

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
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16	
TOTAL	



General Certificate of Secondary Education
Foundation Tier
June 2014

Science A 1

SCA1FP

Unit 5

F

Friday 6 June 2014 1.30 pm to 3.00 pm

For this paper you must have:

- a ruler
- the Chemistry Data Sheet and Physics Equations Sheet booklet (enclosed). You may use a calculator.

Time allowed

- 1 hour 30 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 90.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 13 should be answered in continuous prose. In this question you will be marked on your ability to:
 - use good English
 - organise information clearly
 - use specialist vocabulary where appropriate.

Advice

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



J U N 1 4 S C A 1 F P O 1

G/KL/104303/Jun14/E4

SCA1FP

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ANSWER IN THE SPACES PROVIDED**



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

Biology Questions

1 Bacteria and viruses can reproduce quickly inside the body and make people feel ill.

1 (a) Use the correct answer from the box to complete the sentence.

[1 mark]

antibodies antitoxins toxins

Bacteria and viruses make us feel ill because they produce

1 (b) (i) Antibiotics can be used to treat some infections.

Use the correct answer from the box to complete the sentence.

[1 mark]

bacteria bacteria and viruses viruses

Antibiotics are medicines that kill

1 (b) (ii) New strains of pathogens have developed which are resistant to antibiotics.

Use the correct answer from the box to complete the sentence.

[1 mark]

are short of food invade body cells mutate

New strains are produced when pathogens

1 (b) (iii) What will scientists have to develop to kill these new resistant strains?

[1 mark]

.....
.....

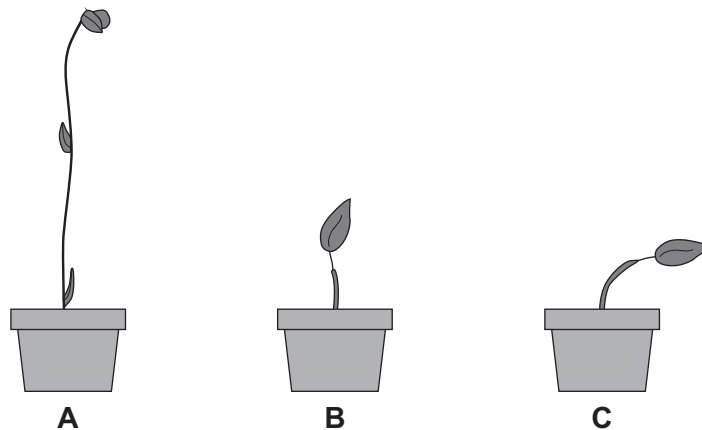
4

Turn over ►



- 2 A student grew three plants in pots of soil. All the plants looked the same at the start. He put one plant on a windowsill. He put the second plant in a dark cupboard. He put the third plant in a greenhouse. He gave all three plants the same amount of water and left them for one week. **Figure 1** shows what the plants looked like after one week.

Figure 1



- 2 (a) (i) Describe **two** differences between plants **A** and **B**.

[2 marks]

.....

.....

.....

.....

- 2 (a) (ii) A hormone caused the differences in the growth of the plants.

What is the name of this hormone?

[1 mark]

Tick (✓) **one** box.

Anabolic steroid

Auxin

Oestrogen



2 (b) (i) Which plant, **A**, **B** or **C**, was grown in a dark cupboard?

[1 mark]

Plant

2 (b) (ii) Which plant, **A**, **B** or **C**, was grown on a windowsill?

[2 marks]

Plant

Give a reason for your answer.

.....
.....

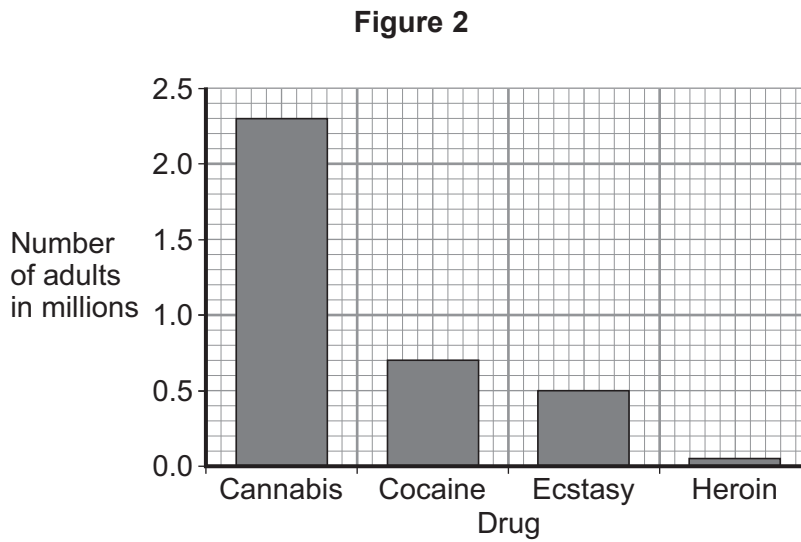
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Turn over for the next question

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3 **Figure 2** shows how many UK adults used cannabis, cocaine, ecstasy or heroin in 2011.



