

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	
9	
10	
11	
12	
13	
14	
TOTAL	



General Certificate of Secondary Education
Higher Tier
June 2014

Science A 1

SCA1HP

Unit 5

H

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 3 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 H P O 1

G/KL/104304/Jun14/E5

SCA1HP

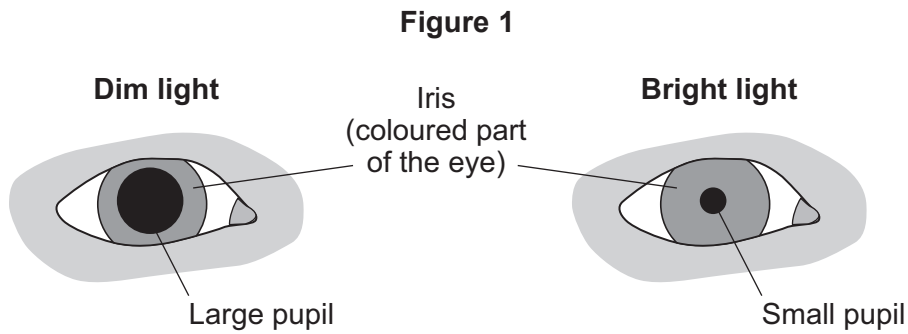
Answer **all** questions in the spaces provided.

Biology Questions

- 1 The pupil is the black part of the eye.
It is the opening for light to enter the eye and reach the receptor cells.
If bright light is shone into the eye, the pupil decreases in size.

This is an example of a reflex action.

Figure 1 shows two eyes, one reacting to dim light, the other reacting to bright light.



- 1 (a) Suggest how the reflex action of the eye to bright light is useful to the body. **[2 marks]**

.....

.....

.....

.....

- 1 (b) Picking up a book is a voluntary action.
Describe **two** differences between a reflex action and a voluntary action. **[2 marks]**

.....

.....

.....

.....

4



2

Thalidomide is a drug that was developed in the 1950s.
It was originally developed to treat one particular medical condition.
It was later found to be useful in treating another condition.

Thalidomide had not been tested thoroughly enough before use and caused some serious side effects. The drug was then banned in the 1960s.

Recently it has been used successfully in the treatment of other diseases.

- State what thalidomide was originally developed to treat and what it is used to treat today.
- Describe what else thalidomide was used for and why it was banned in the 1960s.

[4 marks]

.....

.....

.....

.....

.....

.....

.....

.....

.....

4

Turn over for the next question

Turn over ►



3 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 2 shows the food groups in a balanced diet.

Figure 3 shows two people doing different types of exercise.

Figure 2



Figure 3



In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Describe how an unbalanced diet **and** not enough regular exercise can affect your health.

[6 marks]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Extra space

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

6

Turn over ►



Chemistry Questions

- 4 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 4**.

Figure 4



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

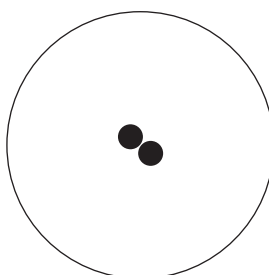
Figure 5 shows an incomplete diagram of the structure of a helium atom. A proton is shown as ●

Complete **Figure 5** to show the atomic structure of helium.

[3 marks]

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

Figure 5



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

Why are the elements in Group 0 unreactive?

[1 mark]

.....

.....



4 (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 ►



5 **Table 1** shows information about three metals.

Table 1

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

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

[1 mark]

.....

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

Aluminium cannot be extracted by reduction with carbon.

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

[1 mark]

.....

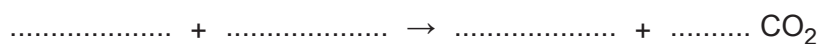
5 (b) (ii) Why is it more expensive to extract aluminium than iron?

[1 mark]

.....

5 (c) Complete and balance the symbol equation for the reaction to produce iron from iron(III) oxide.

[2 marks]



Turn over for the next question

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

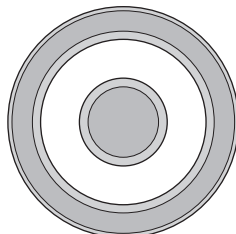
Turn over ►



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

Figure 6

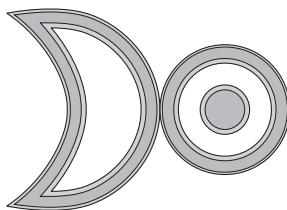
Gold



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 7**.

