

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Secondary Education
June 2008

ADDITIONAL SCIENCE
Unit Physics P2

PHYSICS
Unit Physics P2

PHY2H
H



Higher Tier

Wednesday 11 June 2008 1.30 pm to 2.15 pm

<p>For this paper you must have:</p> <ul style="list-style-type: none"> a ruler. <p>You may use a calculator.</p>

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

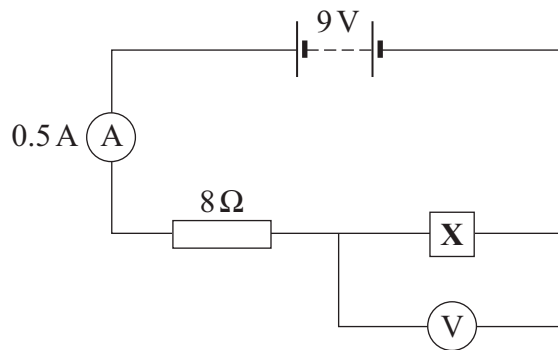
- In all calculations, show clearly how you work out your answer.

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



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

- 1 (a) The circuit diagram drawn below includes a component labelled **X**.



- 1 (a) (i) Use the equation in the box to calculate the potential difference across the 8 ohm resistor.

potential difference = current \times resistance
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Show clearly how you work out your answer.

.....

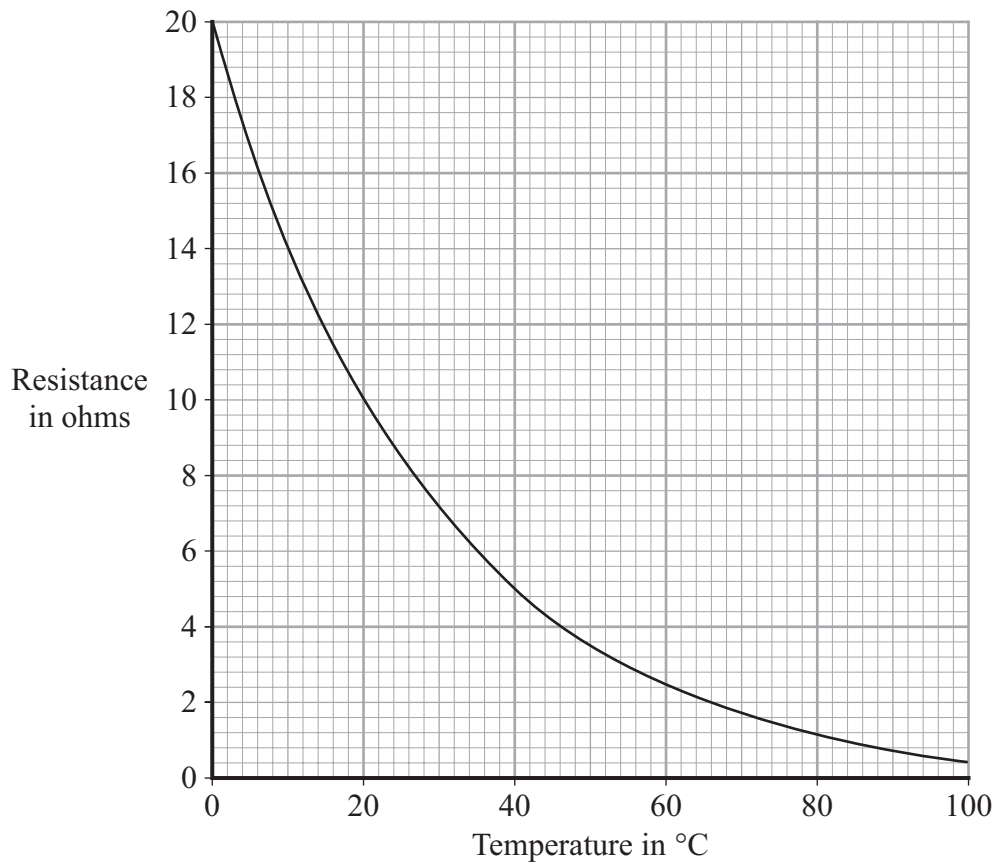
Potential difference = volts
 (2 marks)

- 1 (a) (ii) What is the potential difference across component **X**?

.....
 (1 mark)



- 1 (b) The graph shows how the resistance of component X changes with temperature.



- 1 (b) (i) What is component X?