3 (a) (i) How many adults used cannabis in 2011?

[1 mark]

..... million

3 (a) (ii) Suggest why more people used cannabis rather than the other drugs.

[1 mark]

.....
.....

3 (a) (iii) Tick (✓) **one** correct statement about cannabis.

[1 mark]

It causes muscles to grow.

It may cause mental illness in some people.

It may cause limb deformities.

3 (b) Heroin and cocaine are very addictive drugs.

What happens to most drug addicts if they suddenly stop taking the drug?

[1 mark]

.....
.....

4



4 Two common medicines are paracetamol and ibuprofen. These medicines help to reduce high body temperature.

4 (a) Use the correct answer from the box to complete the sentence.

[1 mark]

drugs	enzymes	vaccines
--------------	----------------	-----------------

It is important to maintain body temperature around 37 °C because this is the best temperature for to work inside the body.

4 (b) Children who were ill with high body temperatures were identified at doctors' surgeries.

These children were put into two groups.
The children in each group were matched for age, gender and body mass.

Group 1: 50 children were given paracetamol.

Group 2: 50 children were given ibuprofen.

4 (b) (i) Give **one** control variable in this investigation.

[1 mark]

.....
.....

4 (b) (ii) In some investigations when medicines are tested, a placebo is given to one group.

What is a placebo?

[1 mark]

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.....

Question 4 continues on the next page

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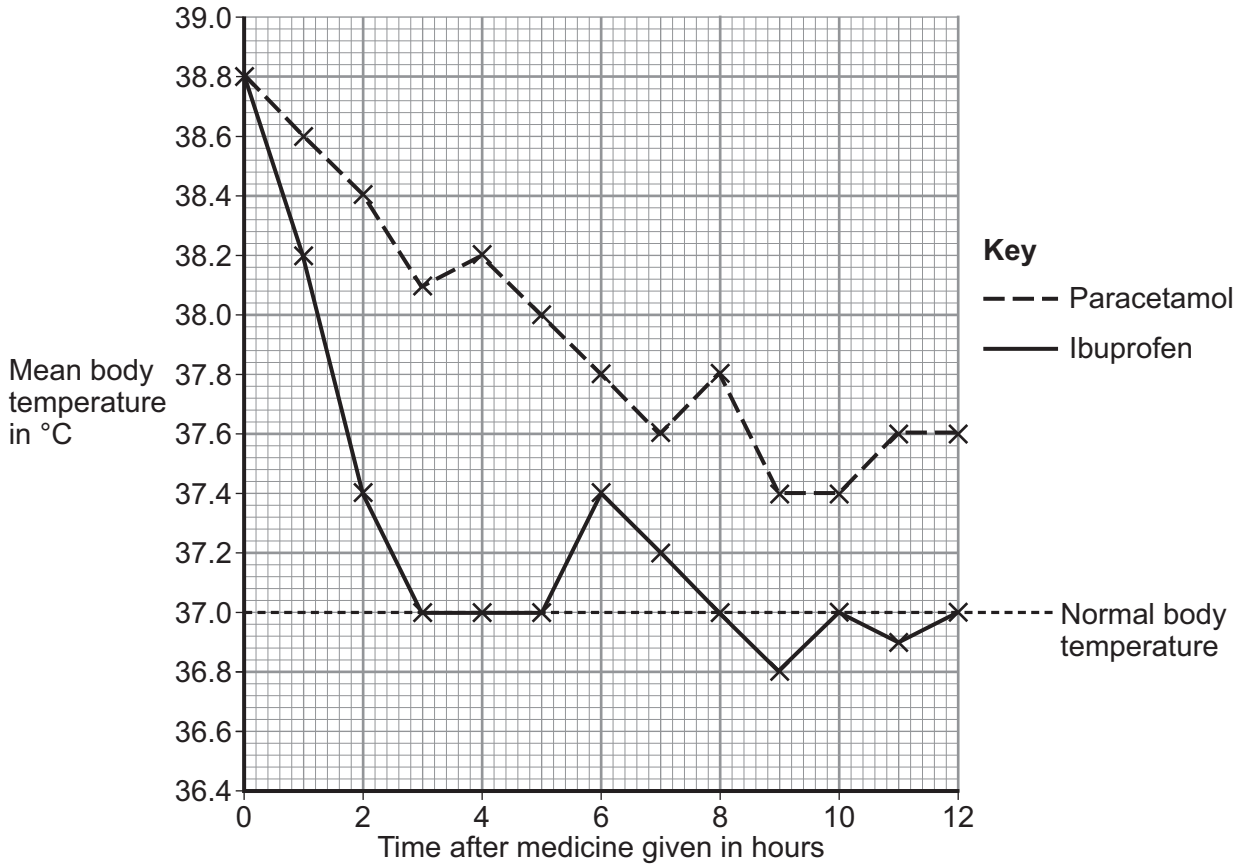