Figure 7

Platinum



- 6 (a) Gold and platinum are elements.

What is meant by the term **element**?

[1 mark]

.....

.....

- 6 (b) Why is it incorrect to represent platinum as shown in **Figure 7**?

[1 mark]

.....

.....



6 (c) Scientists now use a formula such as Ag_2O to represent a substance.

What does the formula Ag_2O tell you about this substance?

[2 marks]

.....

.....

.....

.....

4

Turn over for the next question

Turn over ►



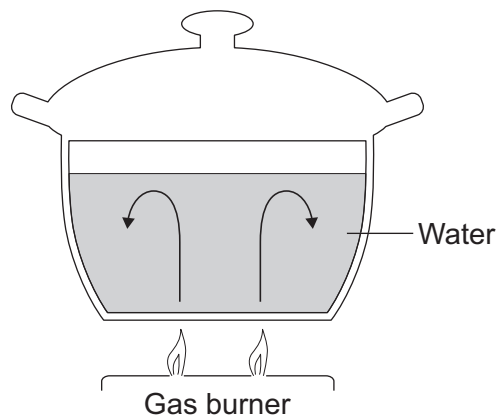
Physics Questions

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

7 (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 8 shows a pot of water and a gas burner.

Figure 8



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

[4 marks]

.....

.....

.....

.....

.....

.....

.....

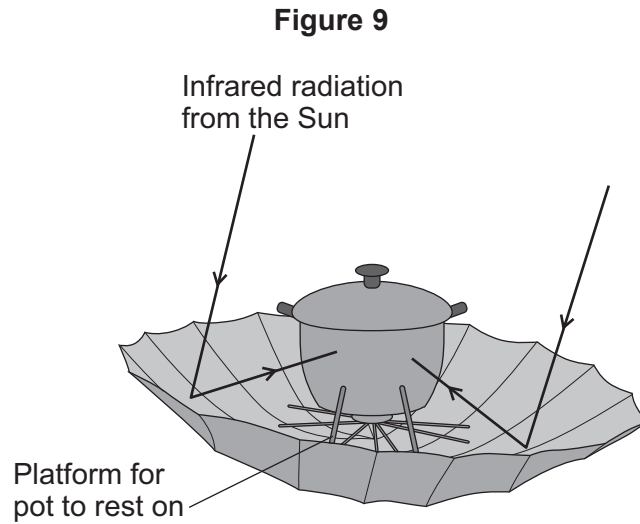
.....

.....



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

Figure 9 shows how a solar furnace works.



- 7 (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.

Question 7 continues on the next page

Turn over ►

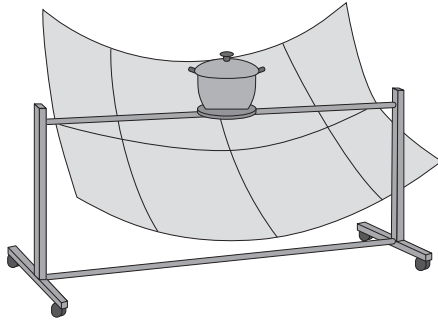


7 (b) (ii) The student looks at two different designs for a solar furnace.

Figure 10 shows the two designs A and B.

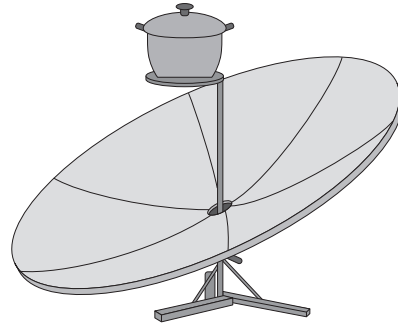
Figure 10

Design A



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

Design B



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]

.....

.....

.....

.....

.....

.....

.....

.....

.....



Turn over for the next question

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Turn over ►



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

8 (a) What does **decreased efficiency** mean?

Tick (✓) **one** box.

