Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

For Examiner's Use

General Certificate of Secondary Education
January 2009

ADDITIONAL SCIENCE **PHY2F**
Unit Physics P2

F

PHYSICS
Unit Physics P2

Foundation Tier

Monday 19 January 2009 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 maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- 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.

For Examiner's Use			
Question	Mark	Question	Mark
1		7	
2		8	
3			
4			
5			
6			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

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

1 Four different processes are described in **List A**. The names of these processes are given in **List B**.

Draw a line to link each description in **List A** to its correct name in **List B**.
Draw only **four** lines.

List A	**List B**
the nuclei of two atoms joining together	gamma emission
the nucleus of an atom splitting into several pieces	electric current
an atom losing an electron	ionisation
an electric charge moving through a metal	nuclear fission
	nuclear fusion

(4 marks)

4

2 (a) Use numbers given in the box to complete the following sentences.

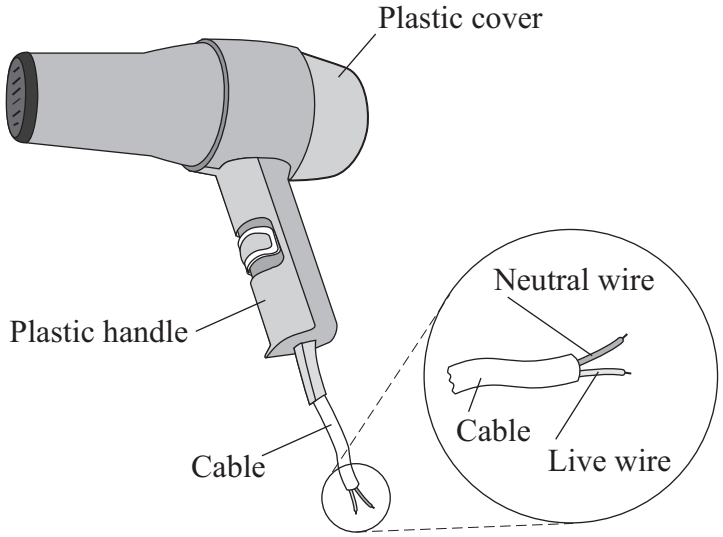
12	**50**	**110**	**230**

In the UK, the mains electricity supply is ..... volts.

The frequency of the UK mains electricity supply is ..... hertz.

(2 marks)

2 (b) The diagram shows a hairdryer designed to be used with the UK mains supply. The cable connecting the hairdryer to the plug does not have an earth wire.



2 (b) (i) Why does the hairdryer **not** need a cable with an earth wire?

.....

.....

(1 mark)

2 (b) (ii) Which **one** of the following materials are the two wires inside the cable made from?

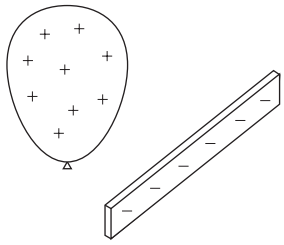
Draw a ring around your answer.

aluminium **copper** **steel**

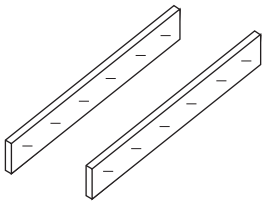
(1 mark)

4

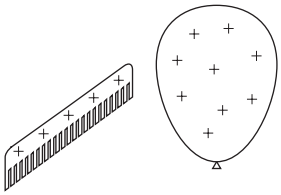
3 (a) The diagrams **X**, **Y** and **Z** show three pairs of charged objects. Each object is either positively charged or negatively charged.



X



Y



Z

3 (a) (i) In which diagram or diagrams do the objects repel each other?

.....

(1 mark)

3 (a) (ii) In which diagram or diagrams do the objects attract each other?

.....

(1 mark)

3 (b) The diagram shows a fuel tanker refuelling an aircraft. A static charge can build up as the fuel flows through the pipe to the aircraft. This can be dangerous.

Fuel tanker

3 (b) (i) Static charge could be dangerous in this situation.
Explain why.

.....

.....

.....

.....

(2 marks)

3 (b) (ii) Before refuelling, the aircraft and fuel tanker are joined to earth by a metal wire.

Which **one** of the following statements is the reason why this procedure reduces the danger?