4 (c) The children's body temperatures were measured before any medicine was given and every hour after treatment started.

Paracetamol was given every 4 hours. Ibuprofen was given every 6 hours.

The results for the two groups are shown in **Figure 3**.

Figure 3



4 (c) (i) What was the mean body temperature 4 hours after paracetamol was given?

[1 mark]

..... °C



4 (c) (ii) Suggest which medicine a parent should give to their child to reduce a high body temperature to normal.

Use information from the graph.

Medicine:

Give **two** reasons for your answer.

[2 marks]

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6

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Chemistry Questions

5 **Figure 4** shows a power station.

Fossil fuels are burnt at some power stations.

Figure 4



5 (a) Draw a ring around the correct answer to complete the sentence.

[1 mark]

Fossil fuels release energy by

combustion.

decomposition.

distillation.

5 (b) Burning fuels can also release substances which cause an environmental effect.

Draw **one** line from each substance to an environmental effect caused by the substance.

[3 marks]

Substance

Environmental effect

Carbon dioxide

Acid rain

Oxides of nitrogen

Bioleaching

Solid particles

Global dimming

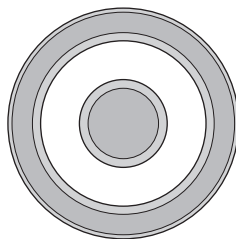
Global warming



- 6 Scientists in the 16th century used the symbol shown in **Figure 5** for gold.

Figure 5

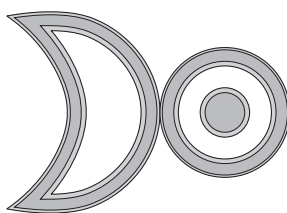
Gold



The scientists thought platinum was made from gold and silver, so they used the symbol for gold in the symbol for platinum. The symbol for platinum is shown in **Figure 6**.

Figure 6

Platinum



- 6 (a) Gold and platinum are elements.

Draw a ring around the correct answer to complete each sentence.

- 6 (a) (i) An element contains only one sort of

atom.

ion.

molecule.

[1 mark]

- 6 (a) (ii) Elements are different from each other because they have different numbers of

ions.

molecules.

protons.

[1 mark]



6 (b) Complete the following sentence.

[1 mark]

Modern scientists call a mixture of gold and silver an alloy.

An alloy is a mixture of

6 (c) The formula of the compound silver oxide is Ag_2O

Give the name and number of the atoms which have joined together to make the compound Ag_2O

Use the Chemistry Data Sheet to help you answer this question.

[3 marks]

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6

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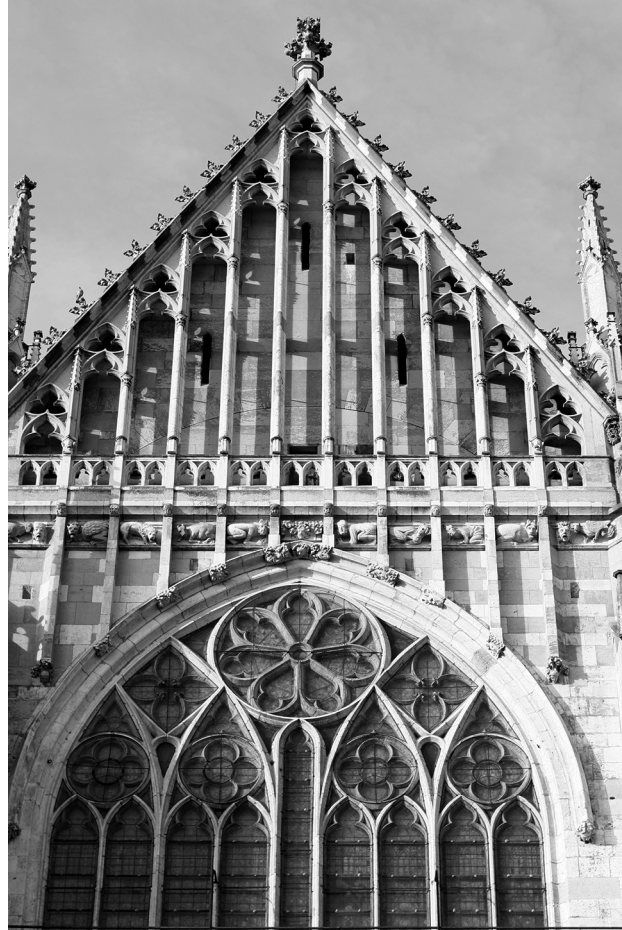
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7 **Figure 7** shows a limestone building.

