Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

For Examiner's Use

General Certificate of Secondary Education
June 2009

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

PHYSICS
Unit Physics P1

Foundation Tier

Friday 19 June 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.

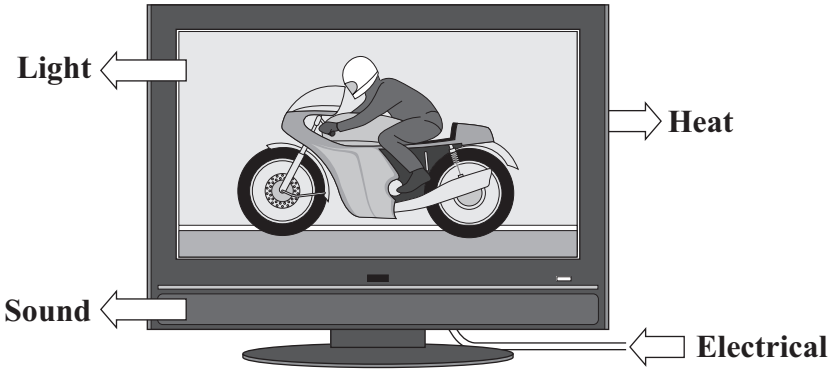
Information
- The maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

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

For Examiner's Use			
Question	Mark	Question	Mark
1		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 the energy transformations produced by a TV.



1 (a) Use words from the diagram to complete the following sentence.

The TV is designed to transform ..... energy into light and ..... energy.

(2 marks)

1 (b) Which **one** of the following statements is **false**?

Put a tick (✓) in the box next to the **false** statement.

The energy transformed by the TV makes the surroundings warmer. ☐

The energy transformed by the TV becomes spread out. ☐

The energy transformed by the TV will be destroyed. ☐

(1 mark)

1 (c) Two different makes of television, **A** and **B**, transform energy at the same rate. Television **A** wastes less energy than television **B**.

Complete the following sentence by drawing a ring around the correct line in the box.

Television **A** has

a higher efficiency than
the same efficiency as
a lower efficiency than

television **B**.

(1 mark)

4

Turn over for the next question

2 Wind and tides are renewable energy sources that are used to generate electricity.

2 (a) Complete each sentence by putting a tick (✓) in the box next to the correct answer.

2 (a) (i) The wind is:

a predictable energy source. ☐

a constant energy source. ☐

an unreliable energy source. ☐

(1 mark)

2 (a) (ii) The tides are:

a predictable energy source. ☐

a constant energy source. ☐

an unreliable energy source. ☐

(1 mark)

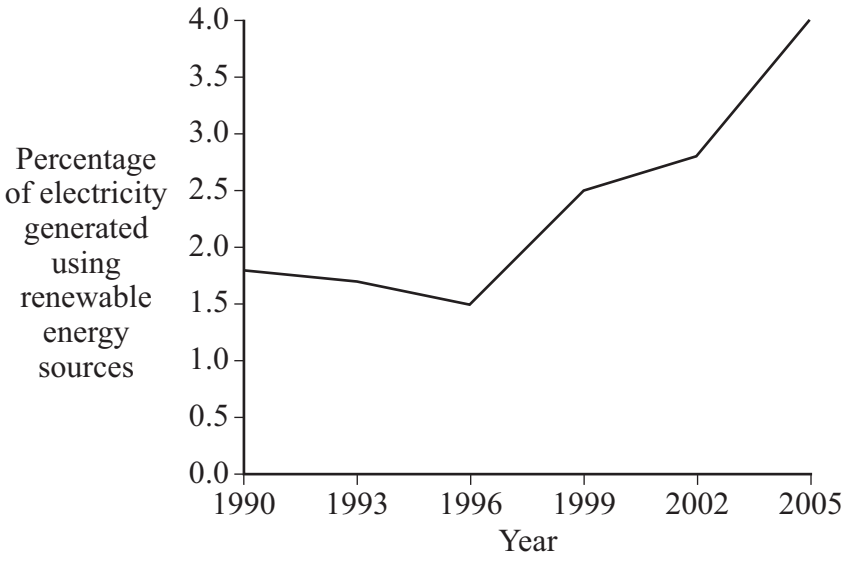
2 (b) If wood is to be used as a renewable energy source, what must be done each time a tree is chopped down?

