Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

For Examiner's Use

General Certificate of Secondary Education
January 2008

SCIENCE B **PHY1F**
Unit Physics P1 **F**

PHYSICS
Unit Physics P1

Foundation Tier

Monday 21 January 2008 1.30 pm to 2.15 pm

For this paper you must have:
- a ruler.

You may use a calculator.

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			
3			
4			
5			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

There are no questions printed on this page

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

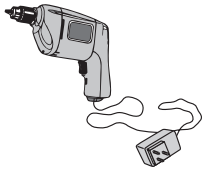
1 (a) Each letter **A**, **B**, **C**, **D** and **E** represents an energy transformation.

A electrical to gravitational potential
B electrical to heat
C electrical to kinetic
D electrical to light
E electrical to sound

Match each of the following devices to the useful energy transformation that it is designed to make.

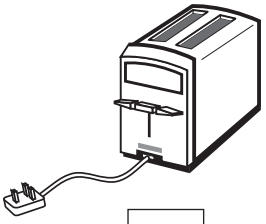
Write the correct letter, **A**, **B**, **C**, **D** or **E**, in the box below the device. Use each letter once or not at all.

Drill



MP3 player

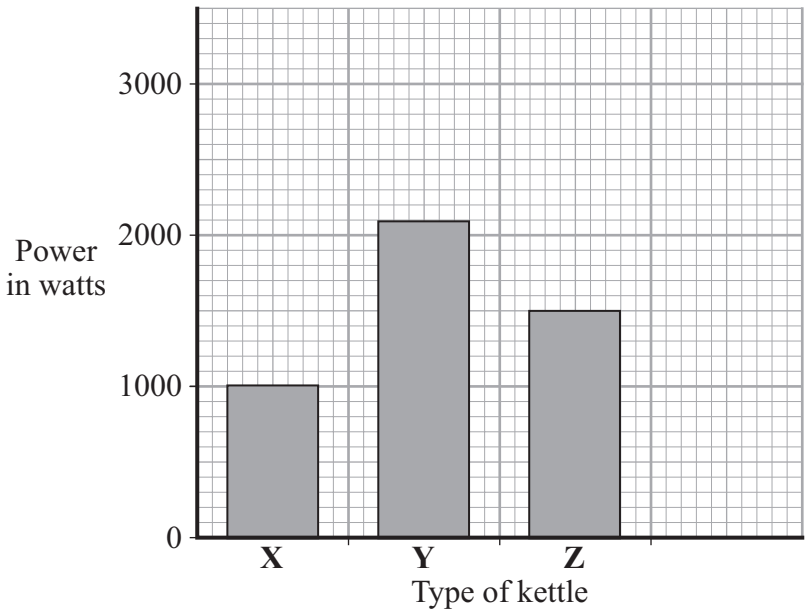
Toaster



(3 marks)

Question 1 continues on the next page

(b) The bar chart shows the power of three electric kettles.



(i) What is the power of kettle **Y**?

.....

(1 mark)

(ii) In one week each kettle is used for a total of 30 minutes.

Which kettle costs the most to use?

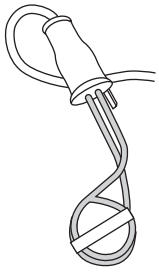
.....

(1 mark)

(iii) A new 'express boil' kettle boils water faster than any other kettle.

Draw a fourth bar on the chart to show the possible power of an 'express boil' kettle. *(1 mark)*

(c) Some friends are going on holiday. They want to be able to boil water to make their own hot drinks. They cannot decide which to take, a travel kettle or a small portable immersion heater that can be placed in a mug.



Travel kettle	**Immersion heater**
• 1 kW element • Holds 1 litre • Works on 110 V or 230 V • Washable water filter	• 0.4 kW element • Heats up to 0.5 litres of water • Works on 230 V only • Small compact size

(i) Give **one** advantage of taking the travel kettle.

.....

.....

(1 mark)

(ii) Give **one** advantage of taking the immersion heater.

