Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

AQA

General Certificate of Secondary Education
Foundation Tier
June 2014

Additional Science
Unit Physics P2

PH2FP

F

Physics
Unit Physics P2

Monday 19 May 2014 1.30 pm to 2.30 pm

For this paper you must have:
- a ruler
- a calculator
- the Physics Equations Sheet (enclosed).

A

Time allowed
- 1 hour

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. Do not write outside the box around each page or on blank pages.
- 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 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 8(a)(iii) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

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

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

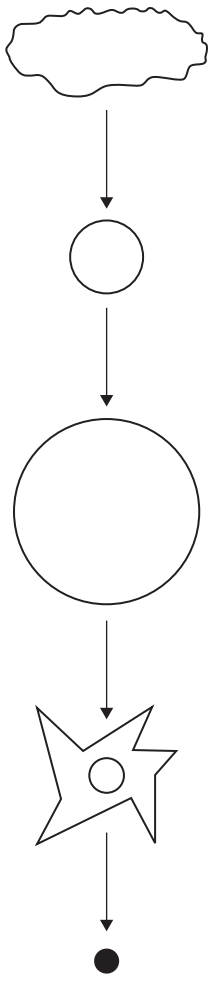
1 (a) **Figure 1** shows the life cycle of a very large star.

Use the correct answers from the box to complete the sentences in **Figure 1**.

[2 marks]

main sequence star	**neutron star**	**supernova**	**white dwarf**

Figure 1



Gas and dust join together to become a protostar.

The star is stable as a ..... .

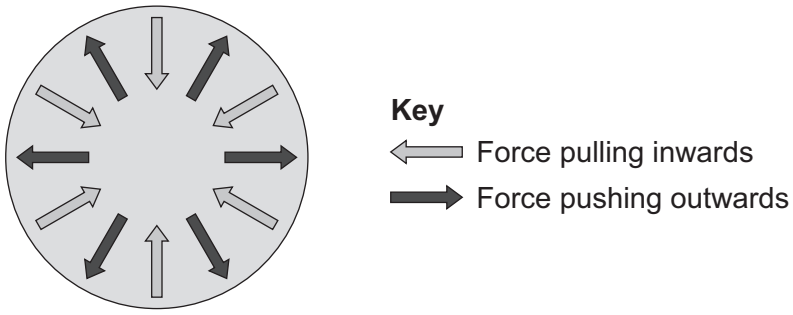
The star expands to become a red super giant.

The outer layers of the star explode as a ..... .

The core of the star shrinks and a black hole is formed.

1 (b) **Figure 2** shows the forces acting on a star when the star is stable.

Figure 2



Draw a ring around the correct answer to complete the sentence.

[1 mark]

When a star is stable, the forces pushing outwards are

bigger than
smaller than
balanced by

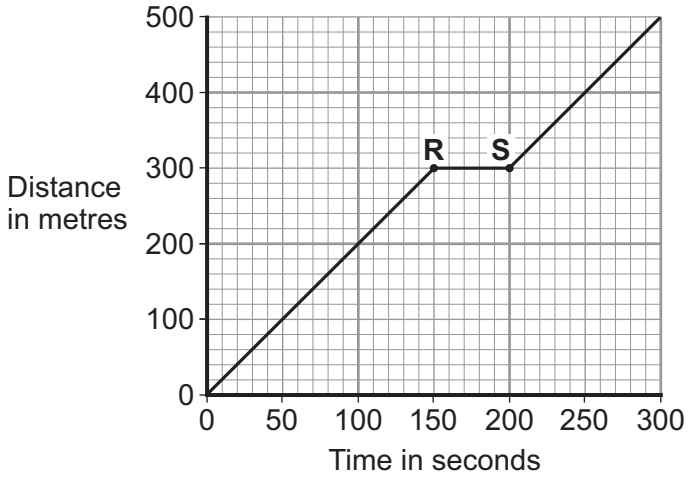
the forces pulling inwards.

3

Turn over for the next question

2 (a) **Figure 3** shows the distance–time graph for a person walking to a bus stop.

Figure 3



2 (a) (i) Which **one** of the following statements describes the motion of the person between points **R** and **S** on the graph?

Tick (✓) **one** box.