.....

.....

(1 mark)

2 (c) In the UK, electricity is generated using renewable and non-renewable energy sources. The graph shows the percentage of electricity generated using renewable energy sources between 1990 and 2005.



Complete the following sentence by drawing a ring around the correct line in the box.

In 2015, the percentage of electricity generated using renewable energy sources is most likely to be

greater than 4%
equal to 4%
less than 4%

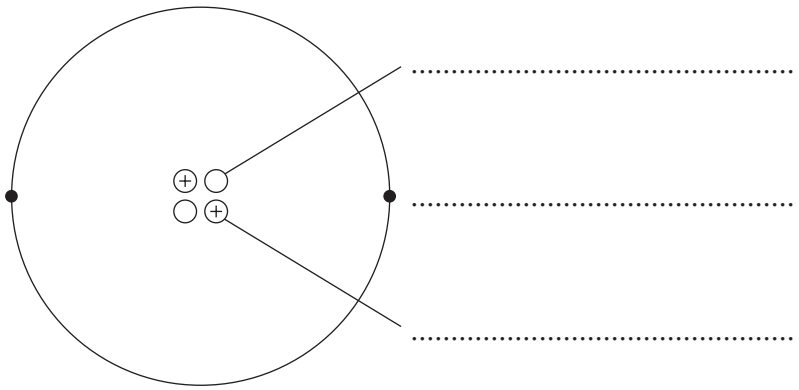
.

(1 mark)

4

Turn over for the next question

3 The diagram shows a helium atom.



3 (a) (i) Use the words in the box to label the diagram.

electron	**neutron**	**proton**

(2 marks)

3 (a) (ii) An alpha particle is the same as the nucleus of a helium atom.

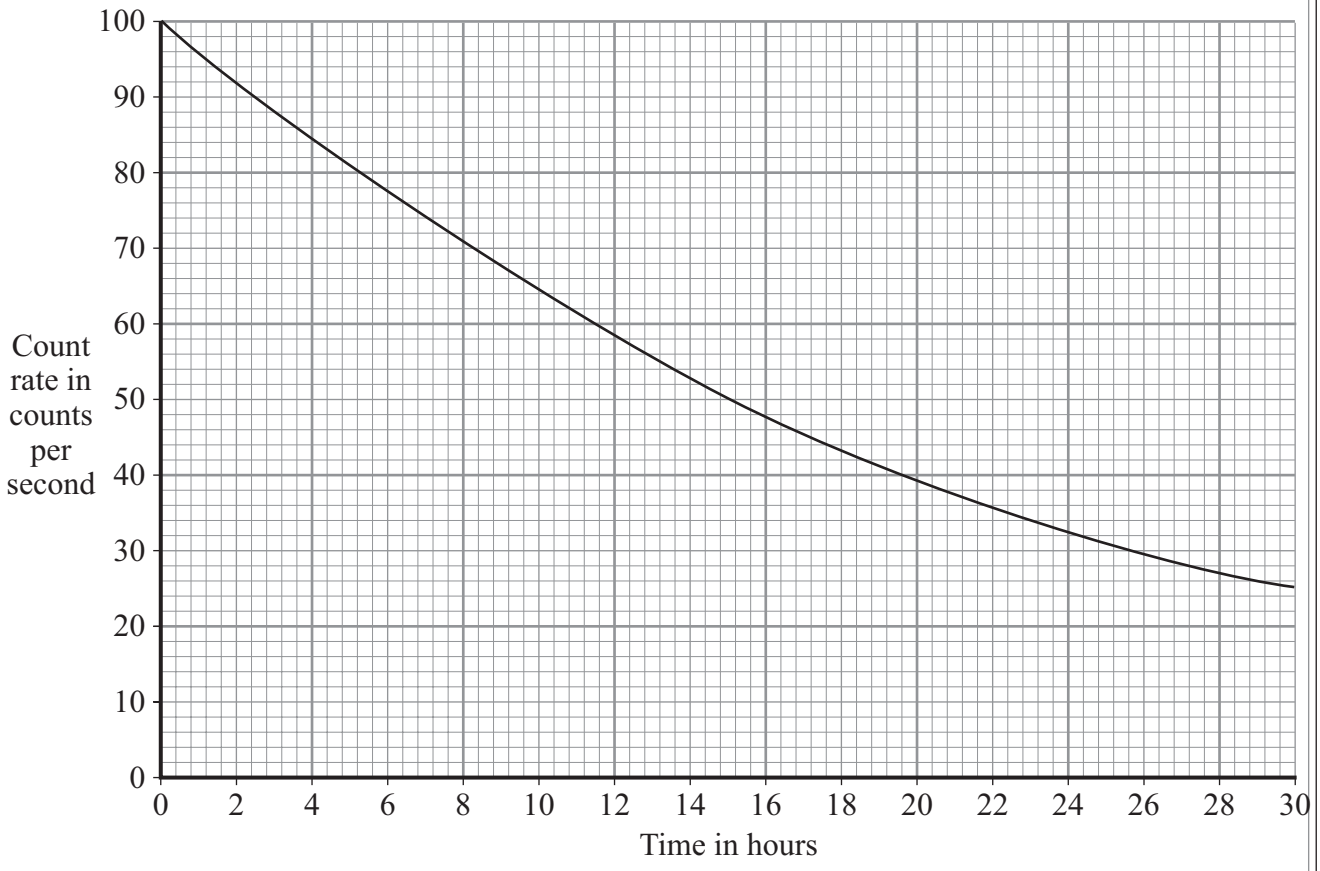
How is an alpha particle different from a helium atom?

