AQA

General Certificate of Secondary Education
Foundation Tier
January 2010

Additional Science   PHY2F
Unit Physics P2

F

Physics
Unit Physics P2

Wednesday 20 January 2010   9.00 am to 9.45 am

For this paper you must have:
- a ruler.
You may use a calculator.

Time allowed
- 45 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- You are expected to use a calculator where appropriate.
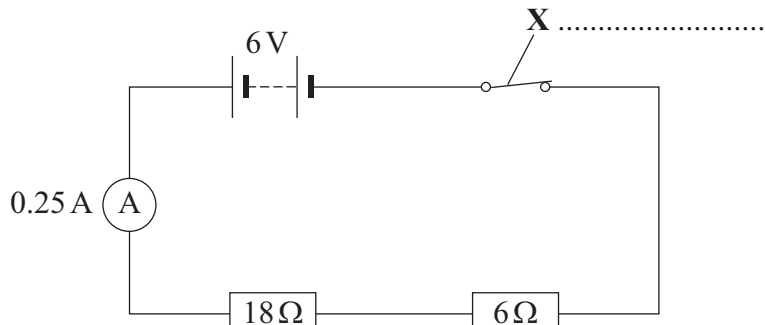- You are reminded of the need for good English and clear presentation in your answers.

Advice
- In all calculations, show clearly how you work out your answer.

PHY2F

*Areas outside
the box will
not be scanned
for marking*

Answer **all** questions in the spaces provided.

1 A circuit diagram is shown below.

1 (a) Use a word from the box to label component **X**.

| fuse | switch | thermistor |

(1 mark)

1 (b) Calculate the total resistance of the two resistors in the circuit.

....

Total resistance = ... Ω

(1 mark)

1 (c) The reading on the ammeter is 0.25 A.

The current through the 6 Ω resistor will be:

bigger than 0.25 A   equal to 0.25 A   smaller than 0.25 A

Draw a ring around your answer.

(1 mark)

1 (d) The 6 V battery is made by correctly joining several 1.5 V cells in series.

Calculate the number of cells needed to make the battery.
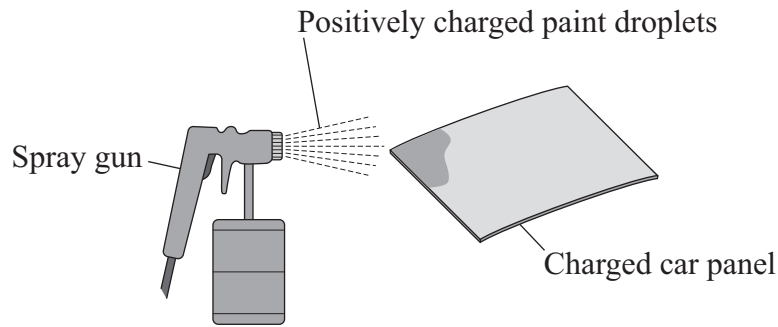
....

Number of cells = ...

(1 mark)

4

2 (a) The diagram shows how static electricity is used to paint a metal car panel.

Positively charged paint droplets

Spray gun

Charged car panel

Use words from the box to complete the following sentences.

attract	opposite	repel	same

All the paint droplets have the same type of charge. This makes the paint droplets

.... each other and spread out.

The car panel and the paint droplets have the .... type of

charge. This causes the car panel to .... the paint droplets.

The car panel is covered by an even layer of paint.

(3 marks)

2 (b) In which **one** of the following situations is static electricity dangerous and not useful?

Put a tick (✔) in the box next to your answer.

using a photocopier ☐

refuelling an aircraft ☐

a smoke precipitator ☐

Give a reason for your answer.

....

....

(2 marks)

5

Turn over ▶

3 (a) The diagram shows three identical go-karts, **P**, **Q** and **R**, travelling at different speeds along the straight part of an outdoor racetrack.

P   **Q**   **R**

→ 20 m/s   → 25 m/s   → 28 m/s
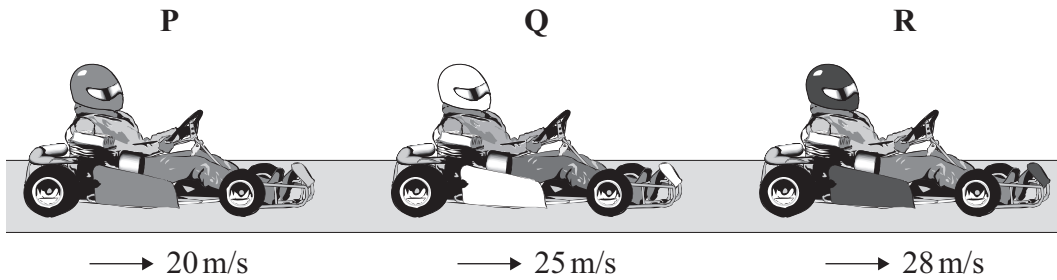
Which **go-kart**, **P**, **Q** or **R**, has the greatest momentum?