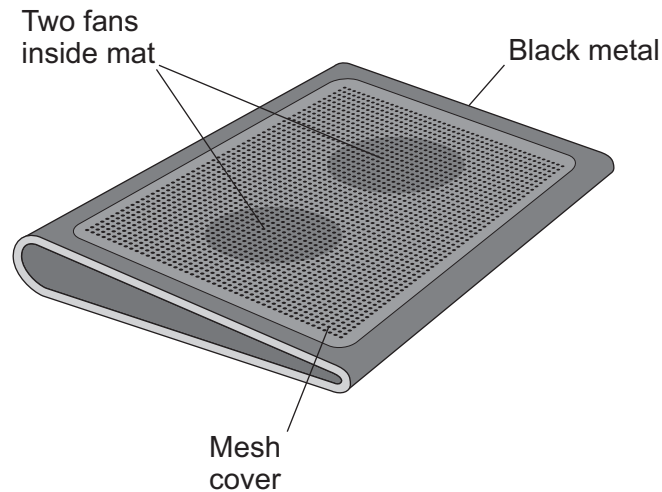
[1 mark]

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

8 (b) To prevent laptop computers from overheating, a laptop can be placed on a 'Chill mat'.

Figure 11 shows a 'Chill mat'.

Figure 11



Describe **three** ways in which the features of the 'Chill mat' help to increase the rate of energy transfer from a laptop computer.

[3 marks]

.....

.....

.....

.....

.....

.....

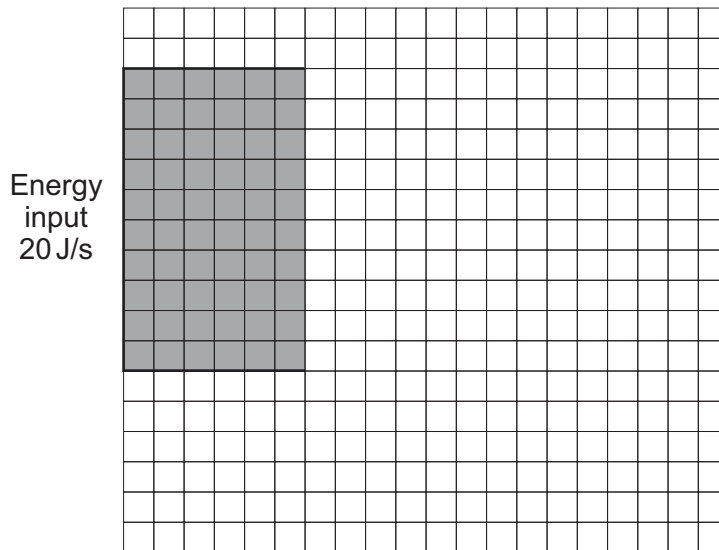
8 (c) The input energy to a laptop computer is 20 J each second. When the laptop is being used, 12 J of energy is transferred usefully each second and 8 J of energy is wasted each second.

Use the grid in **Figure 12** to complete the Sankey diagram for the laptop computer when it is being used.

Label your diagram.

[2 marks]

Figure 12



6

Turn over ►



Biology Questions

9 The growth of plants is controlled by a hormone.

9 (a) What is the name of the hormone that controls plant growth?

[1 mark]

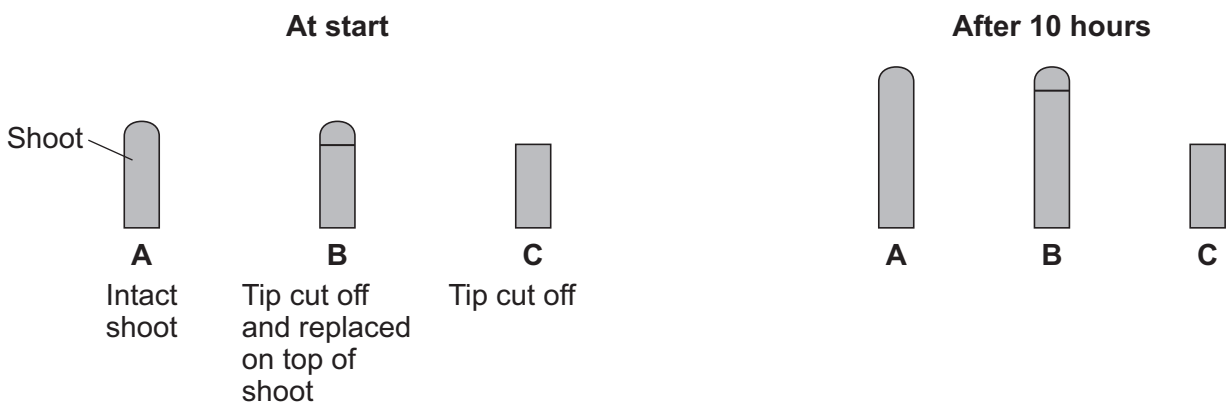
.....