Limestone buildings are damaged by substances in the air.

Figure 7



7 (a) Complete the following sentences.

[2 marks]

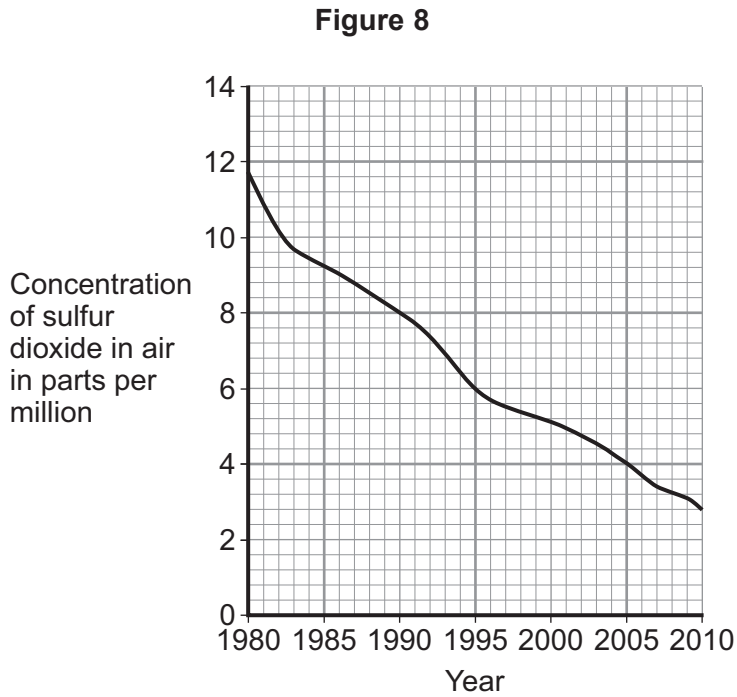
Sulfur dioxide in the air affects limestone buildings.

This is because sulfur dioxide is a cause of rain which reacts with limestone.

Limestone is mainly composed of the compound carbonate.



7 (b) **Figure 8** shows the concentration of sulfur dioxide in the air from 1980 to 2010.



7 (b) (i) Describe the trend shown in **Figure 8**.

[1 mark]

.....

.....

7 (b) (ii) All petrol now sold in the UK is sulfur-free.

Suggest **two** reasons why.

[2 marks]

.....

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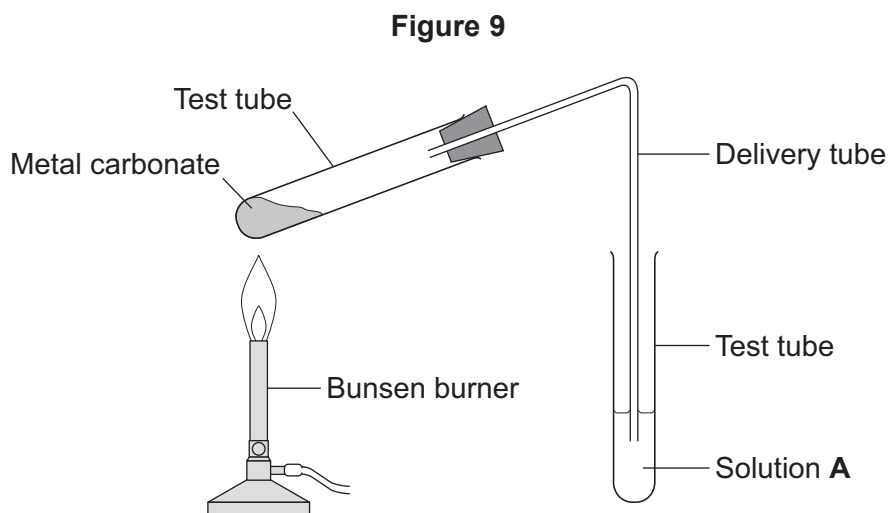
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8 A student investigated heating metal carbonates.