.....

(1 mark)

- 1 (b) (ii) Over which range of temperatures does the resistance of component X change the most?

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

0°C to 20°C

20°C to 40°C

40°C to 60°C

60°C to 80°C

80°C to 100°C

(1 mark)

5

Turn over ►



- 2 (a) The table gives information about the radioactive isotope, radon-222.

mass number	222
atomic number	86
radiation emitted	alpha particle

- 2 (a) (i) Complete the following sentence.

The mass number is the total number of..... and
..... inside an atom.

(2 marks)

- 2 (a) (ii) Radon-222 is an isotope of radon.

How many protons are there in an atom of radon-222?

.....

(1 mark)

- 2 (a) (iii) When an atom of radon-222 emits an alpha particle, the radon-222 changes into an atom of polonium-218.

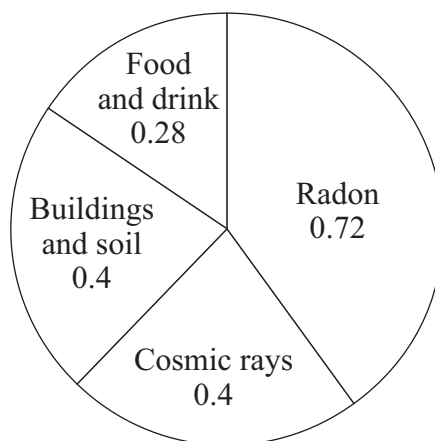
An alpha particle consists of 2 protons and 2 neutrons.

How is the structure of the nucleus of a polonium-218 atom different from the structure of the nucleus of a radon-222 atom?

.....

(1 mark)

- 2 (b) The pie chart shows the average radiation dose that a person in the UK receives each year from natural background radiation.
The doses are measured in millisieverts (mSv).



- 2 (b) (i) Calculate the proportion of natural background radiation that comes from radon. Show clearly how you work out your answer.

.....

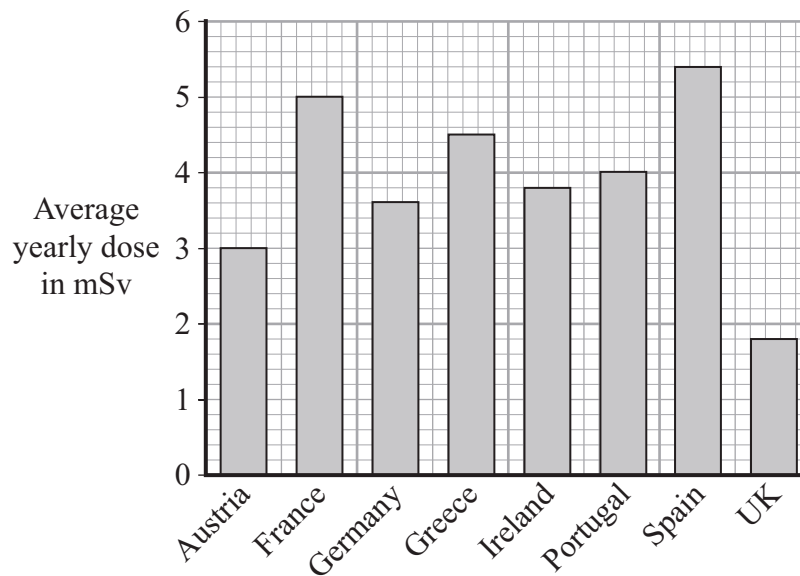
Proportion of radon =
 (2 marks)

- 2 (b) (ii) Not all background radiation is from natural sources.

Name **one** source of background radiation that is not natural.

.....
 (1 mark)

- 2 (c) The bar chart shows the average yearly dose from natural background radiation in different European countries.



- 2 (c) (i) How many times bigger is the average annual background dose in Germany compared to the UK?

.....
 (1 mark)

Question 2 continues on the next page

Turn over ►



- 2 (c) (ii) The following table gives the effects of different radiation doses on the human body.

Radiation dose in mSv	Effects
10 000	Immediate illness; death within a few weeks
1 000	Radiation sickness; unlikely to cause death
50	Lowest dose with evidence of causing cancer

A family goes to Germany for a two-week holiday. Should they be concerned about the higher level of background radiation in Germany?

Draw a ring around your answer.

Yes No

Explain your answer.

.....

.....

.....