9 (b) A scientist carried out investigations on plant growth using similar plant shoots. The diagrams in **Figure 13** and **Figure 14** show what he did to the plant shoots and how the plant shoots had grown after 10 hours.

All the plant shoots were kept in the dark.

Figure 13

Investigation 1



9 (b) (i) What conclusion can be made from the results of **Investigation 1**?

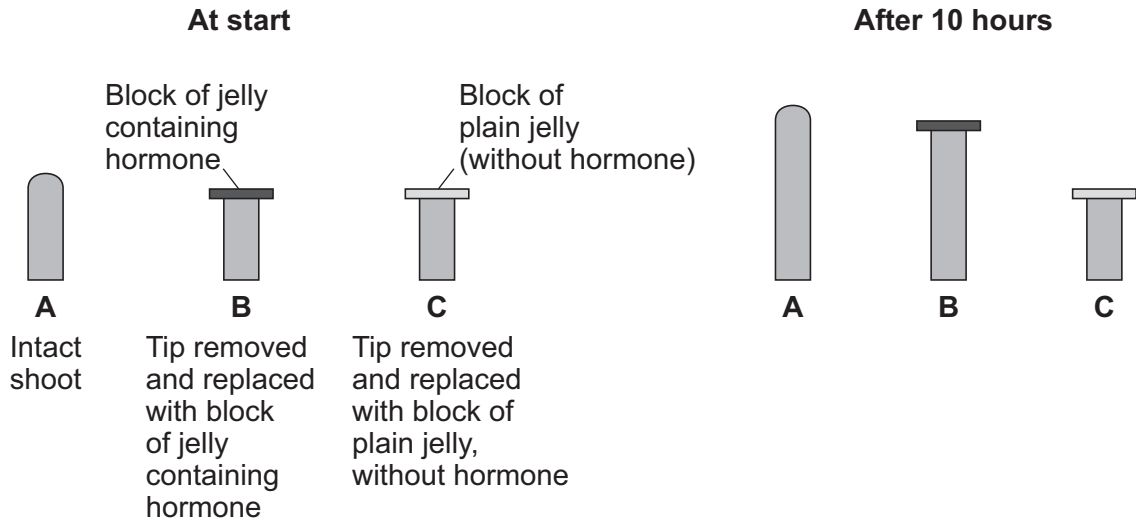
[1 mark]

.....
.....



Figure 14

Investigation 2



9 (b) (ii) In Investigation 2 why was a block of plain jelly, without hormone, placed on shoot C? [1 mark]

.....

.....

9 (b) (iii) What conclusion can be made from Investigation 2? [1 mark]

.....

.....

9 (b) (iv) All the shoots that grew taller were straight.
Suggest why none of the shoots grew curved. [1 mark]

.....

.....

5

Turn over ▶



10 Bacteria and viruses can reproduce quickly inside the body and make us feel ill. These organisms may cause symptoms such as a high body temperature.

10 (a) How do bacteria and viruses make us feel ill?

[1 mark]

.....

.....

10 (b) Two common medicines are paracetamol and ibuprofen. These medicines help to reduce high body temperature.

Data was collected to find out whether paracetamol, ibuprofen or a combination of these two medicines was the best to reduce high body temperature in children.

Children who were ill with high body temperatures were identified at doctors' surgeries.

These children were put into three treatment groups:

Group 1: given paracetamol only

Group 2: given ibuprofen only

Group 3: given a combination of paracetamol and ibuprofen

The children in each group were matched for age and gender.

There were 50 children in each group.

Table 2 shows how often the medicines were given to the children in each group. The doses were as directed by the manufacturers.

Table 2

	Time in hours						
	0	2	4	6	8	10	12
Group 1: Paracetamol only	P		P		P		P
Group 2: Ibuprofen only	I			I			I
Group 3: Paracetamol and ibuprofen	P&I		P	I	P		P&I

Key: P = paracetamol only

I = ibuprofen only

P&I = paracetamol and ibuprofen



Why is it important to maintain a normal body temperature?

[1 mark]

.....
.....

10 (c) This investigation would have been improved if a fourth group of children had been included.

10 (c) (i) The children in each group were matched for age and gender.

Suggest **one** other factor the children should have been matched for to make this investigation valid.

[1 mark]

.....

10 (c) (ii) What would the children in the fourth group have been given?

[1 mark]

.....
.....

10 (c) (iii) Suggest why this would have improved the investigation.

[1 mark]

.....
.....