The student used the apparatus in **Figure 9**.



The student's results are shown in **Table 1**.

Table 1

Metal carbonate	Colour before heating	Colour after heating	Mass before heating in g	Mass after heating in g	Solution A
Copper carbonate	Green	Black	12.4	8.0	Turns cloudy
Potassium carbonate	White	White	13.8	13.8	Stays colourless
Zinc carbonate	White	White	12.5	8.1	Turns cloudy



8 (a) Use the correct answer from the box to complete the sentence.

[1 mark]

black	green	white
--------------	--------------	--------------

The colour of copper oxide is

8 (b) Solution **A** is used to test for carbon dioxide.

Carbon dioxide turns Solution **A** cloudy.

What is the name of Solution **A**?

[1 mark]

.....

8 (c) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

neutralisation	purification	decomposition
-----------------------	---------------------	----------------------

Most metal carbonates produce the metal oxide and carbon dioxide when heated.

The reaction taking place is called

8 (c) (ii) Potassium carbonate did **not** react.

How can you tell from the information in **Table 1** that potassium carbonate did not react?

Give **three** reasons for your answer.

[3 marks]

1

.....

2

.....

3

.....

6

Turn over ►



Physics Questions

9 Electrical appliances transfer energy in different ways. **Figure 10** shows a television.

Figure 10



9 (a) Use the correct answer from the box to complete the sentence.

[1 mark]

less than	more than	the same as
------------------	------------------	--------------------

Energy is conserved by the television.

Energy is conserved, means that the energy input is
the total energy output.

9 (b) The power input to the television is 120 W.

Calculate the total energy transferred by the television when it is switched on for 300 seconds.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

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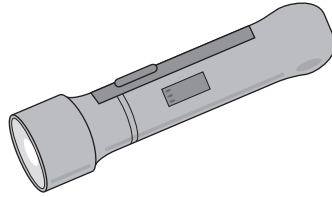
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Energy = J



9 (c) **Figure 11** shows a torch that does not need batteries.

Figure 11



Shaking the torch up and down for 5 minutes generates enough electricity to light the torch bulb for 20 minutes.

Use the correct answer from the box to complete each sentence about the energy transfers.

[2 marks]

elastic potential	kinetic	light	sound
--------------------------	----------------	--------------	--------------

When the torch is shaken up and down, the torch transfers energy to electrical energy.

When the torch is turned on, the bulb usefully transfers electrical energy to energy.

5

Turn over for the next question

Turn over ►



10 Laptop computers can get very hot when they are left on for a long time. This decreases the energy efficiency of a laptop computer.

10 (a) Which statement best describes what **decreased efficiency** means?

Tick (✓) **one** box.

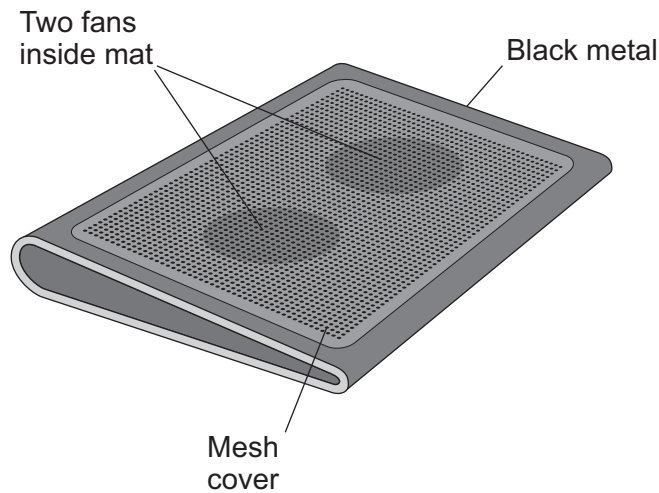
[1 mark]

Statement	Tick (✓)
The energy output is increased.	
A greater proportion of the energy is wasted.	
The energy input is decreased.	

10 (b) To prevent a laptop computer from overheating, it can be placed on a 'Chill mat'.

Figure 12 shows a 'Chill mat'.

Figure 12



Complete the following sentences to describe **three** ways in which a 'Chill mat' is designed to increase the rate of energy transfer from a laptop computer.

[3 marks]

The metal is good at transferring energy because metal is a good

The black colour means that the mesh is good at radiating radiation to the surroundings.