[1 mark]

Not moving ☐

Moving at constant speed ☐

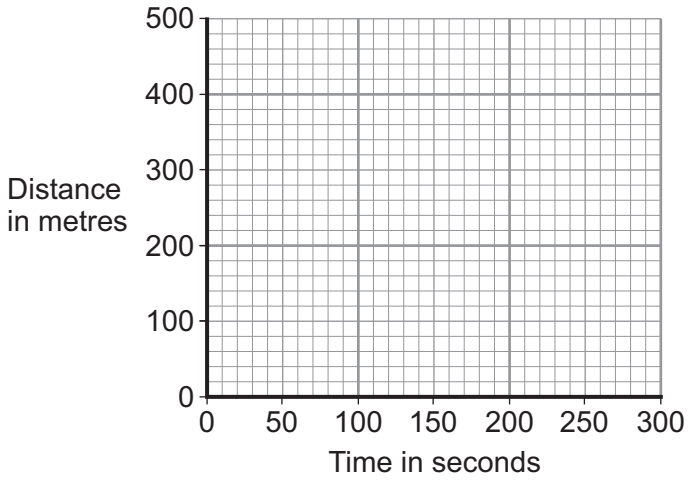
Moving with increasing speed ☐

2 (a) (ii) Another person, walking at constant speed, travels the same distance to the bus stop in 200 seconds.

Complete **Figure 4** to show a distance–time graph for this person.

[1 mark]

Figure 4



2 (b) A bus accelerates away from the bus stop at 2.5 m/s^2.

The total mass of the bus and passengers is 14 000 kg.

Calculate the resultant force needed to accelerate the bus and passengers.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

.....

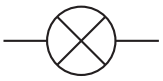
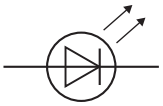
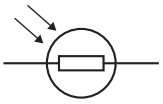
.....

Resultant force = ... N

4

3 (a) Draw **one** line from each circuit symbol to its correct name.

[3 marks]

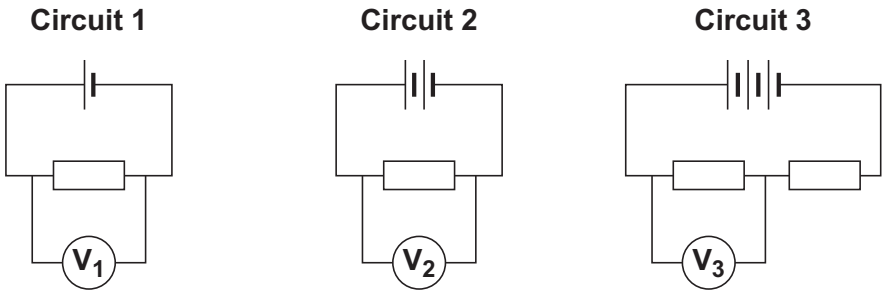
Circuit symbol	**Name**
	Diode
	Light-dependent resistor (LDR)
	Lamp
	Light-emitting diode (LED)

3 (b) **Figure 5** shows three circuits.

The resistors in the circuits are identical.

Each of the cells has a potential difference of 1.5 volts.

Figure 5



3 (b) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

half	twice	the same as

The resistance of **circuit 1** is ..... the resistance of **circuit 3**.

3 (b) (ii) Calculate the reading on voltmeter $\mathbf{V_2}$.

[1 mark]

.....

Voltmeter reading $\mathbf{V_2}$ = ... V

3 (b) (iii) Which voltmeter, $\mathbf{V_1}$, $\mathbf{V_2}$ or $\mathbf{V_3}$, will give the lowest reading?

Draw a ring around the correct answer.

[1 mark]

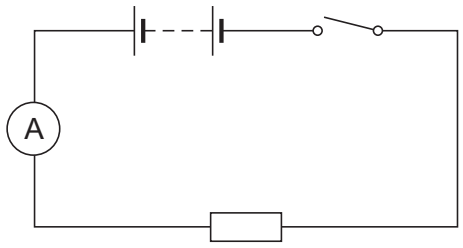
$\mathbf{V_1}$ $\mathbf{V_2}$ $\mathbf{V_3}$

Question 3 continues on the next page

3 (c) A student wanted to find out how the number of resistors affects the current in a series circuit.

Figure 6 shows the circuit used by the student.