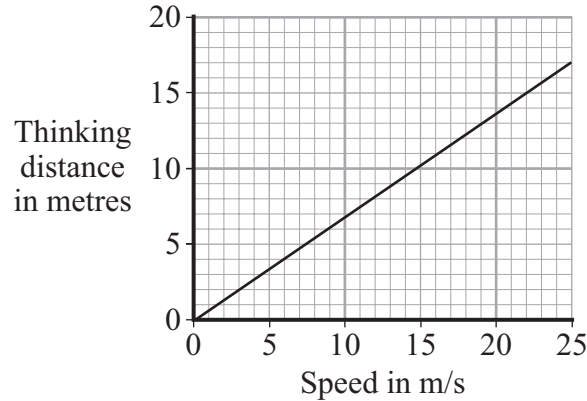
.....

(2 marks)



- 3 (a) A car driver takes a short time to react to an emergency before applying the brakes. The distance the car will travel during this time is called the 'thinking distance'.

The graph shows how the thinking distance of a driver depends on the speed of the car.



- 3 (a) (i) What is the connection between thinking distance and speed?

.....
(1 mark)

- 3 (a) (ii) Many people drive while they are tired.

Draw a new line on the graph to show how thinking distance changes with speed for a tired driver.

(1 mark)

- 3 (a) (iii) The graph was drawn using data given in the Highway Code.

Do you think that the data given in the Highway Code is likely to be reliable?

Draw a ring around your answer.

Yes **No** **Maybe**

Give a reason for your answer.

.....
.....

(1 mark)

Question 3 continues on the next page

Turn over ►



3 (b) The distance a car travels once the brakes are applied is called the 'braking distance'.

3 (b) (i) What is the relationship between thinking distance, braking distance and stopping distance?

.....
(1 mark)

3 (b) (ii) State **two** factors that could increase the braking distance of a car at a speed of 15 m/s.

1

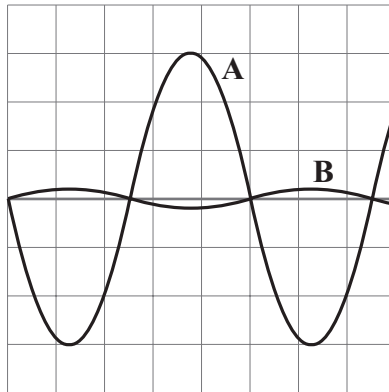
2

(2 marks)

6



- 4 The diagram shows two oscilloscope traces, **A** and **B**.



Trace **A** shows how the potential difference between the live and neutral terminals of an electricity supply changes with time.

- 4 (a) Describe how the potential of the live terminal varies with respect to the neutral terminal of the electricity supply.

.....
.....

(2 marks)

- 4 (b) What does trace **B** show?

.....
.....

(1 mark)

- 4 (c) Each horizontal division on the oscilloscope represents 0.005 s.

- 4 (c) (i) What is the period of this electricity supply?

.....

Period = seconds

(1 mark)

- 4 (c) (ii) Calculate the frequency of the supply.

.....

Frequency = hertz

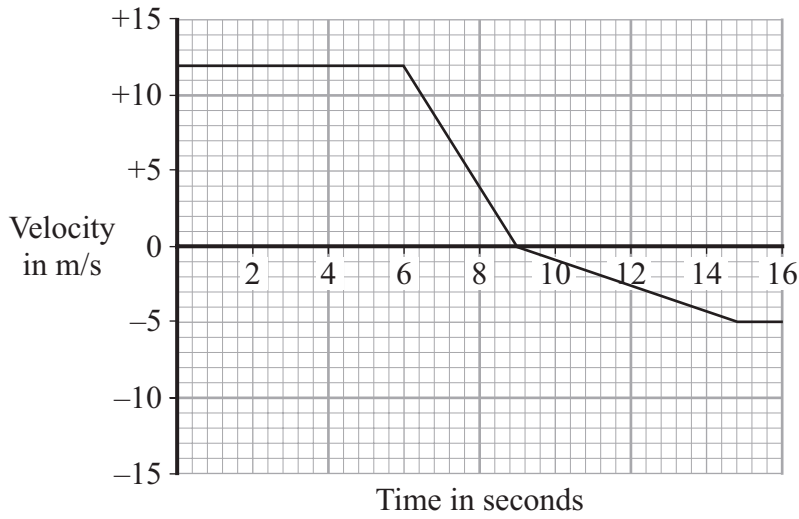
(1 mark)

5

Turn over ►



5 A car is driven along a straight road. The graph shows how the velocity of the car changes during part of the journey.



5 (a) Use the graph to calculate the deceleration of the car between 6 and 9 seconds.