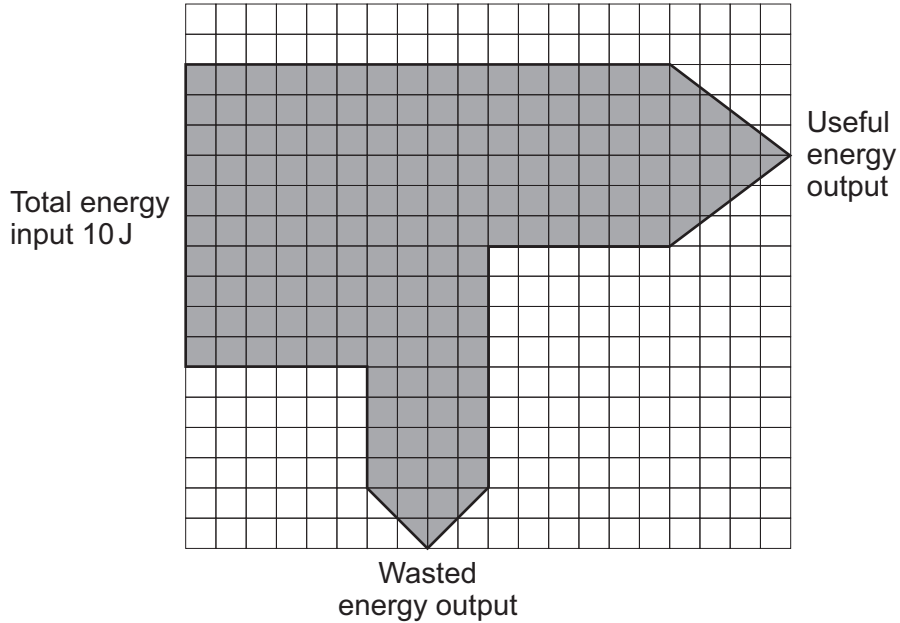
The mesh increases the rate of convection because it has a large surface



10 (c) The total energy input to a laptop computer is 10 J each second.

Figure 13 shows the energy transfers in a laptop computer each second.

Figure 13



10 (c) (i) Use **Figure 13** to calculate the useful energy output each second for the laptop computer.

[1 mark]

Useful energy output each second = J

10 (c) (ii) Calculate the efficiency of the laptop computer.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

.....

Efficiency =

10 (c) (iii) What effect does the wasted energy have on the surroundings?

[1 mark]

.....

8

Turn over ►



11 A student investigated the specific heat capacity of five different metals.

11 (a) Complete the following sentence to show what is meant by **specific heat capacity**.

[2 marks]

The specific heat capacity of a substance is the amount of energy required to change the of one kilogram of the substance by one degree

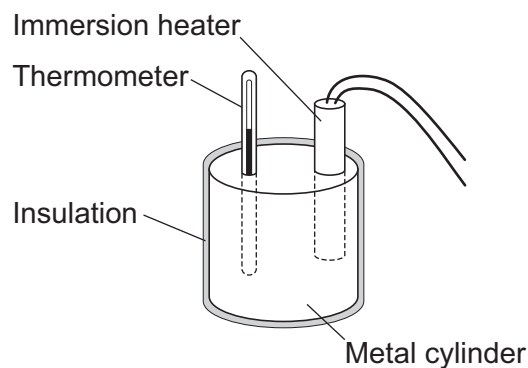
11 (b) Each metal is in the form of a cylinder.

Each metal cylinder had a mass of 2 kg.

The student wrapped the same thickness of insulation around each metal cylinder.

He used an immersion heater to transfer the same amount of energy to each metal cylinder. **Figure 14** shows the apparatus he used.