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

The charge will stay in the wire. ☐

The charge will flow to earth. ☐

The charge will move onto the aircraft. ☐

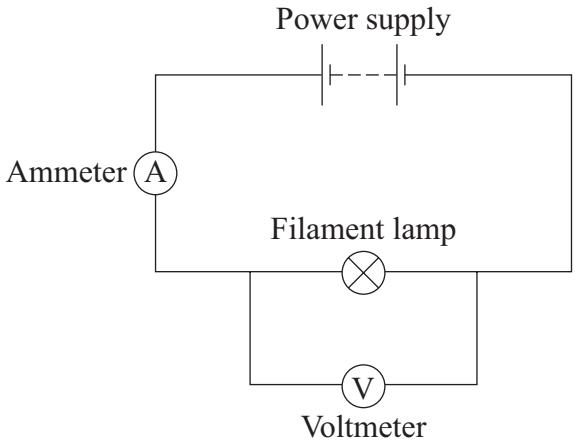
The charge will move onto the fuel tanker. ☐

(1 mark)

5

Turn over ▶

4 (a) The diagram shows the circuit used by a student to measure the power of a filament lamp.



Name a component connected in parallel with the filament lamp.

.....

(1 mark)

4 (b) By adding another component to the circuit, the student is able to obtain a range of ammeter and voltmeter readings.

Ammeter reading in amps	**Voltmeter reading in volts**
0.10	1.0
0.15	2.0
0.20	4.0
0.25	7.0
0.30	11.0

4 (b) (i) Which **one** of the following components did the student add to the circuit?

Draw a ring around your answer.

fuse **switch** **variable resistor**

(1 mark)

4 (b) (ii) What is the range of ammeter readings taken by the student?

from ..... amps to ..... amps

(1 mark)

4 (b) (iii) Use the data in the table and the equation in the box to calculate the **maximum** power of the filament lamp.

power (watt, W)	=	current (ampere, A)	×	potential difference (volt, V)

Show clearly how you work out your answer.

.....

.....

Power = ... W

(3 marks)

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

As the temperature of a filament lamp increases, its resistance

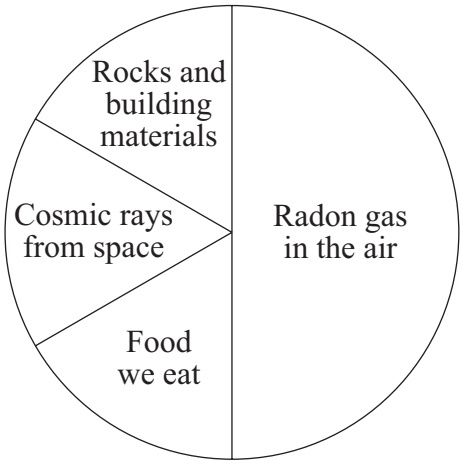
increases
remains constant
decreases

.

(1 mark)

7

5 (a) The pie chart shows the average proportions of natural background radiation from various sources in one part of the UK.



5 (a) (i) What proportion of the background radiation comes from radon gas?

.....

(1 mark)

5 (a) (ii) Suggest why our bodies are slightly radioactive.

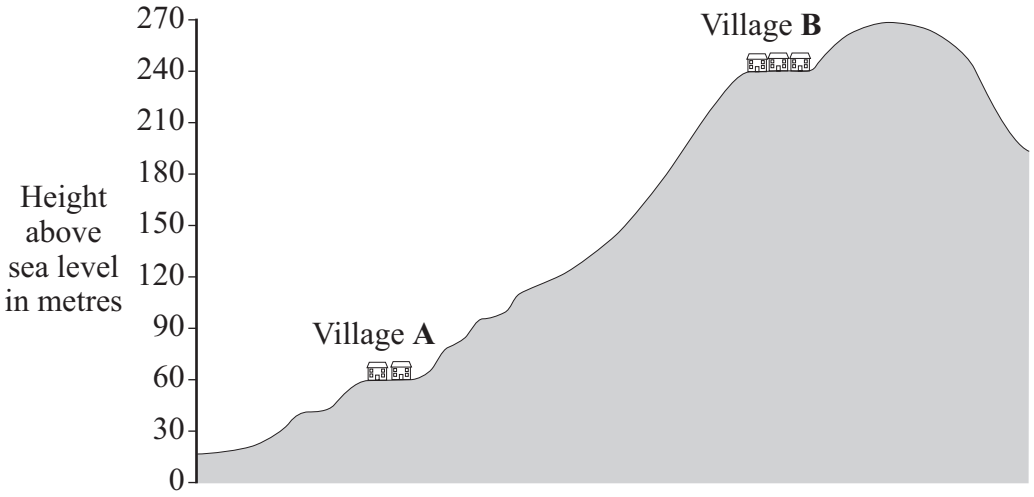
.....

.....

(1 mark)

5 (b) The level of background radiation from cosmic rays is not the same everywhere. For every 30 metres above sea level, the amount of background radiation increases by one unit.

The diagram shows the position of two villages, **A** and **B**, built on a hill.



How is the amount of background radiation from cosmic rays different in village **A** compared to village **B**?

To obtain full marks you must include a calculation in your answer.

.....

.....

.....

.....

