

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	



General Certificate of Secondary Education
Foundation Tier
June 2011

Science B
Unit Physics P1

PHY1F
F

Physics
Unit Physics P1

Friday 17 June 2011 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 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. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

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

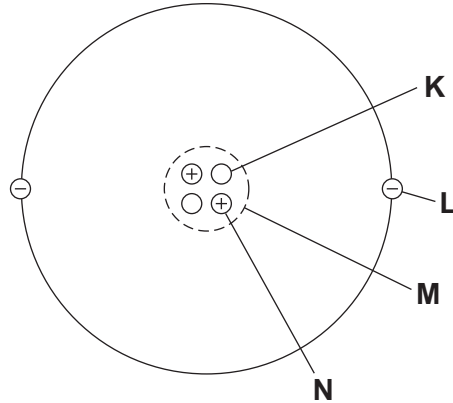
- In all calculations, show clearly how you work out your answer.



J U N 1 1 P H Y 1 F 0 1

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

1 (a) The diagram represents a helium atom.



1 (a) (i) Which part of the atom, **K**, **L**, **M** or **N**, is an electron?

Part
(1 mark)

1 (a) (ii) Which part of the atom, **K**, **L**, **M** or **N**, is the same as an alpha particle?

Part
(1 mark)

1 (b) A radioactive source emits alpha particles.

What might this source be used for?

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

to monitor the thickness of aluminium foil as it is made in a factory

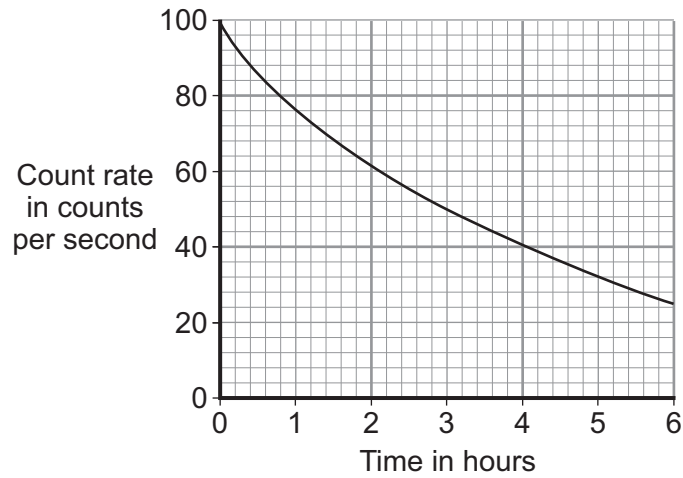
to make a smoke detector work

to inject into a person as a medical tracer

(1 mark)



- 1 (c) The graph shows how the count rate from a source of alpha radiation changes with time.



What is the count rate after 4 hours?

..... counts per second
(1 mark)

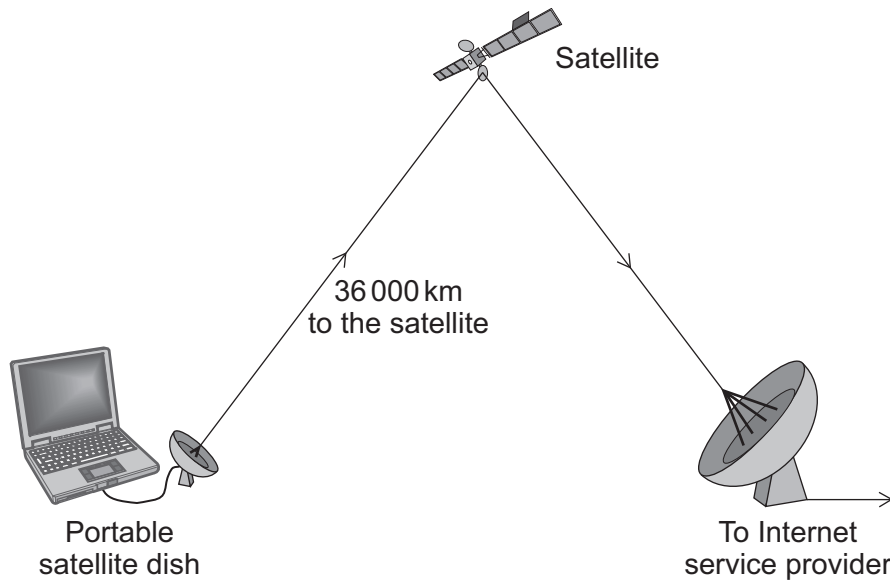
4

Turn over for the next question

Turn over ►



- 2 (a) The diagram shows a computer connected to the Internet using a satellite link.