Figure 14



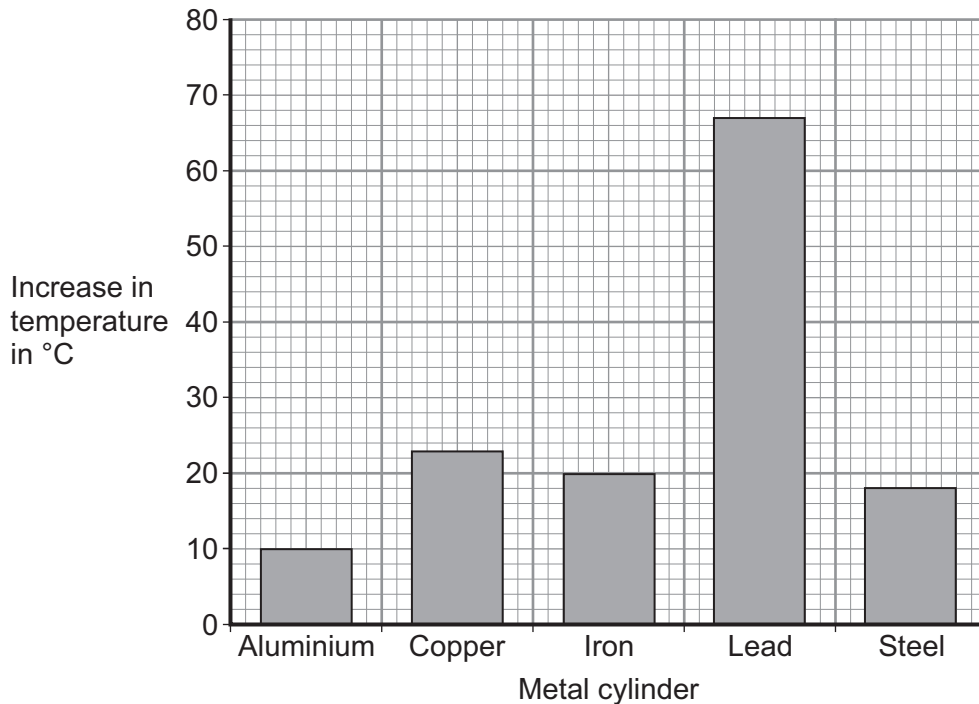
He measured the temperature of the metal cylinder at the start and at the end of each experiment, using a thermometer.

He calculated the increase in temperature of each metal cylinder.



His results are shown in **Figure 15**.

Figure 15



11 (b) (i) What was the independent variable in the investigation?

[1 mark]

.....

11 (b) (ii) The cylinders with a small increase in temperature were made of metals with a high specific heat capacity.

Tick (✓) the **two** correct conclusions that can be made from **Figure 15**.

[2 marks]

Conclusions	Tick (✓)
Aluminium has the greatest temperature increase.	
Copper and iron have similar specific heat capacities.	
Steel has the highest specific heat capacity.	
Lead has the lowest specific heat capacity.	

Question 11 continues on the next page

Turn over ►



11 (c) The steel cylinder had a mass of 2 kg.
The steel cylinder increased in temperature by 18 °C.
The specific heat capacity of the steel cylinder is 460 J/kg °C.
Calculate the energy transferred to the steel cylinder.
Use the correct equation from the Physics Equations Sheet.

[2 marks]

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

Energy transferred = J

11 (d) The student used a thermometer for the investigation.
Draw a ring around the correct answer to show the most appropriate resolution for the thermometer.

[1 mark]

1 °C

10 °C

100 °C

8



13 Eating a balanced diet and taking regular exercise will help you to stay healthy.

A balanced diet contains the correct amounts of different foods and the right amount of energy.

Figure 17 shows the food groups in a balanced diet.

Figure 18 shows two people doing different types of exercise.

Figure 17



Figure 18



Chemistry Questions

- 14** Helium is found underground. Scientists think that the helium reserves will last for a further 50 years. Helium is much lighter than air and escapes from the Earth's atmosphere when released.

Helium has many uses. Helium is used in medical scanners and space telescopes to keep them cool. Divers and some hospital patients breathe a mixture of helium and oxygen. Party balloons are filled with helium gas.

A party balloon and a diver are shown in **Figure 19**.

Figure 19



- 14 (a)** Helium has a mass number of 4 and an atomic number of 2.

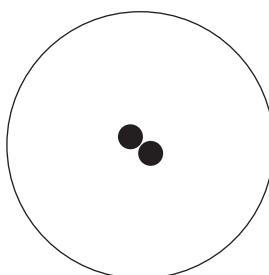
Figure 20 shows an incomplete diagram of the structure of a helium atom. A proton is shown as ●

Complete **Figure 20** to show the atomic structure of helium.

[3 marks]

Represent an electron as **x** and a neutron as ○

Figure 20



- 14 (b)** Helium is in Group 0 of the periodic table.

Why are the elements in Group 0 unreactive?

[1 mark]

.....

.....



14 (c) Many scientists think that helium should **not** be used in party balloons.

Suggest **two** reasons why.

[2 marks]

1

.....

2

.....

6

Turn over for the next question

Turn over ►



15 Table 2 shows information about three metals.

Table 2

Metal	Mainly found as	% of metal in Earth's crust	Relative cost of 1 kg
Aluminium	Aluminium oxide, Al_2O_3	8.2	4.2
Gold	Gold	0.0000001	30000
Iron	Iron(III) oxide, Fe_2O_3	4.1	1

15 (a) Suggest why gold is a very expensive metal.