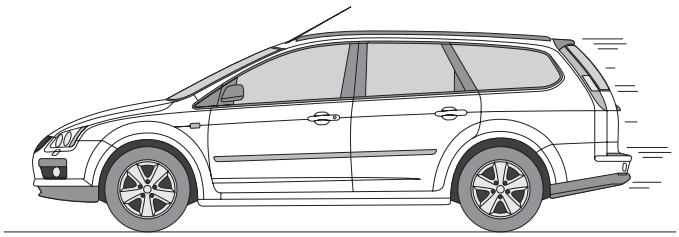
.....

.....

(3 marks)

5

6 (a) The diagram shows a car travelling at a speed of 12 m/s along a straight road.



6 (a) (i) Use the equation in the box to calculate the momentum of the car.

momentum = mass × velocity

Mass of the car = 900 kg

Show clearly how you work out your answer.

.....

.....

.....

.....

Momentum = ... kg m/s

(2 marks)

6 (a) (ii) Momentum has direction.

Draw an arrow on the diagram to show the direction of the car's momentum.

(1 mark)

6 (b) The car stops at a set of traffic lights.

How much momentum does the car have when it is stopped at the traffic lights?

.....

Give a reason for your answer.

.....

.....

.....

.....

(2 marks)

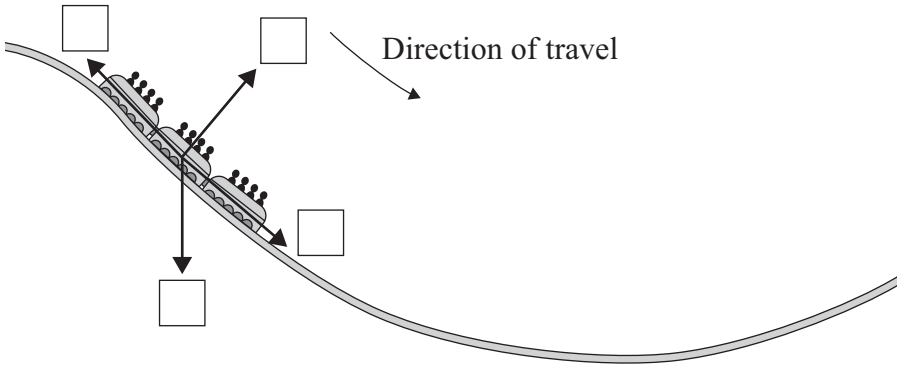
5

Turn over for the next question

7 The diagram shows the passenger train on part of a rollercoaster ride.

7 (a) Which arrow shows the direction of the resultant force acting on the passenger train?

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



(1 mark)

7 (b) At the bottom of the slope, the passengers in the train all have the same speed but they each have a different kinetic energy.

Why is the kinetic energy of each passenger different?

.....

.....

(1 mark)

7 (c) For part of the ride, the maximum gravitational field strength acting on the passengers seems 3 times bigger than normal.

Normal gravitational field strength = 10 N/kg

7 (c) (i) Calculate the maximum gravitational field strength that seems to act on the passengers during the ride.

.....

.....

Maximum gravitational field strength = ... N/kg

(1 mark)

7 (c) (ii) One of the passengers has a mass of 80 kg.

Use the equation in the box to calculate the maximum weight this passenger seems to have during the ride.

weight = mass × gravitational field strength

Show clearly how you work out your answer.

.....

.....

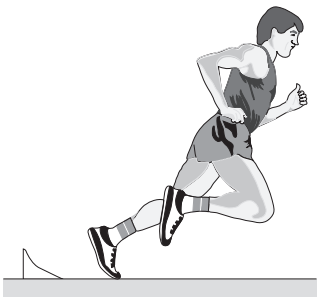
Maximum weight = ... N

(2 marks)

5

Turn over for the next question

8 (a) The diagram shows an athlete at the start of a race. The race is along a straight track.



In the first 2 seconds, the athlete accelerates constantly and reaches a speed of 9 m/s.

8 (a) (i) Use the equation in the box to calculate the acceleration of the athlete.

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

Show clearly how you work out your answer.

.....

.....

.....

Acceleration = ...

(2 marks)

8 (a) (ii) Which **one** of the following is the unit for acceleration?

Draw a ring around your answer.