- 2 (a) (i) Which **one** of the following types of electromagnetic wave is used to send information to the satellite?

Draw a ring around your answer.

microwave

radio

visible light

(1 mark)

- 2 (a) (ii) The information is sent to the satellite using a digital signal.

Which **one** of the signals, **A**, **B**, **C** or **D**, is a digital signal?

Write your answer, **A**, **B**, **C** or **D**, in the box.



Signal

(1 mark)



2 (a) (iii) It is better to send information as a digital signal rather than as an analogue signal.

Which **one** of the following statements explains why?

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

Digital signals travel faster.

Digital signals can be switched on and off.

Digital signals are less affected by interference.

(1 mark)

2 (b) Since 2009, people in some parts of Kenya have been able to connect to the Internet using signals sent through an optical fibre cable rather than via a satellite link.

2 (b) (i) Complete the following sentence by drawing a ring around the correct line in the box.

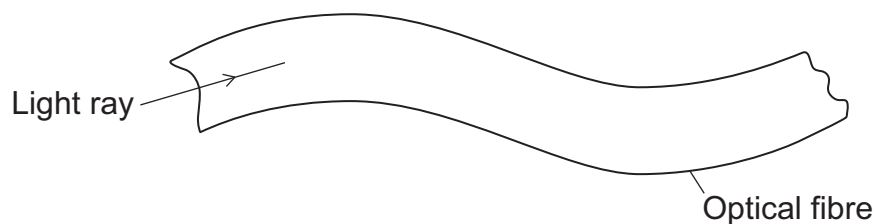
Visible light and

infra red
radio
ultraviolet

 can be used to send signals along an optical fibre.

(1 mark)

2 (b) (ii) The diagram shows part of an optical fibre.



Complete the diagram to show how the light ray travels through the optical fibre.

(2 marks)

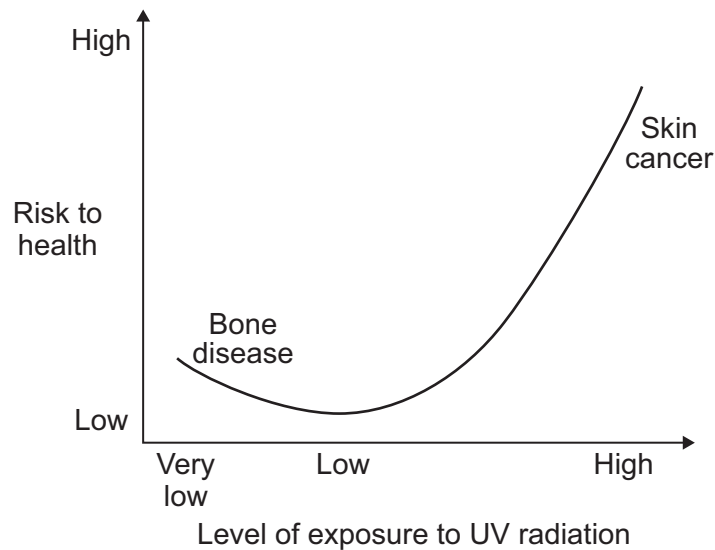
6

Turn over ►



3 Exposure to ultraviolet (UV) radiation can harm a person's health.

The graph shows how the risk to health depends on the level of exposure to UV.



3 (a) What level of exposure to UV radiation gives the highest health risk?

Draw a ring around your answer.

very low

low

high

(1 mark)

3 (b) The body needs vitamin D to prevent bone disease. The ultraviolet radiation in sunlight enables the body to produce vitamin D. Some people hardly ever go outside into direct sunlight.

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

Staying inside will

reduce

not affect

increase

the risk of developing skin cancer.

(1 mark)



3 (b) (ii) How will staying inside affect the risk of developing bone disease?

.....

Give a reason for your answer.

.....

.....

(2 marks)

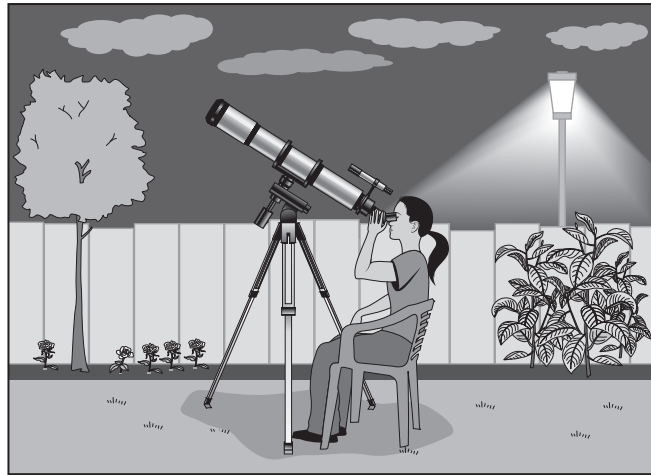
4

Turn over for the next question

Turn over ►



4 (a) The picture shows a person using an optical telescope to look at stars.



