

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Secondary Education  
Foundation Tier  
January 2013

# Science A 1

## Unit 5

Wednesday 9 January 2013 9.00 am to 10.30 am

SCA1FP

F

### For this paper you must have:

- a ruler
- a calculator
- the Chemistry Data Sheet and Physics Equations Sheet Booklet (enclosed).

### 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 14 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.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
TOTAL	



J A N 1 3 S C A 1 F P O 1

G/K90457 6/6/6/6/6

SCA1FP

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

### Biology Questions

- 1 (a)** Cells called receptors detect changes in the environment.

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

A change in the environment is called

an effector.

a response.

a stimulus.

(1 mark)

- 1 (b)** The picture shows a girl ice skating.



Receptors are found in the sense organs. They detect changes in the environment.

Complete each of the following sentences to give the change each receptor detects to help her **dance on ice**.

Receptors in her eyes are sensitive to .....

Receptors in her ears are sensitive to .....

Receptors in the skin of her feet are sensitive to .....

(3 marks)



**2** Internal conditions in the body are controlled.

Use words from the box to complete each of the following sentences.

<b>blood</b>	<b>FSH</b>	<b>glands</b>
<b>hormones</b>	<b>LH</b>	<b>white blood cells</b>

Many processes in the body are controlled by chemical substances called

.....

The chemicals are secreted by .....

They are transported to their target organs in .....

One of these chemical substances stimulates the release of an egg from a woman's ovary.

This chemical substance is called ..... (4 marks)

<b>4</b>

**Turn over for the next question**

**Turn over ►**



**3** Scientists are developing drugs all the time.

Complete the following sentences about the drug thalidomide.

Thalidomide was first developed as a .....

Thalidomide was also found to be effective in pregnant women for relieving

.....

Unfortunately, many babies born to mothers taking thalidomide were born with

deformed .....

The drug was then banned.

More recently thalidomide has been used successfully in the treatment of

.....

(4 marks)

4
---



4 Plants are sensitive to light, gravity and moisture.

4 (a) Complete the table to show whether roots and shoots grow towards or away from light, the force of gravity and moisture.

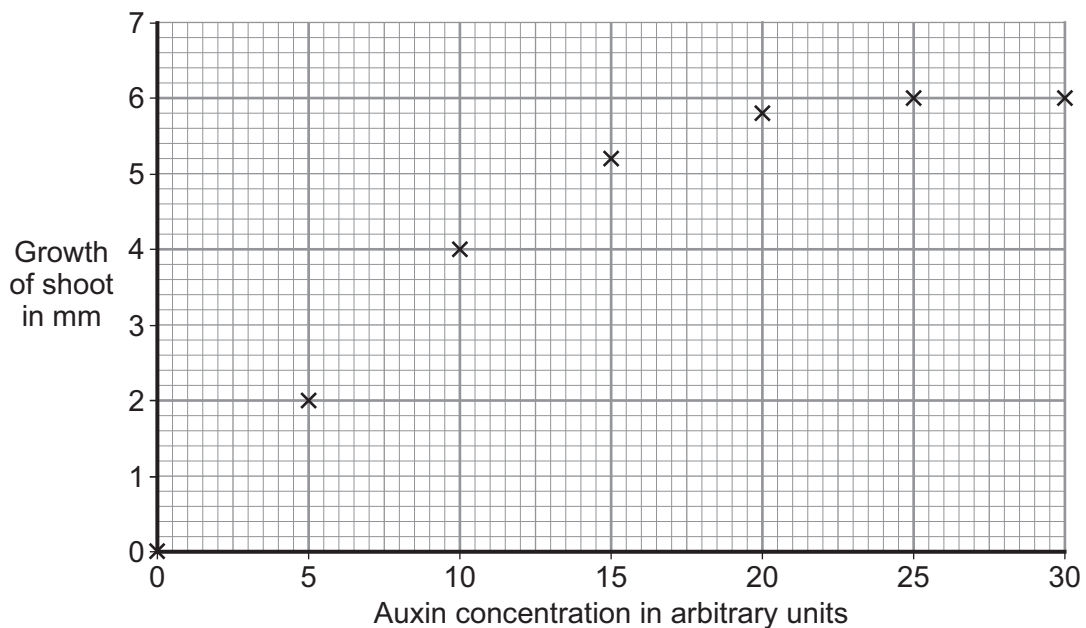
In each box draw a ring around the correct answer.

	Light	Force of gravity	Moisture
Roots grow	towards / away from	towards / away from	towards / away from
Shoots grow	towards / away from	towards / away from	

(3 marks)

4 (b) A hormone called auxin controls the response of plants to light.

The graph shows the effect of different auxin concentrations on the growth of a shoot.



4 (b) (i) Draw a line of best fit through the points on the graph.

(1 mark)

4 (b) (ii) Use the graph to predict the **lowest** auxin concentration needed for maximum growth of the shoot.