Question 10 continues on the next page

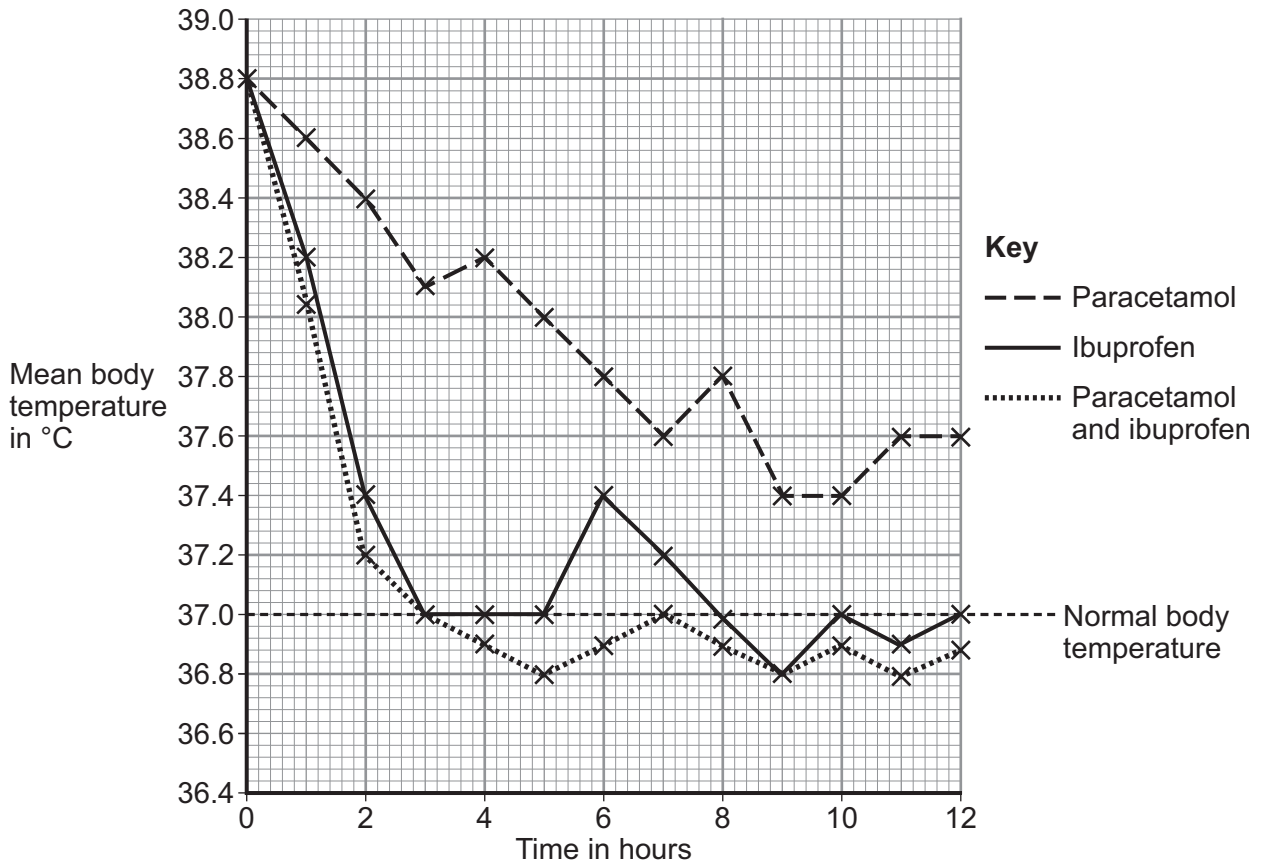
Turn over ►



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

The mean body temperatures for each of the three groups are shown in **Figure 15**.

Figure 15



10 (d) (i) What was the difference in mean body temperature after 4 hours between the group taking paracetamol only and the group taking ibuprofen only?

[1 mark]

.....
 °C

10 (d) (ii) How many more hours did the mean body temperature stay normal or below normal, when taking both paracetamol and ibuprofen compared to taking ibuprofen only?

[1 mark]

.....
 hours



10 (e) Doctors and nurses usually advise parents to give ibuprofen to children with a high body temperature.

Complete the sentences to suggest reasons why giving only ibuprofen might be better than giving only paracetamol or a combination of paracetamol and ibuprofen. You should use information from **Table 2** and **Figure 15**.