Give **two** reasons why it can be difficult to see distant stars using this type of telescope.

1

.....

2

.....

(2 marks)

4 (b) As well as optical telescopes, other types of telescope are on satellites in orbit above the Earth.

Give **one disadvantage** of having a telescope in orbit above the Earth.

.....

.....

(1 mark)



4 (c) In 2008, a new gamma ray telescope, called Fermi, was launched into space. The telescope orbits 560 km above the Earth.

4 (c) (i) Which statement gives a reason why gamma ray telescopes are usually in orbit above the Earth?

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

The telescopes need to be closer to the stars.

The atmosphere absorbs gamma rays.

The telescopes can be used to look at the Earth.

(1 mark)

4 (c) (ii) Some theories predict that particles called WIMPs exist. The theories predict that WIMPs produce a background of gamma rays in very distant galaxies.

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

If a background of gamma rays in very distant galaxies is detected using the Fermi

telescope, this will

prove that WIMPs exist.
support the theories that predict that WIMPs exist.
make scientists change the existing theories.

(1 mark)

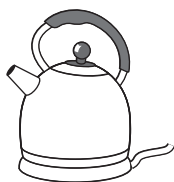
5

Turn over for the next question

Turn over ►



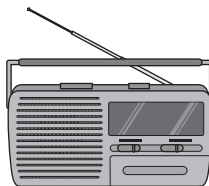
- 5 The diagram shows four electrical appliances. Each appliance is designed to transform electrical energy into one form of output energy.



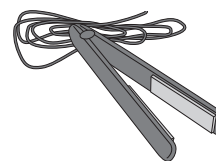
Kettle



Toaster



Radio



Hair straighteners

- 5 (a) Which **one** of the appliances is designed to give a different form of output energy from the other three appliances?

.....

Give a reason for your answer.

.....

.....

(2 marks)

- 5 (b) The power of each appliance is given in the table.

Appliance	Power
Kettle	2.5 kW
Toaster	920 W
Radio	15 W
Hair straighteners	75 W

Each appliance is switched on for 5 minutes.

Which appliance transforms the most energy?

.....

(1 mark)



- 5 (c)** The 75 watt hair straighteners are switched on for a few minutes each day. In one year, the amount of energy transferred from the mains electricity supply to the hair straighteners is 4 kilowatt-hours.

Electricity costs 15p per kilowatt-hour.

Use the equation in the box to calculate the yearly cost of using the hair straighteners.

$$\text{total cost} = \text{number of kilowatt-hours} \times \text{cost per kilowatt-hour}$$

Show clearly how you work out your answer.

.....
.....

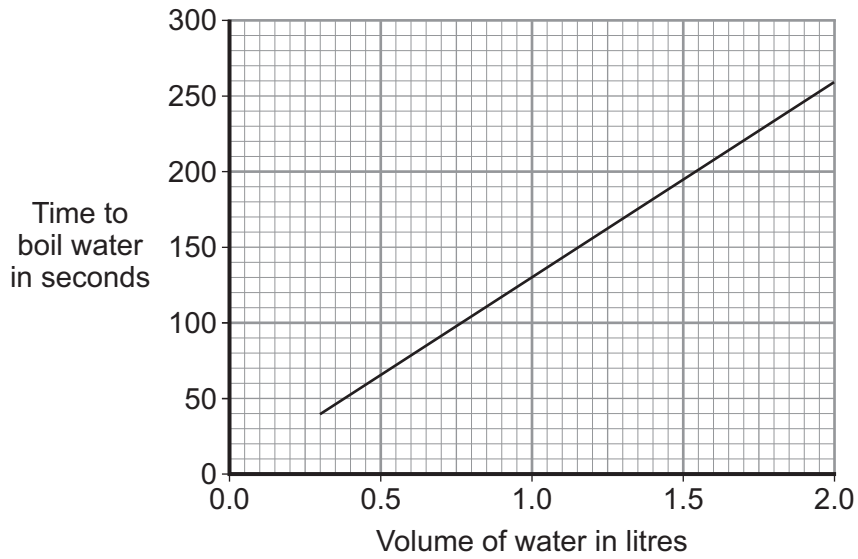
Total cost = pence
(2 marks)

Question 5 continues on the next page

Turn over ►



5 (d) The graph shows how the time to boil water in an electric kettle depends on the volume of water in the kettle.