[1 mark]

.....

.....

15 (b) Iron is extracted from iron oxide by reduction with carbon.

Aluminium cannot be extracted by reduction with carbon.

15 (b) (i) What is the name of the process used to extract aluminium from aluminium oxide?

[1 mark]

.....

15 (b) (ii) Why is it more expensive to extract aluminium than iron?

[1 mark]

.....

.....

3

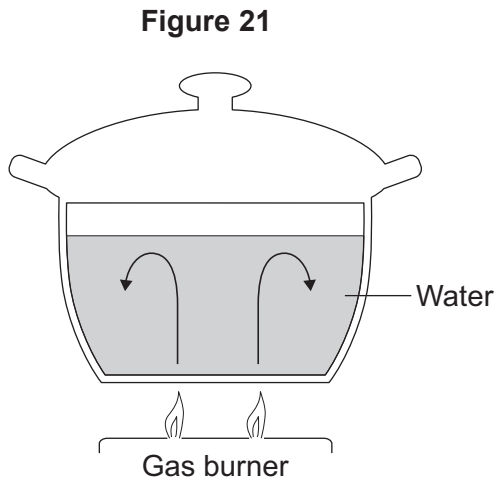


Physics Questions

16 When people go camping, they often cook food outdoors. Food can be heated in different ways.

16 (a) A student goes camping and uses a gas burner to heat a pot of water. Energy is conducted through the base of the pot and heats the water.

Figure 21 shows a pot of water and a gas burner.



Describe how energy is transferred through the water in the pot by convection.

[4 marks]

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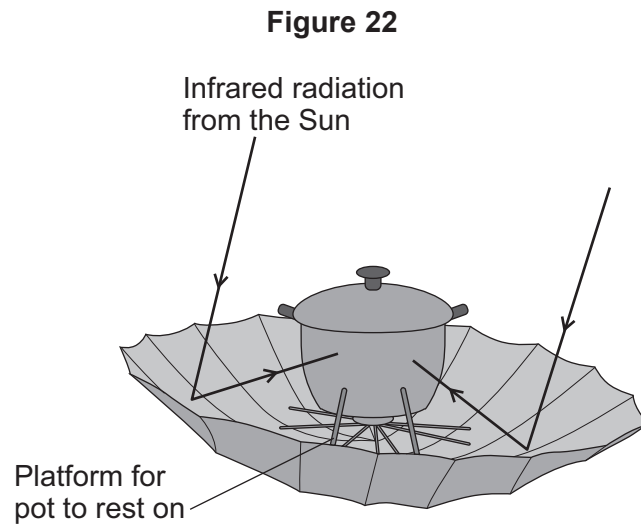
Question 16 continues on the next page

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- 16 (b)** Another student wants to use a portable solar furnace to cook food when she goes camping.

Figure 22 shows how a solar furnace works.



- 16 (b) (i)** Complete the following sentence.

[1 mark]

A solar furnace is made from shiny metal because shiny metal is a good
..... of infrared radiation.

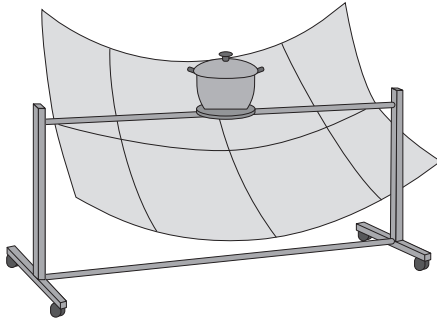


16 (b) (ii) The student looks at two different designs for a solar furnace.

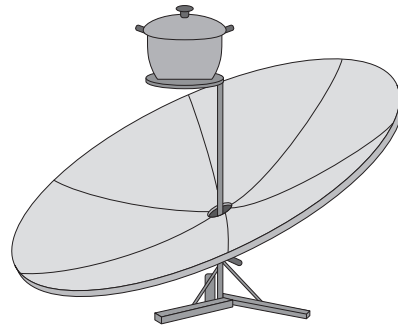
Figure 23 shows the two designs A and B.

Figure 23

Design A



Design B



3 m² silvered surface

90% of incident infrared radiation is directed at pot

Wheeled unit so it can be turned to point towards the Sun

Does not fold

2 m² silvered surface

80% of incident infrared radiation is directed at pot

Automatically turns to track the Sun

Folds into a carry-case

Compare the two designs.

What are the advantages of each design?

[4 marks]

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END OF QUESTIONS



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