.....

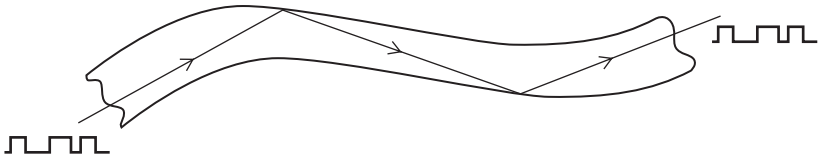
.....

(1 mark)

8

Turn over for the next question

2 (a) The diagram shows a signal and the path taken by the signal as it travels along an optical fibre.



(i) What name is given to the type of signal shown in the diagram?

.....

(1 mark)

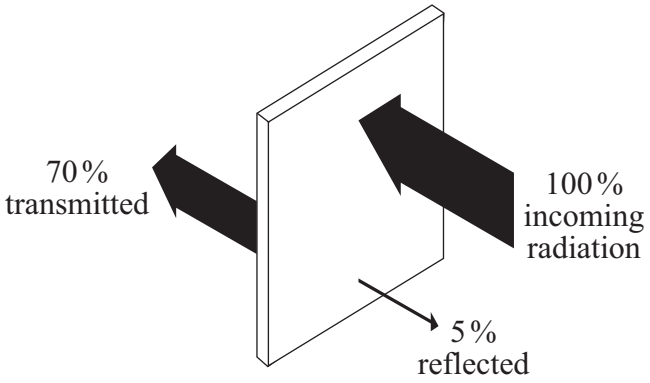
(ii) Name the **two** types of electromagnetic radiation that can be used to send signals along an optical fibre.

1 .....

2 .....

(2 marks)

(b) Infra red radiation can be reflected, absorbed and transmitted by glass.



(i) What percentage of infra red is absorbed by the glass?

.....

(1 mark)

(ii) Complete the following sentence by drawing a ring around the correct word or phrase.

The absorbed infra red | increases / does not change / decreases | the temperature of the glass.

(1 mark)

(c) **Two** of the following statements are true. **One** of the statements is false.

Tick (✓) the boxes next to the **two** true statements.

All objects absorb infra red radiation.	
Black surfaces are poor emitters of infra red radiation.	
A hot object emits more infra red than a cooler object.	

(1 mark)

(d) The following statement is false.

Black surfaces are good reflectors of infra red radiation.

Change **one** word in this statement to make it true.

Write down your **new** statement.

.....

.....

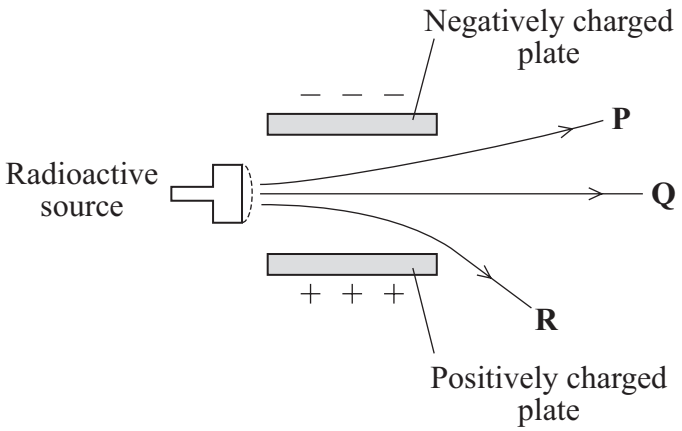
(1 mark)

7

Turn over for the next question

3 A radioactive source emits alpha (α), beta (β) and gamma (γ) radiation. The diagram shows what happens to the radiation as it passes between two charged metal plates.