Figure 6



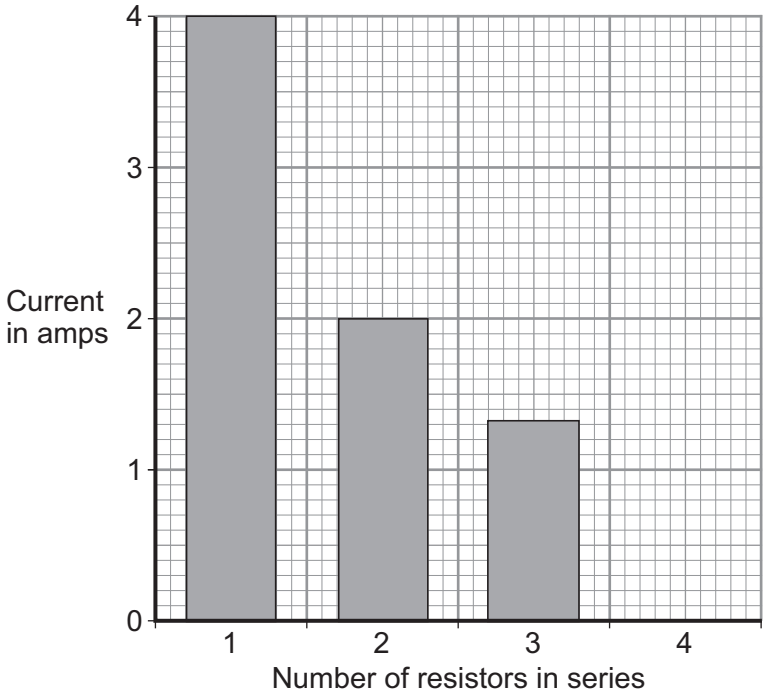
The student started with one resistor and then added more identical resistors to the circuit.

Each time a resistor was added, the student closed the switch and took the ammeter reading.

The student used a total of 4 resistors.

Figure 7 shows three of the results obtained by the student.

Figure 7



3 (c) (i) To get valid results, the student kept one variable the same throughout the experiment.

Which variable did the student keep the same?

[1 mark]

.....

3 (c) (ii) The bar chart in **Figure 7** is not complete. The result using 4 resistors is not shown.

Complete the bar chart to show the current in the circuit when 4 resistors were used.

[2 marks]

3 (c) (iii) What conclusion should the student make from the bar chart?

[1 mark]

.....

.....

10

Turn over for the next question

4 A paintball gun is used to fire a small ball of paint, called a paintball, at a target.

Figure 8 shows someone just about to fire a paintball gun.

The paintball is inside the gun.

Figure 8

4 (a) What is the momentum of the paintball before the gun is fired?

[2 marks]

.....

Give a reason for your answer.

.....

.....

4 (b) The gun fires the paintball forwards at a velocity of 90 m/s.

The paintball has a mass of 0.0030 kg.

Calculate the momentum of the paintball just after the gun is fired.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

.....

.....

Momentum = ... kg m/s

4 (c) The momentum of the gun and paintball is conserved.

Use the correct answer from the box to complete the sentence.

[1 mark]

equal to	**greater than**	**less than**

The total momentum of the gun and paintball just after the gun is fired

will be ..... the total momentum of the gun and paintball

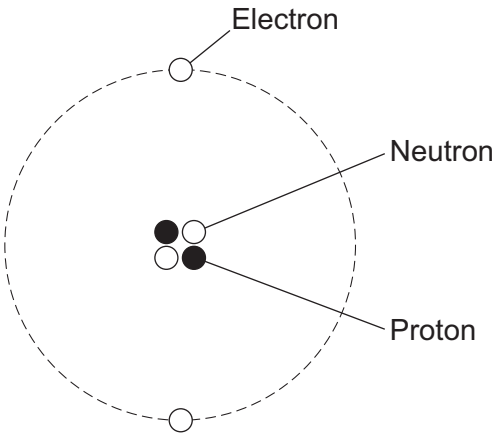
before the gun is fired.

5

Turn over for the next question

5 (a) **Figure 9** shows a helium atom.

Figure 9



5 (a) (i) Which **one** of the particles in the atom is **not** charged?

Draw a ring around the correct answer.

[1 mark]

electron **neutron** **proton**

5 (a) (ii) Which **two** types of particle in the atom have the same mass?

[1 mark]

..... and .....

5 (a) (iii) What is the atomic number of a helium atom?

Draw a ring around the correct answer.

[2 marks]

2 **4** **6**

Give a reason for your answer.

.....

.....

5 (b) Alpha particles are one type of nuclear radiation.

5 (b) (i) Name **one** other type of nuclear radiation.

[1 mark]

.....

5 (b) (ii) Use the correct answer from the box to complete the sentence.

[1 mark]

electrons	**neutrons**	**protons**

The difference between an alpha particle and a helium atom is that the alpha particle does **not** have any ..... .

5 (b) (iii) Which **one** of the following is a property of alpha particles?

Tick (✓) **one** box.