....

Give the reason for your answer.

....

....

(2 marks)

3 (b) The total mass of go-kart **Q** and the driver is 130 kg.

3 (b) (i) Use the equation in the box to calculate the total momentum of go-kart **Q** and the driver.

momentum = mass × velocity

Show clearly how you work out your answer.

....

....

Momentum = ...

(2 marks)

3 (b) (ii) Which of the following is the unit of momentum?

Draw a ring around your answer.

J/s   **kg m/s**   **Nm**

(1 mark)

3 (c) To race safely at high speed, a go-kart driver must have fast reaction times and the outdoor racetrack should be dry.

3 (c) (i) How would being tired affect a driver's reaction time?

....

(1 mark)

3 (c) (ii) How would a wet track affect the braking distance of a go-kart?

....
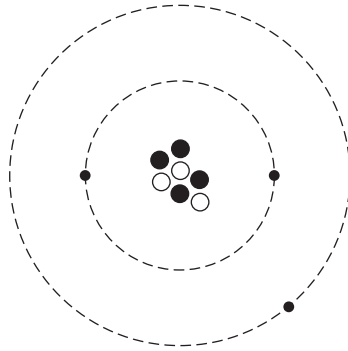
(1 mark)

7

Turn over for the next question

Turn over ▶

4 The diagram represents an atom of lithium.

4 (a) (i) Complete the following table of information for an atom of lithium.

Number of protons	
Number of electrons	
Number of neutrons	

(2 marks)

4 (a) (ii) What is the mass number of a lithium atom?

Draw a ring around your answer.

3	**4**	**7**	**10**

Give a reason for your answer.

....

....

(2 marks)

4 (b) Complete the following sentence by drawing a ring around the correct line in the box.

An atom that has lost an electron is called

an ion
an isotope
a positive atom

.

(1 mark)

4 (c) When an alpha particle is emitted from the nucleus of a radon atom, the radon changes into polonium.

Radon   Alpha particle   +   Polonium

Not to scale
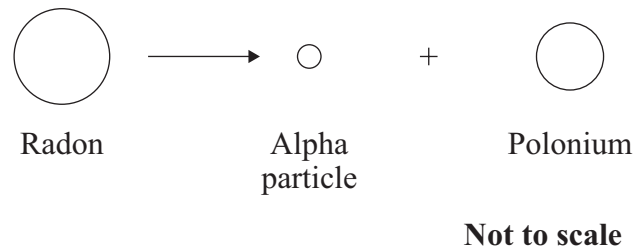
An alpha particle consists of 2 protons and 2 neutrons.

4 (c) (i) Complete the following sentence by drawing a ring around the correct line in the box.

The mass of a polonium atom is
| greater than |
| the same as |
| smaller than |
the mass of a radon atom.

(1 mark)

4 (c) (ii) Give a reason for your answer to part (c)(i).

....

....

(1 mark)

7

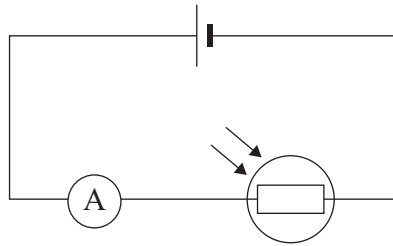**Turn over for the next question**

Turn over ▶

5 The diagram shows a simple circuit.

5 (a) The circuit includes an LDR.

