

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use
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General Certificate of Secondary Education  
January 2007



**SCIENCE B**  
**Unit Physics P1**

**PHY1F**  
**F**

**PHYSICS**  
**Unit Physics P1**

**Foundation Tier**

Friday 26 January 2007 9.00 am to 9.45 am

<p><b>For this paper you must have:</b></p> <ul style="list-style-type: none"> <li>a ruler.</li> </ul> <p>You may use a calculator.</p>
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Time allowed: 45 minutes

**Instructions**

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- 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.

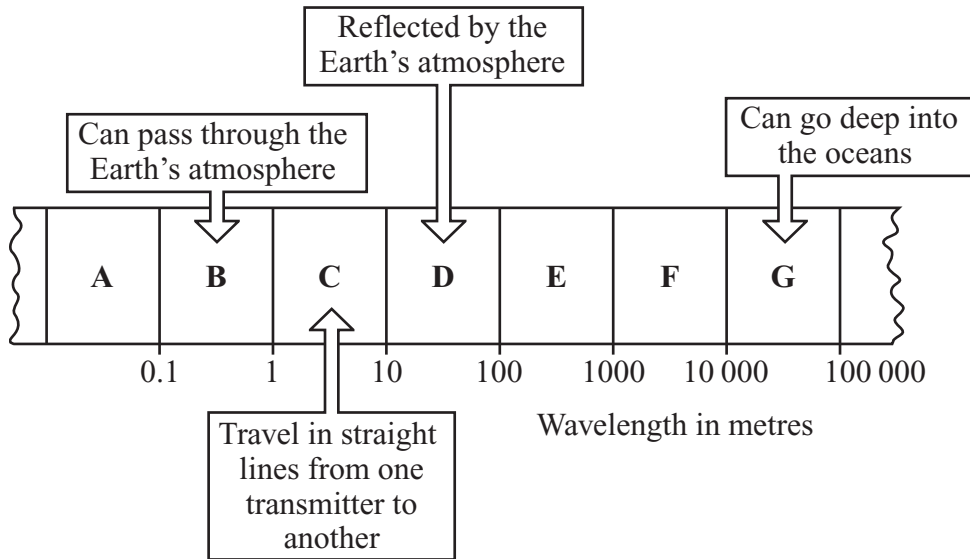
**Advice**

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

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

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

- 1 The diagram shows a small part of the electromagnetic spectrum divided into seven sections. The different properties of the waves in each section make them useful in different ways.



The waves in which section, **A**, **B**, **C**, **D**, **E**, **F** or **G**, are:

- (a) used to send a signal to a satellite in space

.....  
(1 mark)

- (b) used to communicate with a submarine under the water

.....  
(1 mark)

- (c) used by a radio station to broadcast programmes around the world

.....  
(1 mark)

- (d) the waves with the shortest wavelength?

.....  
(1 mark)

**Turn over for the next question**

**Turn over ►**

- 2 (a) The names of three types of radiation are given in **List A**. Various properties of these three types of radiation are given in **List B**.

Draw a line to link each type of radiation in **List A** to its correct property in **List B**.  
Draw only **three** lines.

List A Type of radiation	List B Property of radiation
alpha ( $\alpha$ )	not dangerous
beta ( $\beta$ )	stopped by paper
gamma ( $\gamma$ )	travels at 300 000 000 m/s
	travels up to 1 metre in air

(3 marks)

- (b) This sign warns people that a radioactive source is being used in a laboratory.



Why is it important to warn people that a radioactive source is being used?

.....

.....

(1 mark)

- (c) To study the blood flow in a patient's lungs, a doctor injects some technetium-99 compound into the patient. The gamma radiation given out by the technetium-99 atoms is detected using a gamma camera outside the patient's body.

Which statement gives the reason why gamma radiation is used? Put a tick (✓) in the box next to your choice.