[1 mark]

Have a long range in air ☐

Are highly ionising ☐

Will pass through metals ☐

Question 5 continues on the next page

5 (c) Doctors may use nuclear radiation to treat certain types of illness.

Treating an illness with radiation may also harm a patient.

5 (c) (i) Complete the following sentence.

[1 mark]

The risk from treating a patient with radiation is that the radiation may

..... healthy body cells.

5 (c) (ii) Draw a ring around the correct answer to complete the sentence.

[1 mark]

Radiation may be used to treat a patient if the risk from the

radiation is

much bigger than
about the same as
much smaller than

the possible benefit of having the treatment.

9

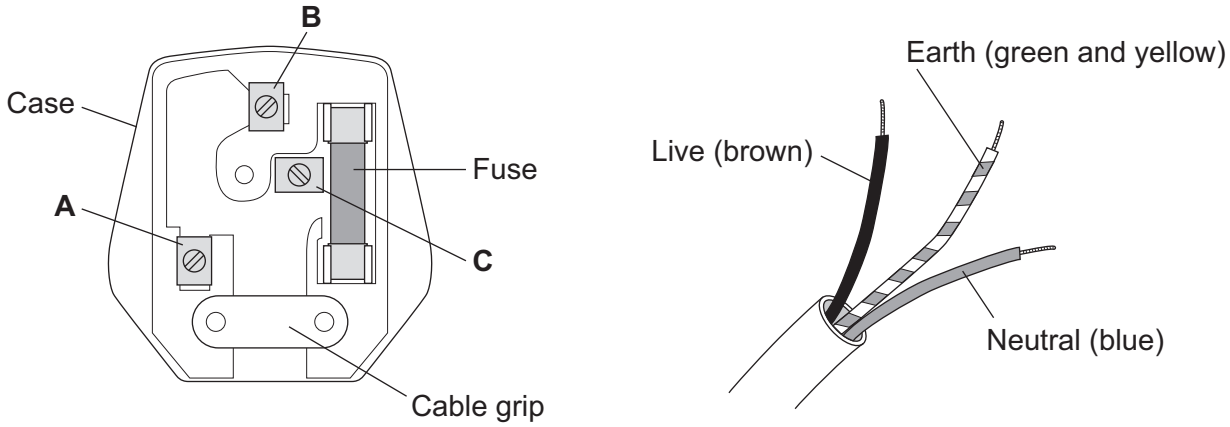
Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

6 (a) **Figure 10** shows the inside of a three-pin plug and a length of three-core cable.

The cable is to be connected to the plug.

Figure 10



6 (a) (i) Complete **Table 1** to show which plug terminal, **A**, **B** or **C**, connects to each of the wires inside the cable.

[2 marks]

Table 1

Wire	**Plug terminal**
Live	
Neutral	
Earth	

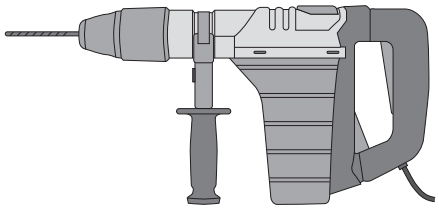
6 (a) (ii) Name a material that could be used to make the case of the plug.

[1 mark]

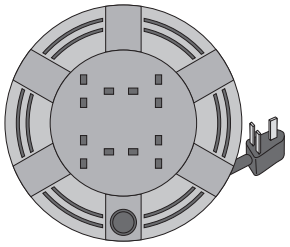
.....

6 (b) **Figure 11** shows an electric drill and an extension lead. The drill is used with the extension lead.

Figure 11



Electric drill



Extension lead

6 (b) (i) The drill is used for 50 seconds.

In this time, 30 000 joules of energy are transferred from the mains electricity supply to the drill.

Calculate the power of the drill.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

.....

.....

Power = ... W

Question 6 continues on the next page

6 (b) (ii) A second drill is used with the extension lead. The power of this drill is 1200 W.

The instructions for using the extension lead include the following information.

> **When in use the lead may get hot:**
>
> **DO NOT go over the maximum power**
>
> - lead wound inside the case: 820 watts
> - lead fully unwound outside the case: 3100 watts

It would **not** be safe to use this drill with the extension lead if the lead was left wound inside the plastic case.

Explain why.

[3 marks]

.....

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.....

.....

6 (c) **Table 2** gives information about three different electric drills.

Table 2

Drill	Power input in watts	Power output in watts
X	640	500
Y	710	500
Z	800	500

A person is going to buy **one** of the drills, **X**, **Y** or **Z**. The drills cost the same to buy.

