to show how the meter should be connected.

(1)

(iii) The current is 0.18 A.

Calculate the resistance of the filament in the lamp.

(3)

resistance = ... Ω

(b) The lamp is designed to be used in a car with a 12 V battery.

(i) When it is connected to the 12 V battery, there is a current of 800 mA in the lamp.

Calculate the power of the lamp.

(2)

power = ... W

(ii) The technician connects the lamp to a 6 V motorcycle battery instead of the 12 V car battery.

He expects the current to be 400 mA (exactly ½ of the current in the 12 V circuit).

He measures the current and finds that it is not 400 mA.

Explain why the current is not 400 mA.

(3)

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(Total for Question 4 = 10 marks)

Using parachutes

5 A relief organisation drops food parcels by parachute from a helicopter.

(a) Each food parcel has a weight of 80 N.

The gravitational field strength is 10 N/kg.

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

(1)

The mass of one food parcel is

☒ **A** 0.8 kg

☒ **B** 8.0 kg

☒ **C** 80 kg

☒ **D** 800 kg

(b) The helicopter is hovering at a constant height above the ground.

It drops a food parcel.

The parcel falls for a few seconds before the parachute starts to open.

Calculate the velocity of the food parcel after falling for 1.2 s.

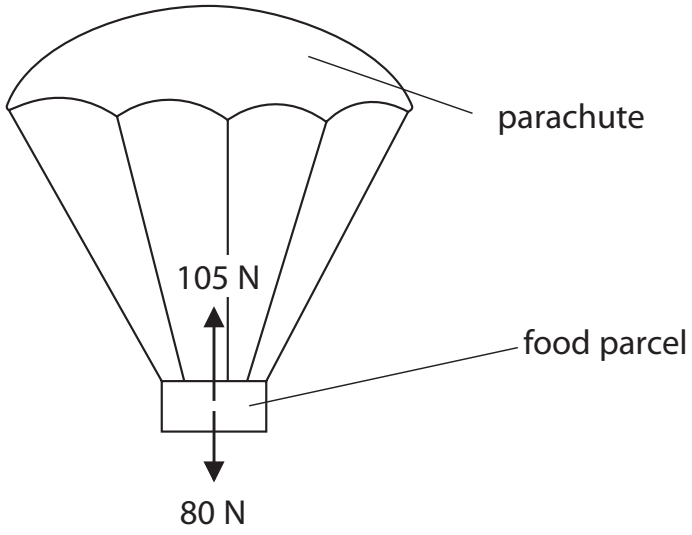
Ignore any air resistance acting on the food parcel.

Acceleration due to gravity, $g = 10$ m/s^2.

(3)

velocity = ... m/s

(c) The diagram shows the forces acting on the food parcel soon after the parachute has opened.



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

(1)