A householder always fills the electric kettle to the top, even when only enough boiling water for one small cup of coffee is required.

Explain how the householder is wasting money.

.....

.....

.....

.....

.....

.....

(3 marks)

8



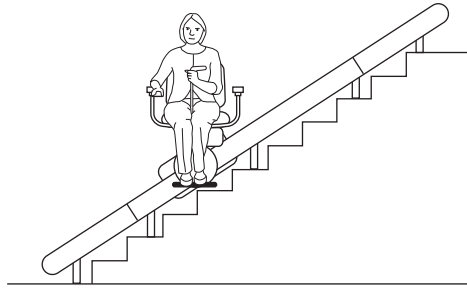
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ANSWER IN THE SPACES PROVIDED**

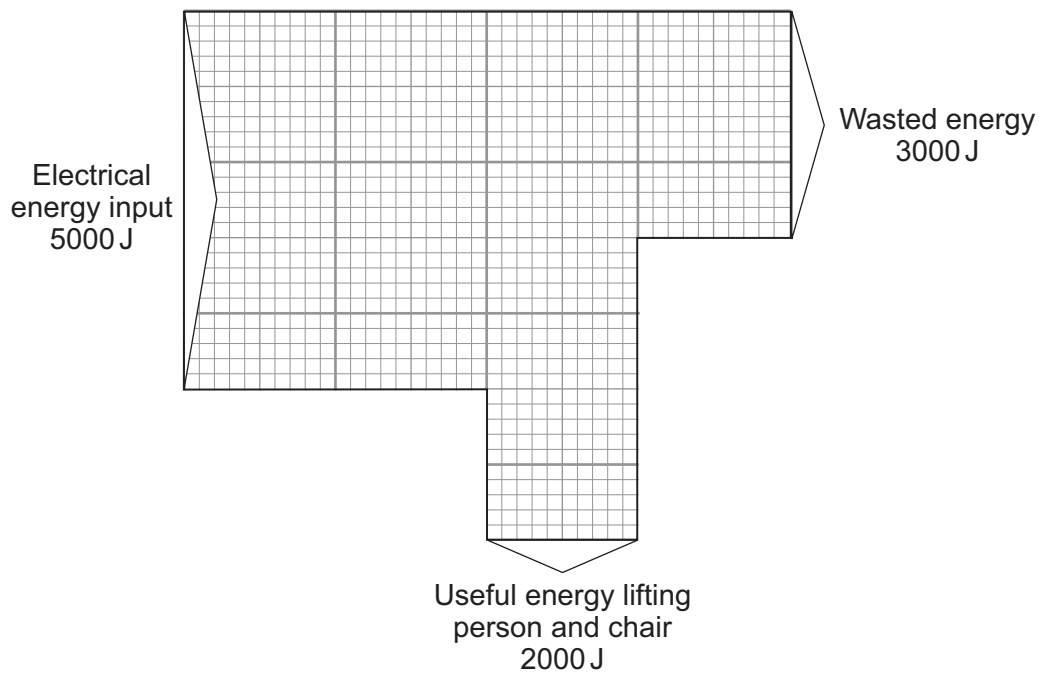
Turn over ►



6 A person uses a stairlift to go upstairs. The stairlift is powered by an electric motor.



The Sankey diagram shows the energy transfers for the electric motor.



6 (a) Complete the following sentence.

The electric motor wastes energy as energy.
(1 mark)



6 (b) Use the equation in the box to calculate the efficiency of the electric motor.

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

Show clearly how you work out your answer.

.....
.....

Efficiency =
(2 marks)

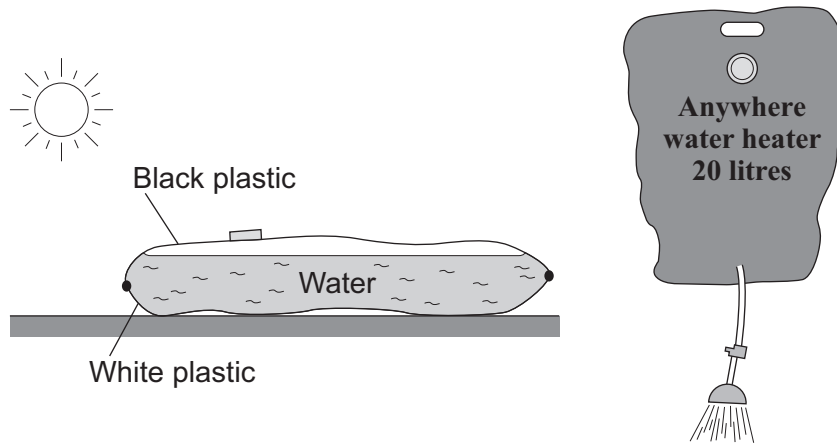
3

Turn over for the next question

Turn over ►



- 7 The diagram shows a simple type of portable shower. The water container is a strong plastic bag that is black on one side and white on the other. To warm the water, the bag is placed on the ground in direct sunlight, with the black side facing the Sun.