Diagram 1



(a) Which line **P**, **Q** or **R** shows the path taken by:

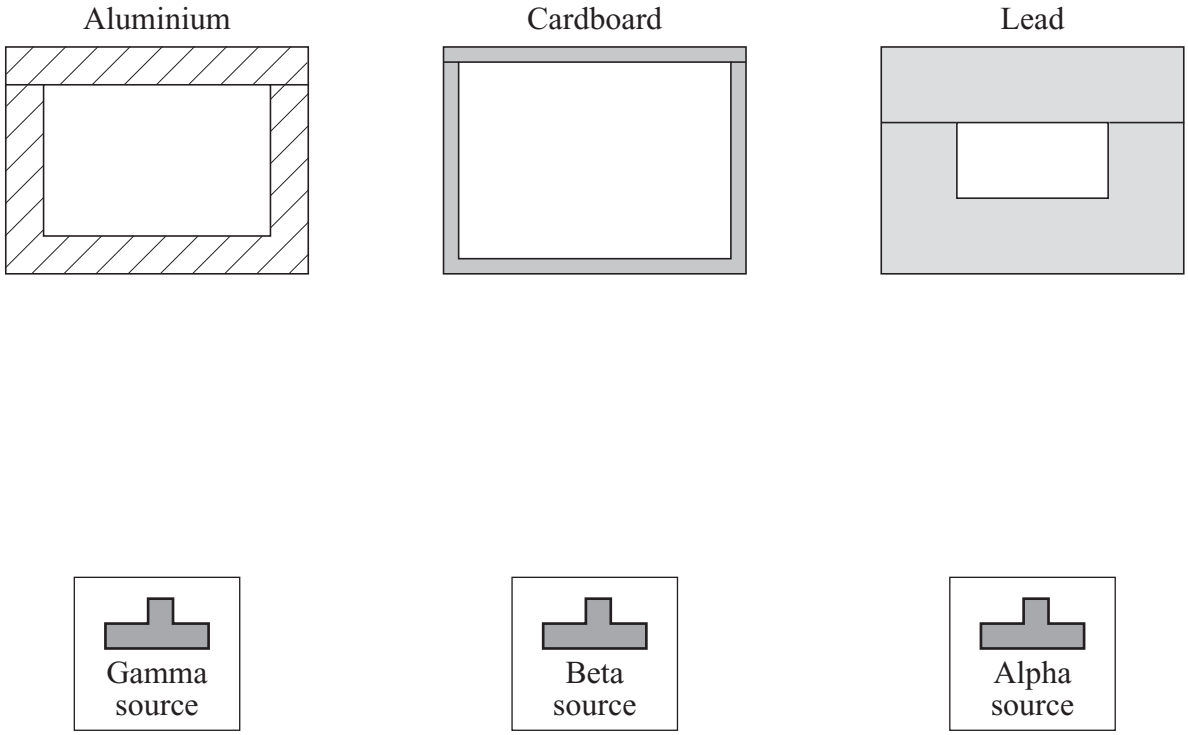
(i) alpha radiation .....

(1 mark)

(ii) gamma radiation? .....

(1 mark)

(b) The diagram shows three different boxes and three radioactive sources. Each source emits only one type of radiation and is stored in a different box. The box reduces the amount of radiation getting into the air.