10 (e) (i) Giving ibuprofen might be better than giving paracetamol because

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

[2 marks]

10 (e) (ii) Giving only ibuprofen might be better than giving a combination of paracetamol and ibuprofen because

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

[2 marks]

11

Turn over for the next question

Turn over ►

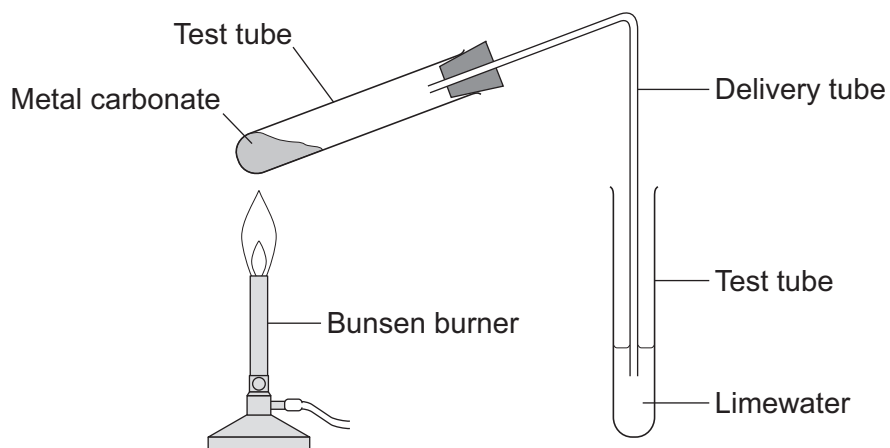


Chemistry Questions

11 A student investigated heating metal carbonates.

The student used the apparatus in **Figure 16**.

Figure 16



The student recorded the results in **Table 3**.

Table 3

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



11 (a) Explain the observations seen when heating copper carbonate.
Include the names of the substances produced.

[3 marks]

.....

.....

.....

.....

.....

.....

11 (b) (i) Potassium carbonate did **not** decompose when heated.
State why.

[1 mark]

.....

.....

11 (b) (ii) Complete **Table 3** to show the results you would expect the student to obtain.

[3 marks]

7

Turn over for the next question

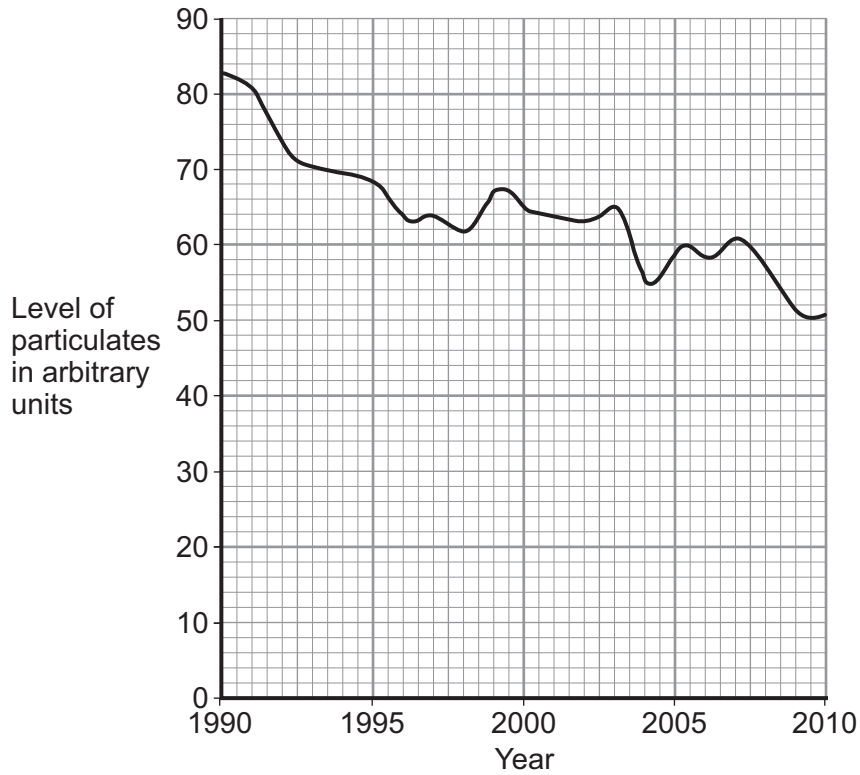
Turn over ►



12 This question is about air pollutants.

12 (a) **Figure 17** shows the level of particulates in the air from 1990 to 2010.

Figure 17



12 (a) (i) Particulates are produced by burning fossil fuels.

What are particulates?