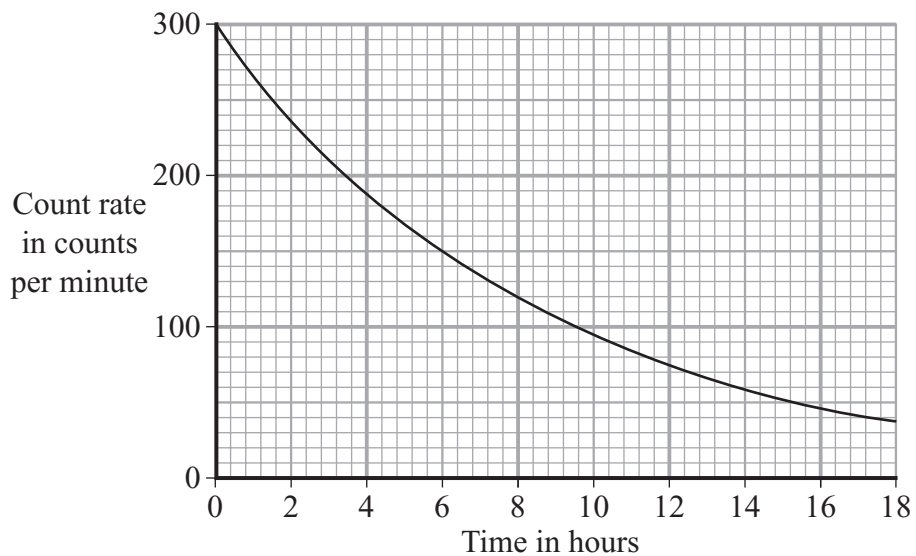
It can travel through a vacuum.

It is not affected by a magnet.

It can pass through the human body.

(1 mark)

- (d) The graph shows how the count rate from a sample of technetium-99 changes with time.



- (i) How many hours does it take for the count rate to fall from 300 counts per minute to 150 counts per minute?

Time = ..... hours  
(1 mark)

- (ii) What is the half-life of technetium-99?

Half-life = ..... hours  
(1 mark)

7

Turn over ►

3 (a) Mobile phones send *digital* signals using electromagnetic waves.

(i) Draw a simple diagram to show a *digital* signal.

(1 mark)

(ii) Which **one** of the following types of electromagnetic wave is used to carry information between masts in a mobile phone network?

Draw a ring around your answer.

**light**

**microwave**

**radio**

(1 mark)

(b) Some people worry that using a mobile phone may be bad for their health.

Look at this information taken from a recent newspaper article.

- Scientists in Sweden found that the regular use of a mobile phone increases the risk of a cancerous growth between the ear and the brain.
- Some people who use mobile phones for a long time complain of headaches and tiredness. The same effect has not been noticed in laboratory tests.
- There is no reliable evidence to link using mobile phones with ill health.
- The waves from a mobile phone are not strong enough to cause long-term heat damage to cells in the body.

(i) Complete the following sentence by drawing a ring around the word in the box that is correct.

The evidence from different scientists doing the same investigation is reliable if

all the scientists get 

different
identical
random

 results.

(1 mark)

(ii) What information in the article supports the idea that mobile phones are bad for your health?

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

(2 marks)

(iii) Some scientists say that using a mobile phone is totally safe.  
What information in the article supports this view?

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

(2 marks)

7

**Turn over for the next question**

**Turn over ►**

4 Light is given out by the Sun and a distant galaxy.

(a) Compared to the light from the Sun, the light from the distant galaxy has moved towards the red end of the spectrum.

(i) What name is given to this effect?

.....  
(1 mark)

(ii) Complete the following sentence by drawing a ring around the line in the box that is correct.

The fact that light from a distant galaxy seems to move towards the red end of

the spectrum gives scientists evidence that

galaxies are shrinking
galaxies are changing colour
the universe is expanding

(1 mark)

(b) Scientists have a theory that the universe began from a very small point and then exploded outwards.

(i) What name is given to this theory?

.....  
(1 mark)

(ii) Which statement gives a reason why scientists think that the universe began with an explosion?

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

At the moment it is the best way of explaining our scientific knowledge.

It can be proved using equations.

People felt the explosion.

(1 mark)

(c) Scientists use various types of telescope to obtain data from our solar system and beyond.

(i) What type of electromagnetic radiation is detected using an optical telescope?

.....  
(1 mark)

(ii) The image from a telescope orbiting in space is usually clearer than the image from a telescope on the Earth.

Which statement gives a reason for this? Put a tick (✓) in the box next to your choice.

A space telescope is bigger.

A space telescope is closer to the stars.

The atmosphere does not block the light to a space telescope.

(1 mark)

(iii) Give **one** disadvantage of having a telescope in space.

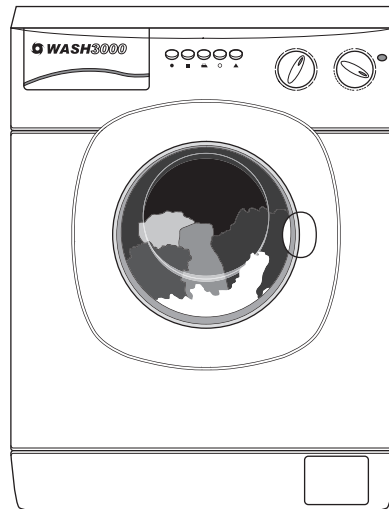
.....  
.....  
(1 mark)

7
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**Turn over for the next question**

**Turn over ►**

- 5 (a) The picture shows a new washing machine.