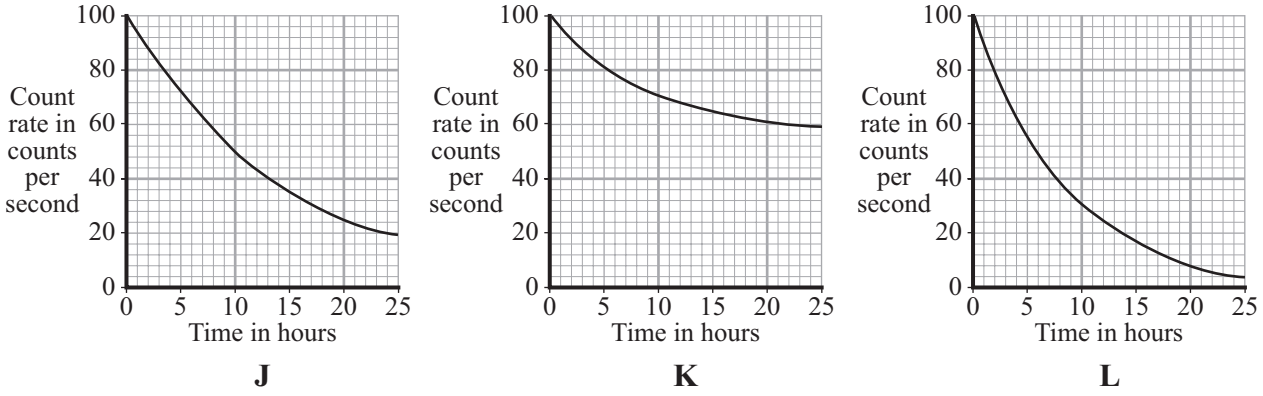


Draw **three** lines to show which source should be stored in which box so that the minimum amount of radiation gets into the air.

(2 marks)

Question 3 continues on the next page

(c) The graphs show how the count rates from three different radioactive sources, **J**, **K**, and **L**, change with time.



(i) Which source, **J**, **K**, or **L**, has the highest count rate after 24 hours? .....

(1 mark)

(ii) For source **L**, what is the count rate after 5 hours?

..... counts per second

(1 mark)

(iii) Which source, **J**, **K**, or **L**, has the longest half-life? .....

(1 mark)

(iv) A radioactive source has a half-life of 6 hours.

What might this source be used for?

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

To monitor the thickness of paper as it is made in a factory ☐

To inject into a person as a medical tracer ☐

To make a smoke alarm work ☐

(1 mark)

8

4 Using an optical telescope to look at stars is not always easy because:

- too many street lights often make it too light to see faint stars
- clouds reduce the light getting to the telescope
- atmospheric pollution often distorts the images.

(a) Large optical telescopes are often positioned high up a mountain.

Describe the advantages of positioning a telescope high up a mountain.

.....

.....

.....

.....

.....

.....

(3 marks)

(b) A new telescope is going to be built in Chile. It will detect electromagnetic waves with a frequency between infra red and radio waves.

What type of waves will this telescope detect?

.....

(1 mark)

(c) Telescopes that detect X-rays are always on satellites in space.

Which statement gives the reason for the telescope to be in space?

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

The atmosphere absorbs X-rays. ☐

X-rays can harm people. ☐

X-rays have a shorter wavelength than light. ☐

(1 mark)

5

5 (a) Water waves are a renewable energy source.

The government wants more electricity to be generated from renewable energy sources. Some people do not think this is a good idea.

What reasons could a government scientist give to show people that using more renewable energy sources is a good idea?

.....

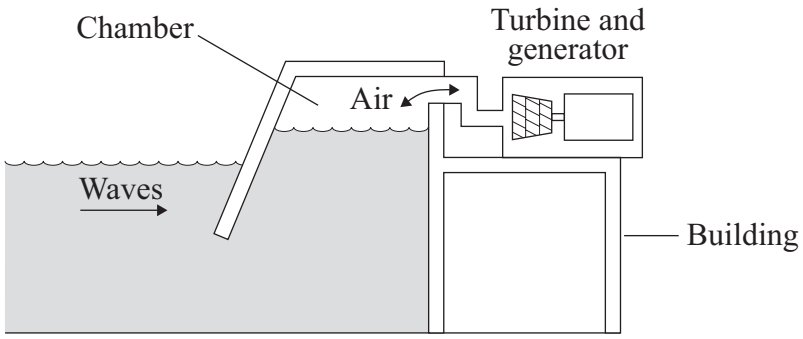
.....

.....

.....

(2 marks)

(b) The diagram shows a wave-powered generator. The generator transforms kinetic energy from the waves to electrical energy.



The following sentences describe how the wave generator works. The sentences are in the wrong order.

R Waves push air up and down a chamber inside the building.
S The turbine turns the generator.
T The generator transforms kinetic energy to electrical energy.
U The air rushes through a turbine making it spin.
V Strong waves move towards the wave-powered generator.