.....

.....

(1 mark)

3 (b) The graph shows how the count rate from a sample of radioactive sodium-24 changes with time.



3 (b) (i) How many hours does it take for the count rate to fall from 100 counts per second to 50 counts per second?

Time = ... hours
(1 mark)

3 (b) (ii) What is the half-life of sodium-24?

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

Question 3 continues on the next page

Turn over ▶

3 (c) A smoke detector contains a small amount of americium-241.

Americium-241 is a radioactive substance which emits alpha particles. It has a half-life of 432 years.

3 (c) (i) Which **one** of the following statements gives a reason why the americium-241 inside the smoke detector will **not** need replacing?

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

The alpha particles have a low energy. ☐

People replace smoke detectors every few years. ☐

Americium-241 has a long half-life. ☐

(1 mark)

3 (c) (ii) The diagram shows the label on the back of the smoke detector.

Why do people need to know that the smoke detector contains a radioactive material?

.....

.....

(1 mark)

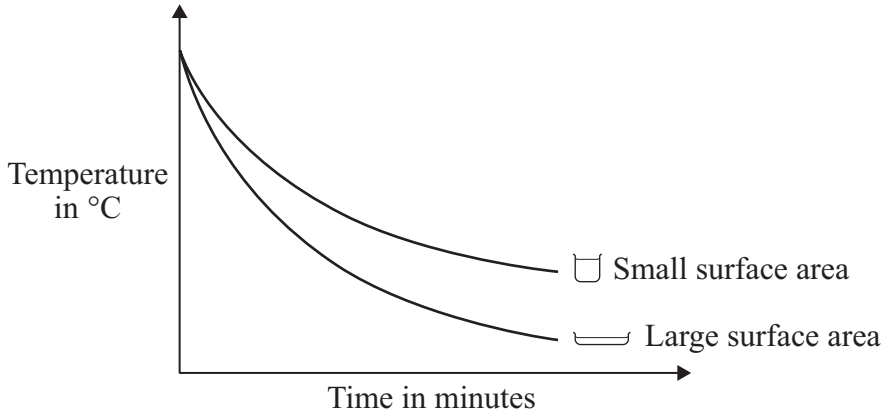
7

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

4 (a) The graph compares how quickly hot water cooled down in two glass beakers with different surface areas.

The volume of water in each beaker was the same.



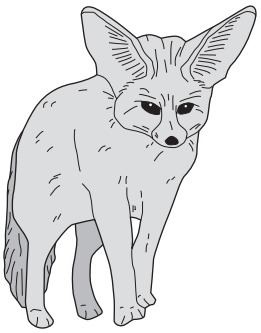
Describe how the surface area of the water affected how fast the water cooled down.

.....

.....

(1 mark)

4 (b) Some foxes live in a hot desert environment.



This type of fox has very large ears.

Explain how the size of the fox's ears help it to keep cool in a hot desert.

.....