What do the letters LDR stand for?
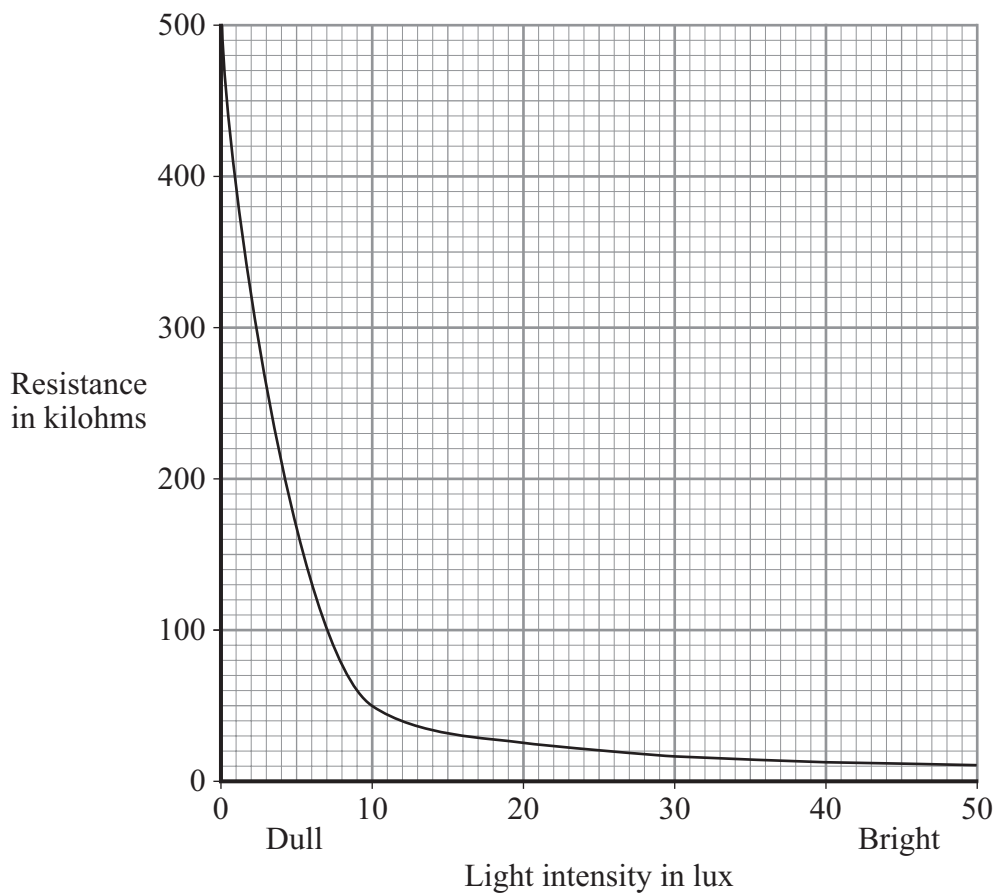
Draw a ring around your answer.

Light-dependable resistor   light-dependent resistor   light-direct resistor

(1 mark)

5 (b) The graph shows how the resistance of an LDR changes with light intensity.

Describe in detail how the resistance of the LDR changes as the light intensity increases from 0 to 50 lux.

....

....

....

....

....

....

(3 marks)

5 **(c)** **(i)** Complete the following sentence by drawing a ring around the correct line in the box.

A decrease in the light intensity of light on the LDR will

| decrease |
| not change | the
| increase |

reading on the ammeter.

(1 mark)

5 **(c)** **(ii)** Give a reason for your answer to part (c)(i).

....

....

(1 mark)

5 **(d)** An LDR can be used to switch a circuit on and off automatically.

In which **one** of the following would an LDR be used?

Put a tick (✓) in the box next to your answer.

a circuit to switch on central heating when it gets cold ☐

a circuit to switch on security lighting when it gets dark ☐

a circuit to switch on a water sprinkler when the soil in a greenhouse is dry ☐

(1 mark)

7

Turn over ▶

6 A cyclist travelling along a straight level road accelerates at $1.2\,m/s^2$ for 5 seconds. The mass of the cyclist and the bicycle is $80\,kg$.

6 (a) Use the equation in the box to calculate the resultant force needed to produce this acceleration.

> resultant force $=$ mass $\times$ acceleration

Show clearly how you work out your answer and give the unit.

....

....

Resultant force = ...
(3 marks)