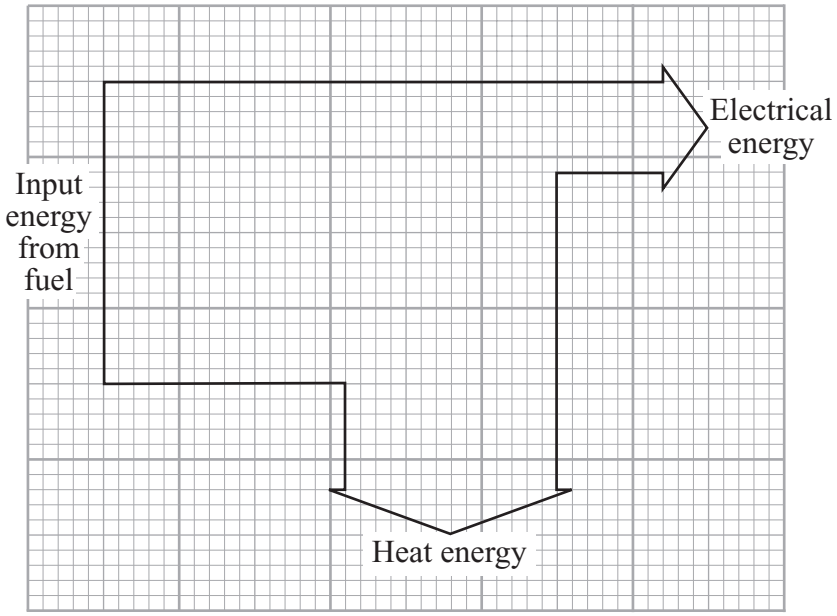
Arrange these sentences in the correct order. Start with letter **V**.

V → ☐ → ☐ → ☐ → ☐

(3 marks)

5

6 (a) The diagram shows the energy transformations in a fuel burning power station.



(i) Name **one** fuel that is burned to provide the energy source for a power station.

.....

(1 mark)

(ii) Use the diagram and the equation in the box to calculate the efficiency of the power station.

$$\text{efficiency} = \frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}}$$

Show clearly how you work out your answer.

.....

.....

Efficiency = ...

(2 marks)

(iii) Name the process by which a nuclear fuel provides the energy needed to generate electricity in a nuclear power station.

.....

(1 mark)

Question 6 continues on the next page

(b) Electricity is distributed from power stations to consumers along the National Grid.

(i) Transformers are part of the National Grid. Transformers are *efficient* devices.

What is meant by a device being *efficient*?

.....

.....

(1 mark)

(ii) When electricity flows through a cable, some energy is transformed into heat.

Explain how the National Grid system reduces the amount of energy lost as heat.

.....

.....

.....

.....

(2 marks)

(c) Read this information taken from a recent newspaper article.

- Researchers have found that children living close to overhead power cables are more likely to develop leukaemia.
- The researchers studied two groups of children. One group had developed leukaemia, the other group was healthy.
- Although the researchers found a link, they are unable to explain why it happened. They say that the results may have happened by chance.
- Other factors that have not been investigated, such as the environment, the geographical area or the children's genes, could be important.
- A cancer research charity said that childhood leukaemia was most likely to be caused by factors that parents were unable to control.

(i) Why did the researchers study a group of healthy children?

.....

.....

(1 mark)

(ii) The information does not say how many children were studied.

Why should this data have been included in the article?

.....

.....

(1 mark)

(iii) The researchers could not be certain that the overhead power cables were responsible for the increased chance of children developing leukaemia.

Explain why.

.....

.....

.....

.....

(2 marks)

(iv) The results of the research carried out by scientists may worry some people.

What do you think scientists should do?

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

Scientists should publish their research findings straight away. ☐

Scientists should not publish their research findings until they have found out as many facts as possible. ☐

Give a reason for your choice.

.....

.....

(1 mark)

12

END OF QUESTIONS

There are no questions printed on this page

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