Use only the information in the table to decide which **one** of the drills, **X**, **Y** or **Z**, the person should buy.

Write your answer in the box. ☐

Give a reason for your answer.

[1 mark]

.....

.....

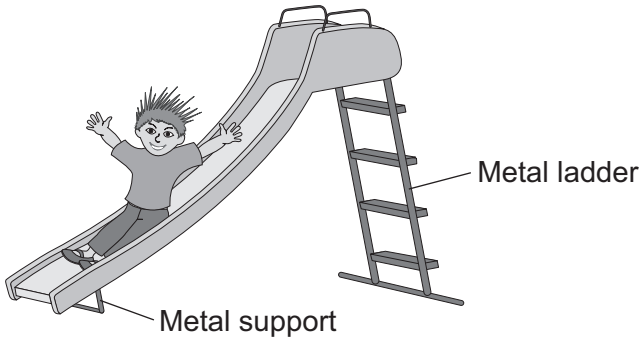
.....

9

Turn over for the next question

7 **Figure 12** shows a slide in a children's playground.

Figure 12



7 (a) A child of mass 18 kilograms goes down the slide.

The vertical distance from the top to the bottom of the slide is 2.5 metres.

Calculate the decrease in gravitational potential energy of the child sliding from the top to the bottom of the slide.

Gravitational field strength = 10 N/kg

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

.....

.....

Decrease in gravitational potential energy = ... J

7 (b) The slide is made of plastic.

7 (b) (i) The child becomes electrically charged when he goes down the slide.

Explain why.

[2 marks]

.....

.....

.....

.....

7 (b) (ii) Going down the slide causes the child's hair to stand on end.

What conclusion about the electrical charge on the child's hair can be made from this observation?

[2 marks]

.....

.....

Give a reason for your answer.

.....

.....

7 (b) (iii) Why would the child **not** become electrically charged if the slide was made from metal?

[1 mark]

.....

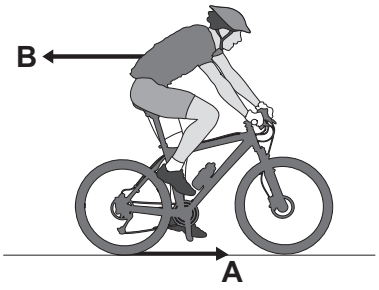
.....

7

Turn over for the next question

8 (a) **Figure 13** shows the horizontal forces acting on a moving bicycle and cyclist.

Figure 13



8 (a) (i) What causes force **A**?

Draw a ring around the correct answer.

[1 mark]

friction **gravity** **weight**

8 (a) (ii) What causes force **B**?

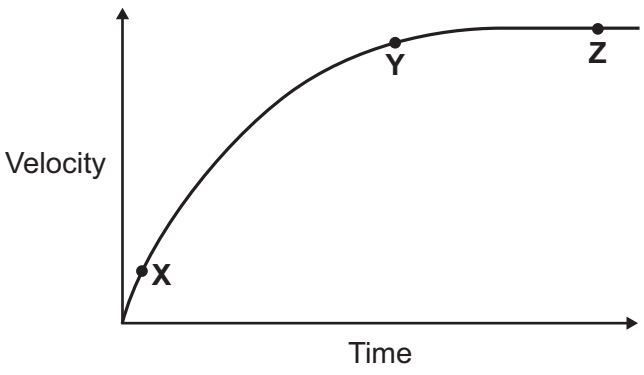
[1 mark]

.....

8 (a) (iii) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Figure 14 shows how the velocity of the cyclist changes during the first part of a journey along a straight and level road. During this part of the journey the force applied by the cyclist to the bicycle pedals is constant.

Figure 14



Describe how **and** explain, in terms of the forces **A** and **B**, why the velocity of the cyclist changes:

- between the points **X** and **Y**
- and between the points **Y** and **Z**, marked on the graph in **Figure 14**.

[6 marks]

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Extra space .....

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Question 8 continues on the next page

8 (b) (i) The cyclist used the brakes to slow down and stop the bicycle.

A constant braking force of 140 N stopped the bicycle in a distance of 24 m.

Calculate the work done by the braking force to stop the bicycle. Give the unit.

Use the correct equation from the Physics Equations Sheet.

[3 marks]

.....

.....

.....

Work done = ...

8 (b) (ii) Complete the following sentences.

[2 marks]

When the brakes are used, the bicycle slows down. The kinetic energy of the bicycle ..... .

At the same time, the ..... of the brakes increases.

13

END OF QUESTIONS