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

.....

.....

.....

Deceleration =
(3 marks)

5 (b) At what time did the car change direction?

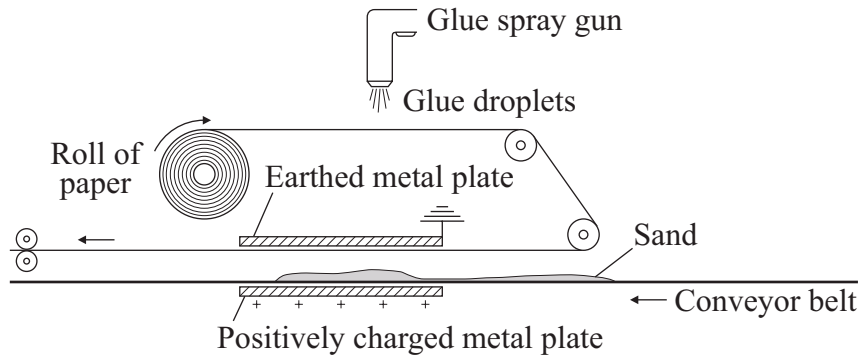
..... seconds
(1 mark)

4



6 Static electricity can be both useful and a nuisance.

6 (a) The diagram shows a method of producing sandpaper using static electricity.



Glue is sprayed onto a moving strip of paper. As the glue leaves the spray gun, the glue breaks up into tiny negatively charged droplets which coat the paper. The sticky paper passes between two metal plates. Sand moving on a conveyor belt also passes between the metal plates.

6 (a) (i) Explain the advantage of having all the droplets of glue negatively charged.

.....

.....

.....

.....

(2 marks)

6 (a) (ii) Explain why the sand moves towards the sticky paper.

.....

.....

.....

.....

(2 marks)

Question 6 continues on the next page

Turn over ►



- 6 (b) People often experience an electric shock when getting out of a car.
This happens because charge is generated as they move around on the car seats.

On a warm dry day, the potential difference between a driver and the car increases to 10 000 volts. As the driver goes to touch the car door, a spark jumps the air gap, transferring 20 joules of energy between the driver and the car.

Use the equation in the box to calculate the initial charge on the driver.

$$\text{energy transformed} = \text{potential difference} \times \text{charge}$$

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

.....

.....

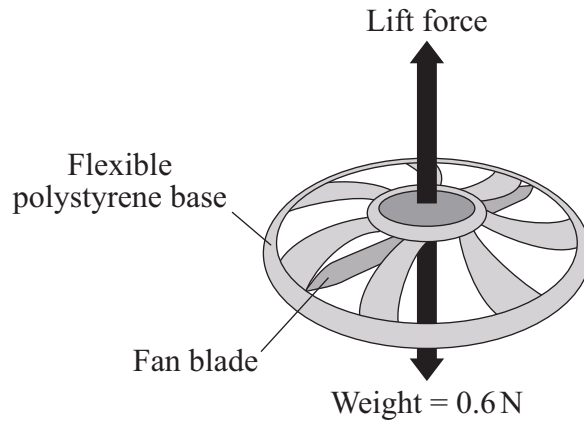
Charge =

(3 marks)

7



7 The diagram shows a small, radio-controlled, flying toy. A fan inside the toy pushes air downwards creating the lift force on the toy.



When the toy is hovering in mid-air, the fan is pushing 1.5 kg of air downwards every 10 seconds. Before the toy is switched on, the air is stationary.

7 (a) Use the equations in the box to calculate the velocity of the air when the toy is hovering.

$\text{momentum} = \text{mass} \times \text{velocity}$ $\text{force} = \frac{\text{change in momentum}}{\text{time taken for the change}}$
--

Show clearly how you work out your answer.

.....

.....

.....

Velocity = m/s
(3 marks)

Question 7 continues on the next page

Turn over ▶



7 (b) Explain why the toy accelerates upwards when the fan rotates faster.

.....
.....
.....
.....

(2 marks)

7 (c) The toy is not easy to control so it often falls to the ground.

Explain how the flexible polystyrene base helps to protect the toy from being damaged when it crashes into the ground.

.....
.....
.....
.....
.....
.....

(3 marks)

8

END OF QUESTIONS



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