- 7 (a) (i) Name the process by which heat is transferred from the Sun to the outside of the bag.

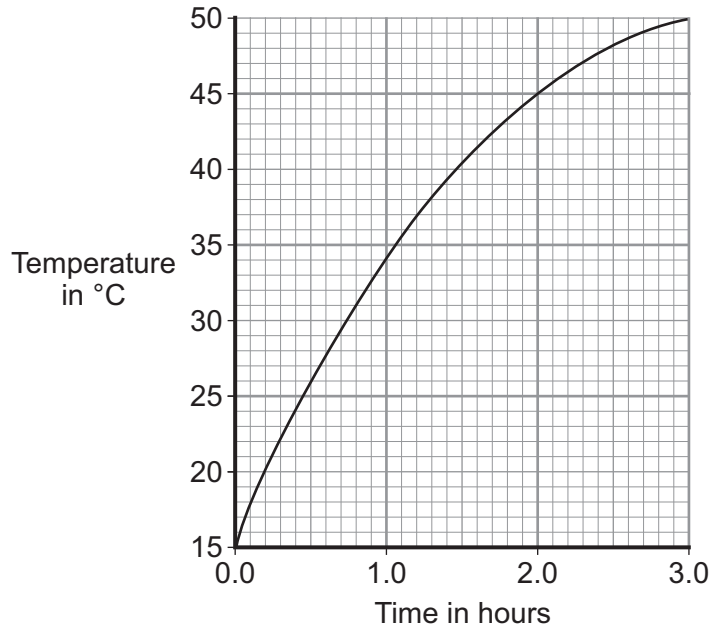
.....
(1 mark)

- 7 (a) (ii) Explain why the black side of the bag and not the white side should face the Sun.

.....
.....
.....
.....
(2 marks)



7 (b) The graph shows how the temperature of the water inside a full bag increases after the bag is placed outside on a sunny day.



7 (b) (i) How long does it take for the water to reach 37°C?

 (1 mark)

7 (b) (ii) Describe how the temperature of the water changes during the three hours.

 (1 mark)

7 (c) A different manufacturer makes the same type of portable shower but uses a bag with a larger surface area. The bag is made from the same coloured plastics and holds the same amount of water.

7 (c) (i) To compare the efficiency of the two bags at heating water, several variables need to be controlled.
 Name **two** variables that need to be controlled.
 1
 2
 (2 marks)

7 (c) (ii) The second bag has a larger surface area.
 Draw a line on the graph to show how the temperature of the water inside the second bag would change over the first hour.
 Assume that the two bags are tested in exactly the same way.
 (1 mark)



8 (a) By 2023, nearly all of the existing nuclear power stations in the UK will be closed down.

8 (a) (i) Before a nuclear power station can be demolished, the remaining nuclear fuel, radioactive waste materials and reactor must be carefully removed.

What is this process called?

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

decommissioning

decontaminating

dismantling

(1 mark)

8 (a) (ii) The workers are exposed to radiation as they remove the reactor. One of the biggest risks is from the isotope cobalt-60, which has a half-life of 5.3 years.

Explain the advantage of waiting 11 years after a nuclear power station has closed down before starting to remove the reactor.

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

(2 marks)



8 (b) It is almost certain that new nuclear power stations will be built in the UK.

The table shows the results of surveys asking people in the UK whether they were in favour of, or against, the building of new nuclear power stations.

	2001	2005	2007
Percentage (%) in favour	20	41	65
Percentage (%) against	60	28	20
Percentage (%) not sure	20	31	15

8 (b) (i) From these surveys, how did public opinion on the building of new nuclear power stations change between 2001 and 2007?

.....

 (1 mark)

8 (b) (ii) Suggest a reason why some people may think that the results from these surveys are unreliable.

.....

 (1 mark)

8 (b) (iii) Give **one** reason in favour of building new nuclear power stations.

.....

 (1 mark)

Question 8 continues on the next page

Turn over ►



- 8 (c)** The government of one Middle Eastern country has decided to build its first nuclear power station. The oil that would have been used to generate electricity can then be sold to other countries.

On what is this decision based?

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

economic issues

ethical issues

social issues

(1 mark)

7

END OF QUESTIONS