[1 mark]

.....

12 (a) (ii) Name an environmental effect caused by particulates.

[1 mark]

.....

12 (a) (iii) Suggest **two** reasons why it is difficult to predict what particulate levels will be in the future.

[2 marks]

.....

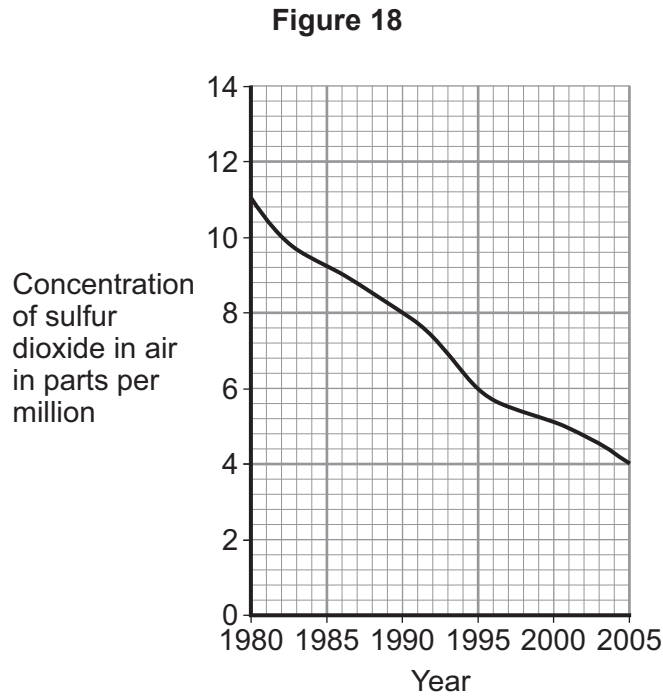
.....

.....

.....



12 (b) Figure 18 shows the concentration of sulfur dioxide in the air from 1980 to 2005.



12 (b) (i) The concentration of sulfur dioxide in the air changed from 11 parts per million in 1980 to 4 parts per million in 2005.

Suggest and explain how this change would have affected the rate of decay of limestone buildings.

[3 marks]

.....

.....

.....

.....

.....

.....

12 (b) (ii) What can be done at a coal-fired power station to reduce the amount of sulfur dioxide released into the air?

[1 mark]

.....

.....