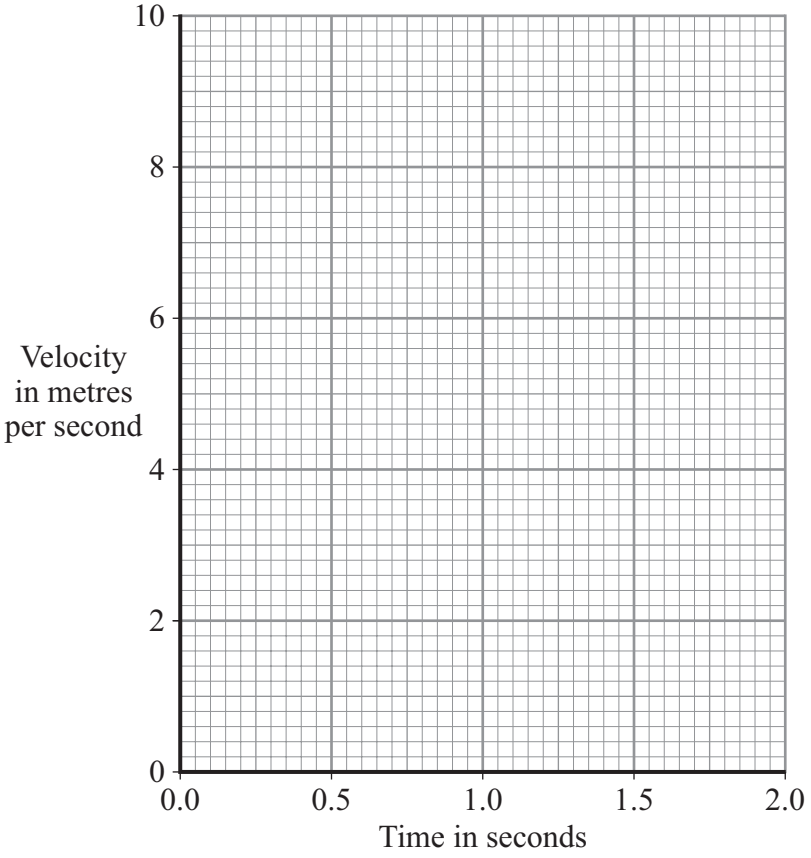
J/s **m/s** **m/s^2** **Nm**

(1 mark)

8 (a) (iii) Complete the following sentence.

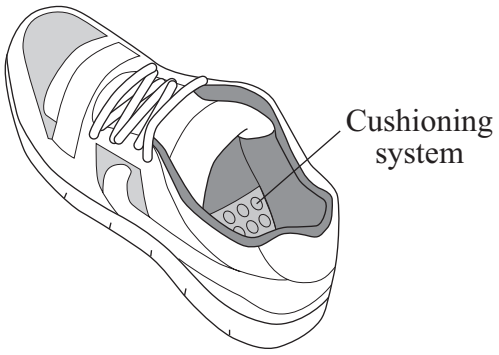
The velocity of the athlete is the ..... of the athlete in a given direction. *(1 mark)*

8 (a) (iv) Complete the graph to show how the velocity of the athlete changes during the first 2 seconds of the race.



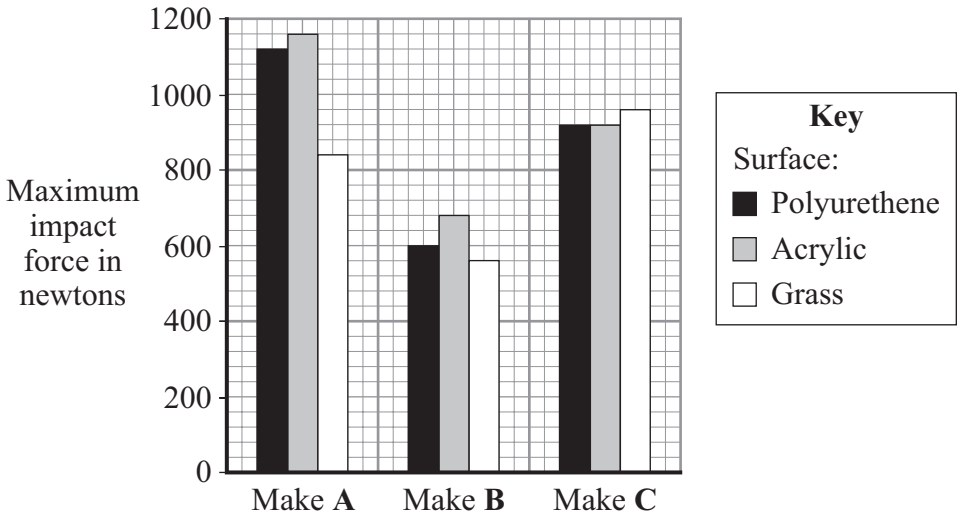
(2 marks)

8 (b) Many running shoes have a cushioning system. This reduces the impact force on the athlete as the heel of the running shoe hits the ground.



Question 8 continues on the next page

The bar chart shows the maximum impact force for three different makes of running shoe used on three different types of surface.



8 (b) (i) Which **one** of the three makes of running shoe, **A**, **B** or **C**, has the best cushioning system?

.....

Explain the reason for your answer.

.....

.....

.....

.....

(3 marks)

8 (b) (ii) The data needed to draw the bar chart was obtained using a robotic athlete fitted with electronic sensors.

Why is this data likely to be more reliable than data obtained using human athletes?

.....

.....

(1 mark)

10

END OF QUESTIONS