Complete the following sentence using **one** of the words in the box.

<b>kinetic</b>	<b>light</b>	<b>sound</b>
----------------	--------------	--------------

A washing machine is designed to transform electrical energy into heat and  
 ..... energy.

*(1 mark)*

- (b) The instruction booklet for the washing machine contains the following information.

<b>Wash cycle</b>	<b>Average power during cycle</b>	<b>Time taken to run cycle</b>
<b>HOT</b>	1.5 kW	2 hours
<b>COOL</b>	1.1 kW	1½ hours
<b>FAST</b>	1.0 kW	¾ hour

- (i) Use the following equation to calculate the energy transferred, in kilowatt-hours, to the washing machine during the HOT wash cycle. Show how you work out your answer.

energy transferred = power × time

.....  
 .....

Energy transferred = ..... kWh  
 (2 marks)

- (ii) Why does it cost more to use the washing machine on the HOT cycle than on the COOL or FAST cycle?

.....  
 .....

(1 mark)

- (iii) Before buying a washing machine, a householder researched several makes to find out which washing machine was the most energy efficient.

Write down **one** way that he could have done this research.

.....  
 .....

(1 mark)

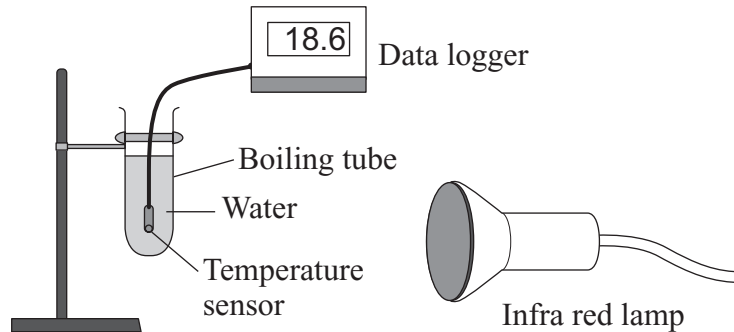
5
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**Turn over for the next question**

**Turn over ►**

- 6 A student had read about a glacier that had been covered in insulating material. The idea was to slow down the rate at which the glacier melts in the summer.

She investigated this idea using the apparatus shown in the diagram.



- (a) These are the steps taken by the student.

- Measure  $30\text{ cm}^3$  of cold water into a boiling tube.
- Place the boiling tube 25 cm from an infra red lamp.
- Record the temperature of the water.
- Switch on the infra red lamp.
- Record the temperature of the water every minute for 5 minutes.
- Repeat with boiling tubes covered in different insulating materials.

- (i) Why did she use an infra red lamp?

.....  
(1 mark)

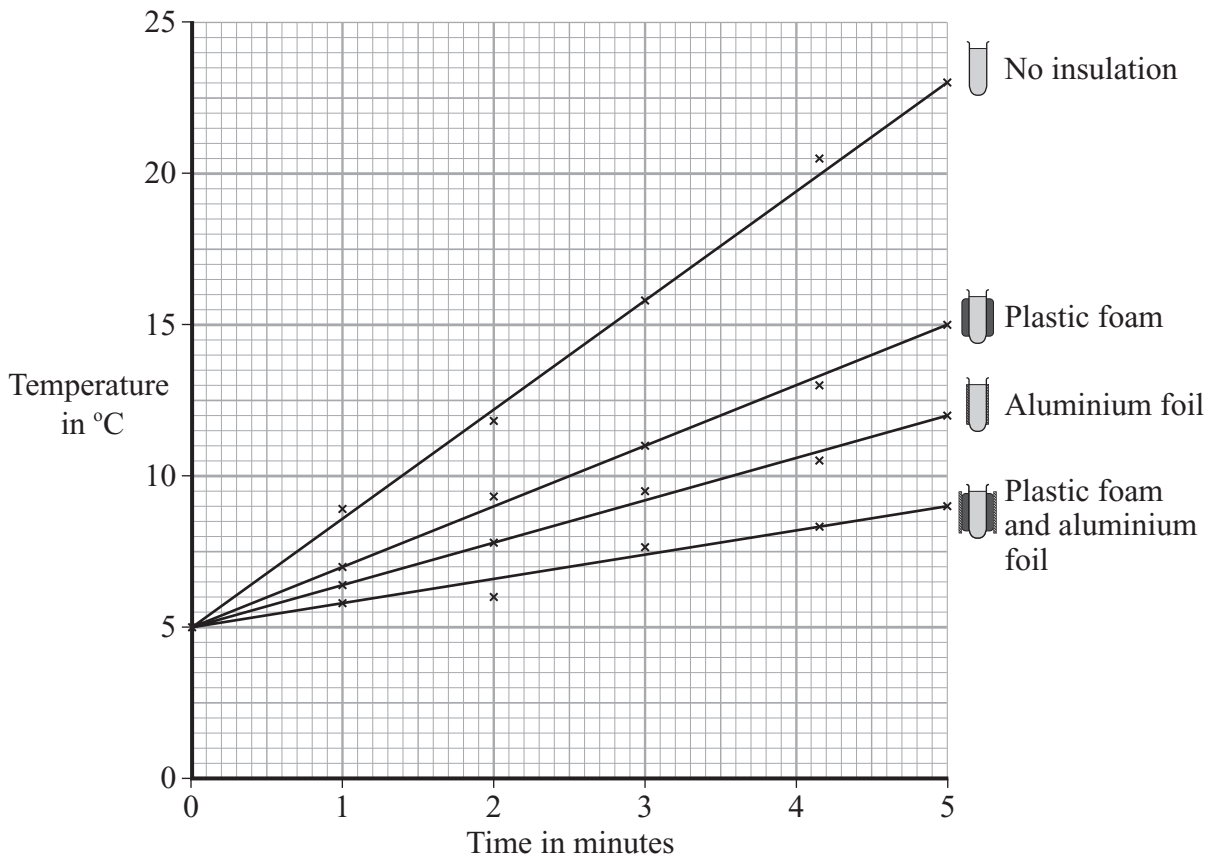
- (ii) Name **one** control variable in this investigation.