The resultant force on the food parcel is

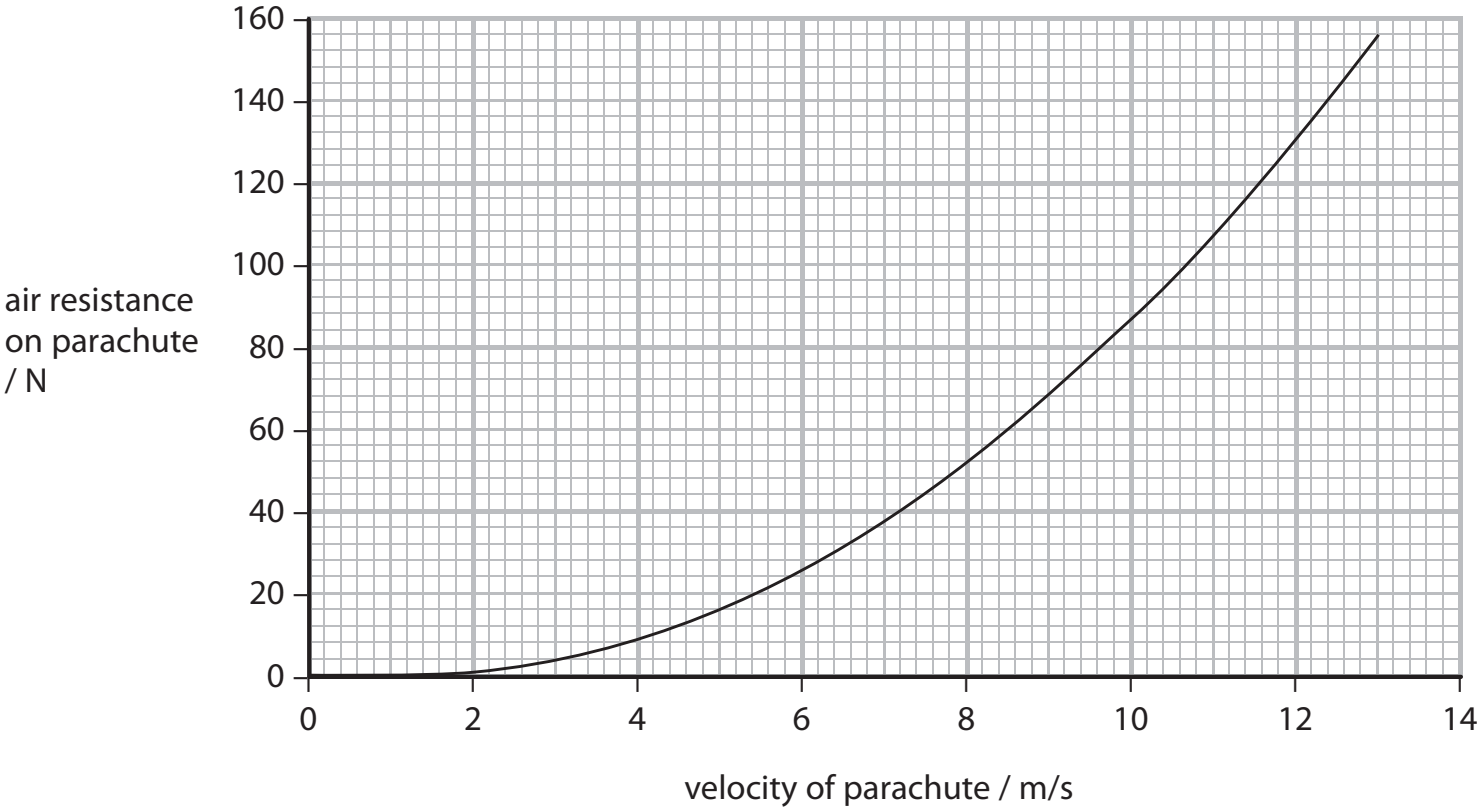
☒ **A** 25 N downwards

☒ **B** 25 N upwards

☒ **C** 185 N downwards

☒ **D** 185 N upwards

(d) The graph shows the results of tests on the parachute. It shows how the air resistance acting on the parachute varies with the velocity of the parachute.



(i) Describe the relationship shown by the graph.

(2)

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*(ii) The food parcel, weighing 80 N, falls the last 20 m to the ground at a constant velocity of 9.6 m/s.

Explain how the forces acting on the food parcel change the velocity of the parcel as it falls from the helicopter to the ground.

You may draw a diagram or graph to help with your explanation.

(6)

(Total for Question 5 = 13 marks)

Radioactive materials

6 (a) (i) Thorium is a radioactive element. It has several isotopes.

State what is meant by the term **isotopes**.

(1)

.....

.....

(ii) One isotope of thorium has a half-life of 1.9 years.
Radium is another radioactive element.
One isotope of radium has a half-life of 3.5 days.

A sample of thorium and a sample of radium start with the same number of atoms.

Compare the initial activities of the samples.

(2)

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(iii) Thorium and radium emit alpha radiation when they decay.

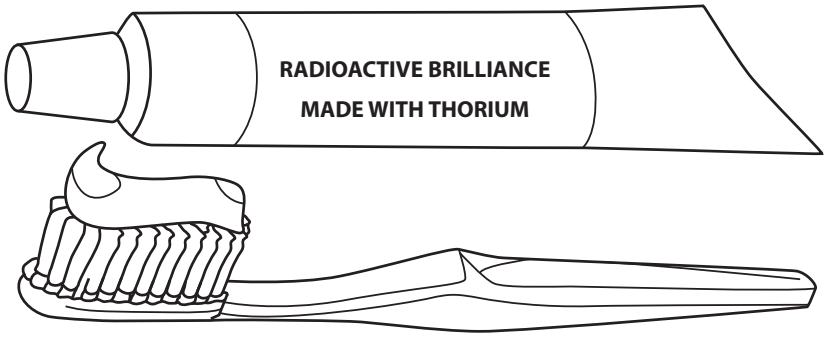
Complete the sentence by putting a cross (☒) in the box next to your answer.

(1)

Alpha radiation

- ☒ **A** can penetrate a few mm of aluminium
- ☒ **B** is highly ionising
- ☒ **C** is a type of electromagnetic radiation
- ☒ **D** has a negative charge

(b) This is a brand of toothpaste that was sold about 75 years ago.



"Use toothpaste with thorium! Have sparkling, brilliant teeth—radioactive brilliance!"

It contained a small amount of radioactive thorium. Some people believed that it would make their teeth much brighter.

(i) This toothpaste cannot be sold today.

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

(1)

Today, there are laws about how radioactive materials can be used because

☒ **A** we can make better measurements of their half-life

☒ **B** the radioactivity of these materials has increased over the last 75 years

☒ **C** we understand more about the effects of radiation

☒ **D** doctors have become better trained

*(ii) An isotope of thorium decays into radium.
Radium is also unstable and decays into radon gas.

This table gives information about these decays.

isotope	half-life	radiation emitted	decays into
thorium	1.9 years	alpha	radium
radium	3.6 days	alpha	radon
radon (gas)	55 seconds	alpha	polonium

Discuss how dangerous it would be to use this isotope of thorium in the toothpaste.

(6)

(Total for Question 6 = 11 marks)

TOTAL FOR PAPER = 60 MARKS