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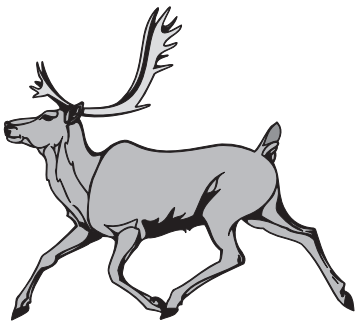
.....

.....

(2 marks)

4 (c) Polar bears and reindeer are adapted to live in cold environments.



Use the words in the box to complete the following sentences.

conduction	**convection**	**radiation**

4 (c) (i) The white colour of a polar bear's fur helps to keep the polar bear warm by reducing the heat lost by ..... .

(1 mark)

4 (c) (ii) The hairs of a reindeer are hollow. The air trapped inside the hairs reduces the heat lost by ..... .

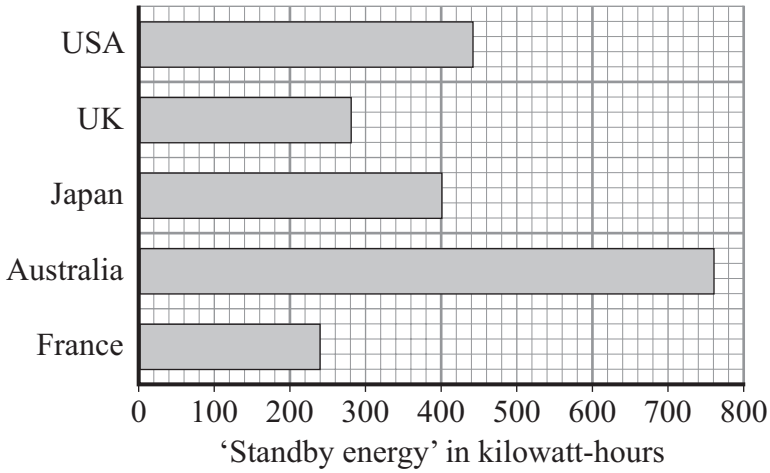
(1 mark)

5

Turn over for the next question

5 Electrical appliances that are left on standby still use energy.

The bar chart compares the *average* amount of 'standby energy' wasted each year in every home in five countries.



5 (a) (i) In which country are the homes that waste, on average, the smallest amount of 'standby energy'?

Draw a ring around your answer.

Australia **France** **Japan** **UK** **USA**

(1 mark)

5 (a) (ii) Suggest a reason why an *average* value is used for the 'standby energy' wasted in the homes.

.....

.....

(1 mark)

5 (b) (i) Australia has one of the lowest electricity prices in the world.

How does this low price seem to affect the amount of 'standby energy' wasted?

.....

.....

(1 mark)

5 (b) (ii) In Australia, most electricity is generated in coal-burning power stations. The Australian government wants less electricity to be wasted.

Wasting less electricity would be good for the Australian environment.

Explain why.

.....

.....

.....

.....

(2 marks)

5 (c) Energy is not usually measured in kilowatt-hours.

Which **one** of the following units is usually used to measure energy?

Draw a ring around your answer.

hertz **joule** **watt**

(1 mark)

5 (d) (i) Electricity in Japan costs the equivalent of 17 pence per kilowatt-hour.

Use the information in the bar chart and the equation in the box to calculate how much the 'standby energy' used in an average Japanese home costs each year.

total cost = number of kilowatt-hours × cost per kilowatt-hour

Show clearly how you work out your answer.

Give your answer in pence.

.....

.....

Cost = ... pence

(3 marks)

Question 5 continues on the next page

5 (d) (ii) In Japan, the largest proportion of electricity is generated using nuclear fuels.

Which **one** of the following statements gives a good reason for using nuclear fuels to generate electricity?

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

A nuclear power station is very expensive to build. ☐

A small amount of nuclear fuel generates a large amount of electricity. ☐

It is easy to store nuclear waste safely. ☐

(1 mark)

10

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

6 (a) The table lists the names of seven telescopes. Each one of the telescopes is designed to detect a different one of the seven types of electromagnetic wave.
The table is incomplete.

Name of telescope	Type of wave detected
HESS	Gamma
XMM Newton	X-ray
FUSE	Ultraviolet
William Herschel	Visible light
Spitzer	
SPT	Microwave
Lovell	Radio

6 (a) (i) Which **one** of the telescopes is designed to detect the type of wave with the shortest wavelength?