6 (b) The graph shows how the velocity of the cyclist changes with time.
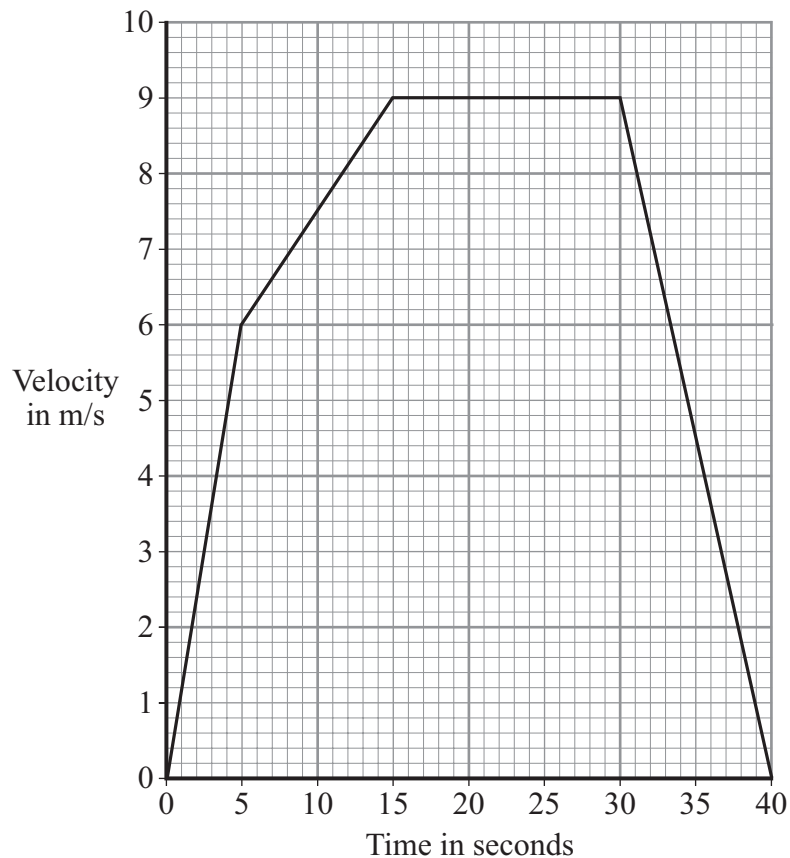
6 (b) (i) Complete the following sentence.

The velocity includes both the speed and the ....
of the cyclist.

(1 mark)

6 (b) (ii) Why has the data for the cyclist been shown as a line graph instead of a bar chart?

....

....

(1 mark)

6 (b) (iii) The diagrams show the horizontal forces acting on the cyclist at three different speeds. The length of an arrow represents the size of the force.
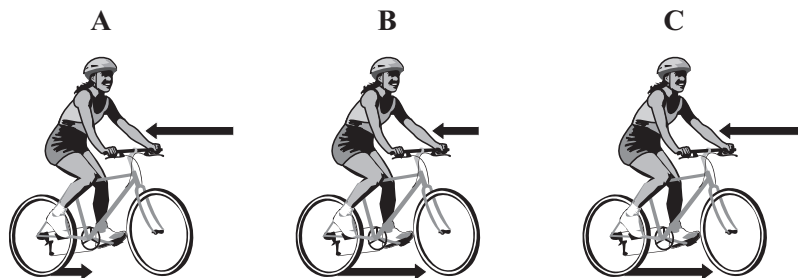
A   **B**   **C**

Which **one** of the diagrams, **A**, **B** or **C**, represents the forces acting when the cyclist is travelling at a constant 9 m/s?

....

Explain the reason for your choice.

....

....

....

....

....

(3 marks)

8

Turn over ▶

7 (a) The process of nuclear fusion results in the release of energy.

7 (a) (i) Describe the process of nuclear fusion.

....

....

....

....

(2 marks)

7 (a) (ii) Where does nuclear fusion happen naturally?

....

(1 mark)

7 (b) For many years, scientists have tried to produce a controlled nuclear fusion reaction that lasts long enough to be useful. However, the experimental fusion reactors use more energy than they produce.

7 (b) (i) From the information given, suggest **one** reason why nuclear fusion reactors are not used to produce energy in a nuclear power station.

....

....

(1 mark)

7 (b) (ii) Suggest **one** reason why scientists continue to try to develop a practical nuclear fusion reactor.

....

....

(1 mark)

7 (c) In 1989, two scientists claimed in a daily newspaper that they had produced nuclear fusion reactions in normal laboratory conditions. The process became known as 'cold fusion'. Other scientists thought that the evidence produced to support 'cold fusion' was unreliable.

7 (c) (i) Suggest **one** reason why other scientists thought that the evidence to support 'cold fusion' was unreliable.

....

....

(1 mark)

7 (c) (ii) In 2007, the results of a new 'cold fusion' research project were published in a respected scientific journal. This journal includes scientists such as Albert Einstein amongst its past authors.

Suggest why people may be more likely to believe an article published in a respected scientific journal than one published in a daily newspaper.

....

....

....

(1 mark)

7

END OF QUESTIONS

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1 4

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