.....  
(1 mark)

- (iii) Give **one** advantage of using a temperature sensor and data logger instead of a glass thermometer to measure temperature.

.....  
.....  
(1 mark)

(b) The results of the investigation are shown in the graph.



(i) Why did the student use a boiling tube with no insulation?

.....

.....

(1 mark)

(ii) From her results, what should she recommend is used to insulate the glacier?

.....

(1 mark)

**Question 6 continues on the next page**

**Turn over ►**

(iii) Explain why the insulation recommended by the student will reduce the heat transfer from the Sun to the glacier.

.....

.....

.....

.....

.....

(2 marks)

(c) Explain, in terms of particles, how heat is transferred through the glass wall of a boiling tube.

.....

.....

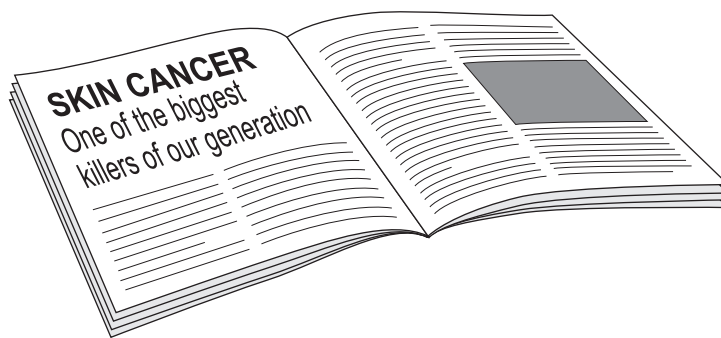
.....

.....

(2 marks)

9

7 A headline from a recent magazine article is shown below.



(a) Complete the following sentence.

Skin cancer can be caused by exposure to excess ..... rays from the Sun.  
(1 mark)

(b) Sunscreen should be used to protect your skin from the damaging effects of the Sun. A thick layer of sunscreen should be applied 30 minutes before sunbathing and re-applied every hour.

The protection factor of a sunscreen lets you work out roughly how long you can stay in the Sun without causing damage to your skin. For example, a ‘factor 10’ sunscreen lets you stay in the Sun for up to ten times longer than if you were not using the sunscreen.

(i) Without sunscreen, a person with fair skin has found that she gets sunburn after 12 minutes of sunbathing.

What is the maximum time that she could sunbathe without burning if she used ‘factor 30’ sunscreen on her skin?

.....

Maximum time = .....  
(1 mark)

(ii) Why does the protection factor give only a rough idea of how long you can sunbathe without getting sunburn?

.....

.....

(1 mark)

(iii) Another person has naturally dark skin.

Suggest why he can sunbathe with less risk of getting skin cancer than a fair-skinned person.

.....

.....

.....

.....

(2 marks)

(c) Most people know that sunbathing can cause skin cancer. But most holidaymakers still like to come home with a suntan.

Why is it important that people understand that there are dangers involved in sunbathing?

.....

.....

(1 mark)

**There are no questions printed on this page**