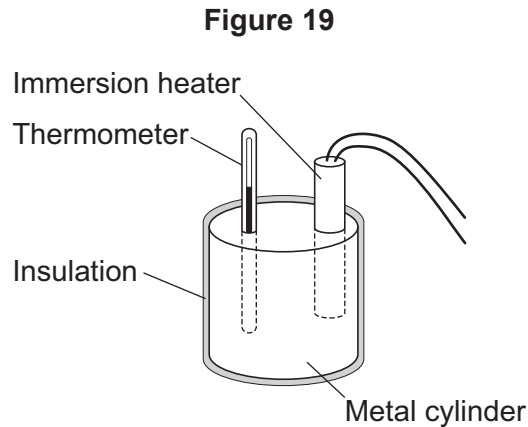
8

Turn over ►



Physics Questions

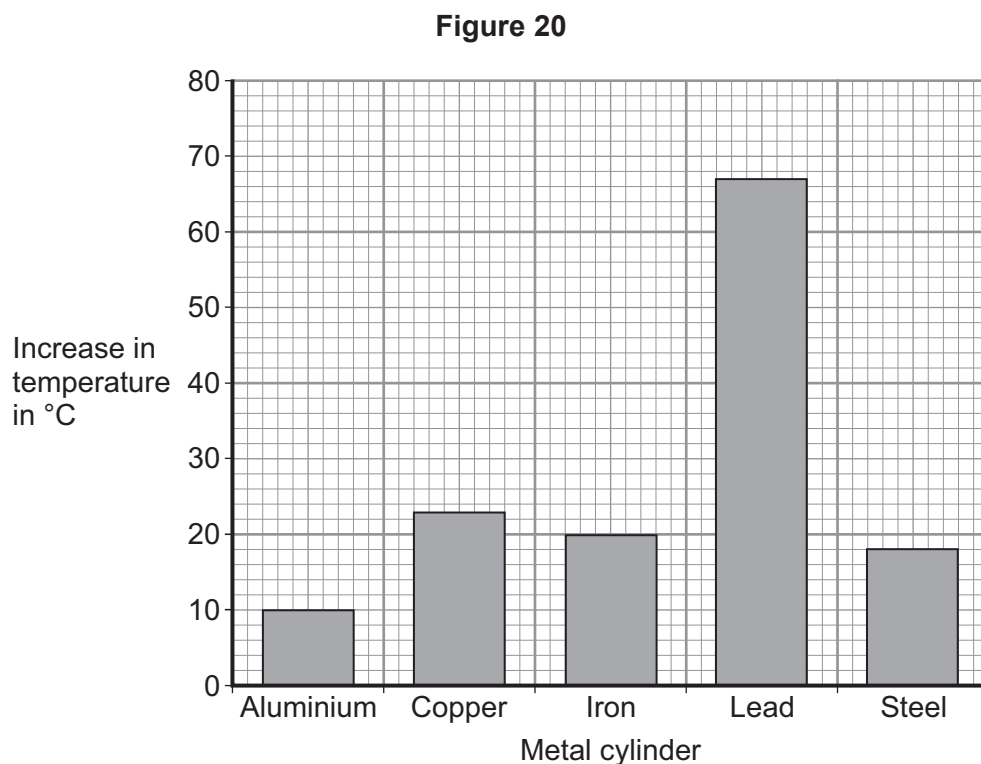
- 13** A student investigated the specific heat capacity of five different metal cylinders.
- Each metal cylinder had a mass of 2 kg.
- He used an immersion heater to transfer 18 000 J of energy to each different metal cylinder.
- Figure 19** shows the apparatus he used.



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

He calculated the temperature rise of each metal cylinder.

The results are shown in **Figure 20**.



13 (a) Suggest an appropriate resolution for the thermometer used in the investigation.

Resolution = °C

Give a reason for your answer.

[2 marks]

.....
.....

13 (b) The mass of metal and the energy transferred to each metal were control variables in the investigation.

Suggest another variable that should have been controlled.

[1 mark]

.....

13 (c) Which metal has the highest specific heat capacity?

Give a reason for your answer.

[2 marks]

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

13 (d) In this investigation, 18 000 J of energy was supplied to a 2 kg cylinder of steel.

Calculate the specific heat capacity of steel.

Use the correct equation from the Physics Equations Sheet.

[3 marks]

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

Specific heat capacity = J/kg °C

8

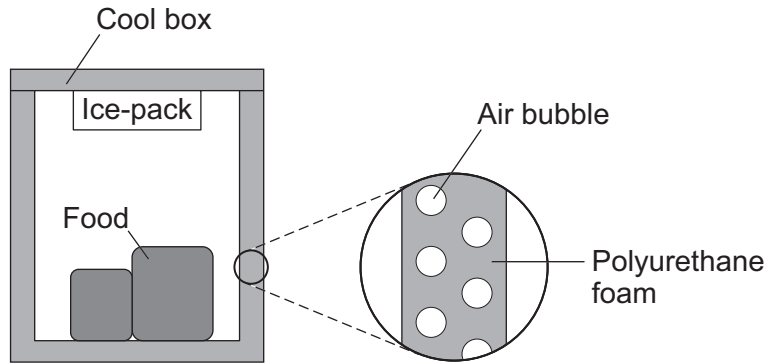
Turn over ►



14 Figure 21 shows a cool box.

A cool box is used to keep food colder than the surroundings. The cool box consists of plastic walls with a layer of polyurethane foam between them.

Figure 21



14 (a) The polyurethane foam has a low U-value.

Why does the polyurethane foam need to have a low U-value?

[1 mark]

.....

.....

14 (b) The polyurethane foam contains air bubbles.

Explain how the air bubbles reduce energy transfer through the walls of the cool box.

You should refer to the processes of energy transfer in your answer.

[3 marks]

.....

.....

.....

.....

.....

.....



14 (c) An ice-pack can be placed inside the cool box. An ice-pack contains a material with a very high specific heat capacity. The ice-pack is frozen in a freezer and cooled to $-18\text{ }^{\circ}\text{C}$ before being put in the cool box.

The ice-pack keeps the contents of the cool box cooler than the surroundings for a long time.

Describe how.

[3 marks]

.....

.....

.....

.....

.....

.....

7

END OF QUESTIONS



There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Acknowledgement of copyright-holders and publishers

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements in future papers if notified.

Figure 2: Food pyramid © Thinkstock
Figure 3: Attractive female running, profile © Thinkstock
Figure 3: Man doing yoga © Thinkstock

Copyright © 2014 AQA and its licensors. All rights reserved.