.....

(1 mark)

6 (a) (ii) What type of wave is the Spitzer telescope designed to detect?

.....

(1 mark)

6 (b) The William Herschel telescope is on the Earth's surface. Another telescope, the Hubble telescope, which also detects visible light, orbits the Earth.

How is the image produced by the Hubble telescope better than the image produced by the William Herschel telescope?

.....

Give a reason for your answer.

.....

.....

(2 marks)

6 (c) Some types of electromagnetic wave are absorbed by water.
The SPT telescope is located in the Antarctic, which is a dry environment.

Explain why it is better to have this type of telescope in a dry environment rather than in a wet, humid environment.

.....

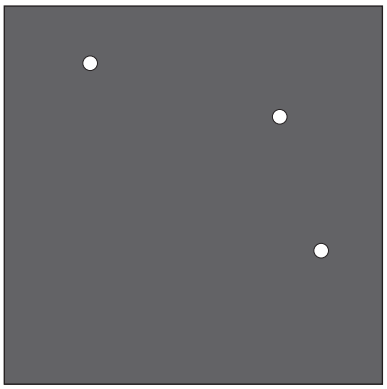
.....

.....

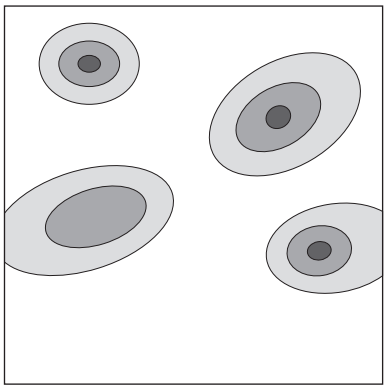
.....

(2 marks)

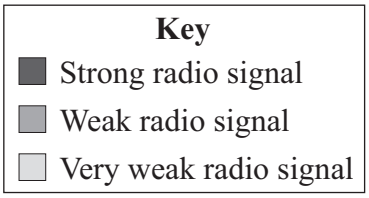
6 (d) The pictures represent the images produced using a visible light telescope and a radio telescope. Both images are of the same part of the sky. The shading on the radio telescope image represents the strength of the radio signals.



Visible light image



Radio telescope image



Suggest what extra information can be gained from the radio telescope image compared with the visible light image.

.....

.....

(1 mark)

7

Turn over ▶

7 (a) Mobile phone networks send digital signals using microwaves.

7 (a) (i) Give **one** advantage of sending information as a digital signal rather than as an analogue signal.

.....

.....

(1 mark)

7 (a) (ii) Give **one** other use of microwaves.

.....

.....

(1 mark)

7 (b) Some scientists think that there is a link between using a mobile phone and some types of illness. Other scientists disagree. They say that the evidence is limited and unreliable.

7 (b) (i) Suggest what scientists could do to show a link between using a mobile phone and illness.

.....

.....

(1 mark)

7 (b) (ii) How could scientists improve the reliability of the evidence?

.....

.....

(1 mark)

7 (b) (iii) Complete the following passage by drawing a ring around the word in the box that is correct.

There has been little or no experimental research into the health of children who use mobile phones.

This is partly because of the | economic / environmental / ethical | issues involved in using children in scientific research.

(1 mark)

7 (c) Before being sold, new mobile phones must be tested and given a SAR value. The SAR value is a measure of the energy absorbed by the head while a mobile phone is being used.

The table gives the SAR value for three mobile phones made by different companies. To be sold in the UK, a mobile phone must have a SAR value lower than 2.0 W/kg.

Mobile phone	SAR value in W/kg
J	0.18
K	0.86
L	1.40

7 (c) (i) All companies use the same test to measure a SAR value.

Why is using the same test important?

.....

.....

(1 mark)

Question 7 continues on the next page

7 (c) (ii) Would the companies that make the mobile phones, **J**, **K** and **L**, be correct to claim that these three phones are totally safe to use?

Answer yes or no. .....

Give a reason for your answer.

.....

.....

(1 mark)

7 (d) Devices designed to protect a mobile phone user from microwave radiation are now available.

Why is it important that these devices are tested by scientists who are **not** working for the company that makes the devices?

.....

.....

(1 mark)

8

END OF QUESTIONS