Auxin concentration = ..... arbitrary units  
(1 mark)

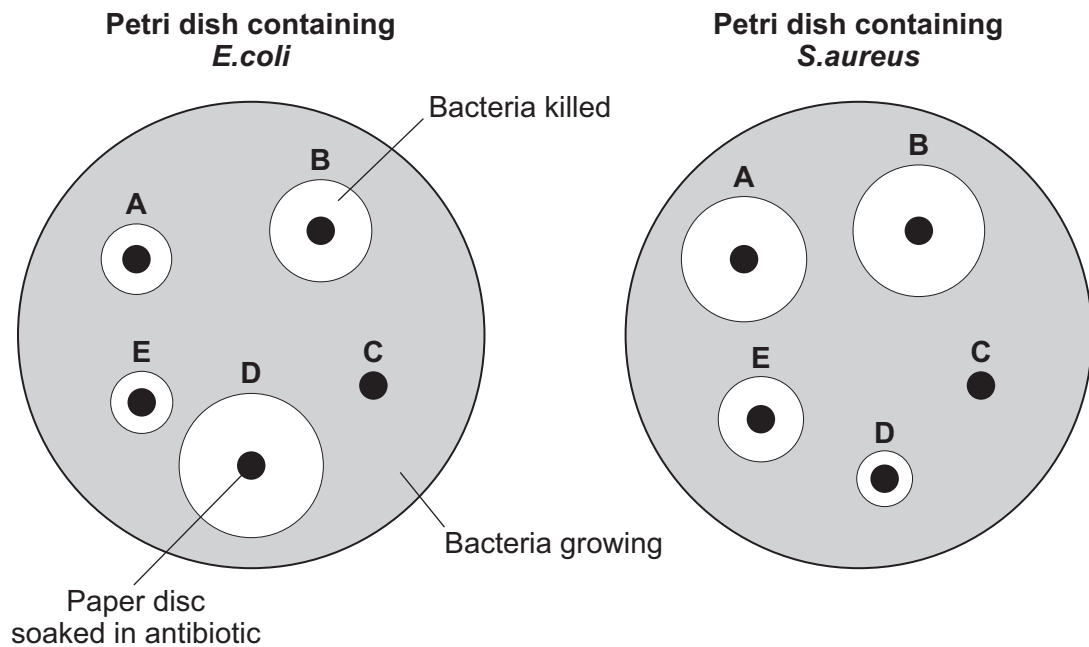


**5** A scientist investigated how effective 5 different antibiotics were at killing two types of bacteria, *E.coli* and *S.aureus*.

- The scientist grew the bacteria on agar in two different Petri dishes.
- He placed paper discs soaked in the 5 different antibiotic solutions, **A**, **B**, **C**, **D** and **E**, onto the agar.
- He used the same concentration of each antibiotic and the same sized paper discs.
- The Petri dishes were incubated at 25 °C for 3 days.

A clear area around the paper disc means that the antibiotic has killed the bacteria there.

The results are shown in the diagram.



**5 (a)** Give **one** variable the scientist controlled.

.....  
(1 mark)



**5 (b)** Use the results shown in the diagram to help you to answer the following questions.

**5 (b) (i)** Which antibiotic, **A**, **B**, **C**, **D** or **E**, was the most effective at killing *E.coli*?

Write the correct answer in the box.

(1 mark)

**5 (b) (ii)** Which antibiotic, **A**, **B**, **C**, **D** or **E**, did not kill either *E.coli* or *S.aureus*?

Write the correct answer in the box.

(1 mark)

**5 (b) (iii)** Which antibiotic, **A**, **B**, **C**, **D** or **E**, would be the best to use to kill both *E.coli* and *S.aureus*?

Antibiotic: .....

Give a reason for your answer.

.....

.....

.....

(2 marks)

**5 (c)** MRSA is a strain of *S.aureus*. MRSA cannot be killed by most antibiotics.

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

Bacteria that cannot be killed by antibiotics are

immune.

powerful.

resistant.

(1 mark)

6

**Turn over for the next question**

**Turn over ►**



**Chemistry Questions**

- 6** Fire dancers use firesticks to make flame patterns.



One end of the firestick is soaked in kerosene.  
The kerosene is lit and burns with a yellow flame.

Kerosene is a mixture of hydrocarbons.

- 6 (a)** Complete the following sentence.

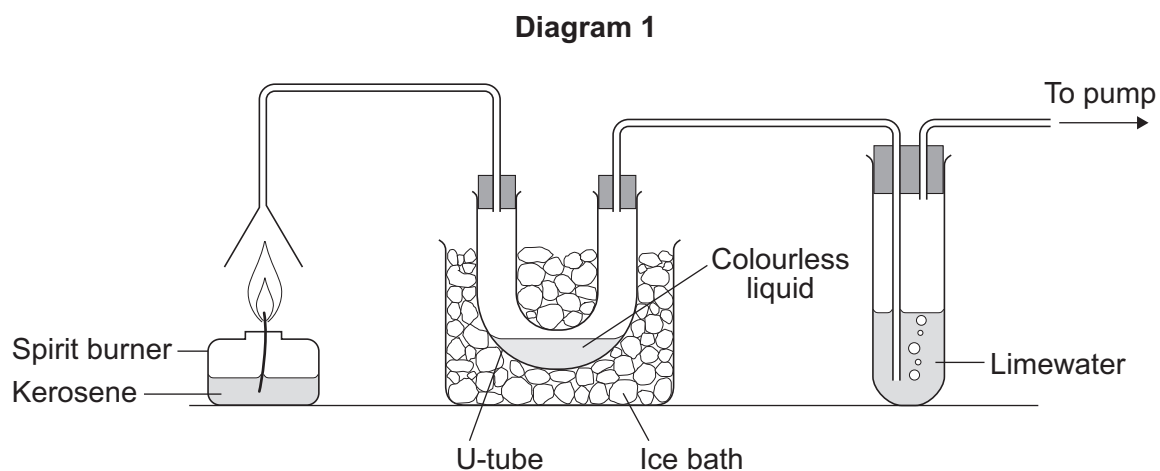
A hydrocarbon is made up of only two elements, ..... and carbon.  
(1 mark)





- 6 (b)** A student investigated the products formed when kerosene burned.

**Diagram 1** shows the apparatus the student used.



- 6 (b) (i)** The limewater turns cloudy.

Name the gas that turns limewater cloudy.

.....

(1 mark)

- 6 (b) (ii)** Name the colourless liquid collected in the U-tube.

.....

(1 mark)

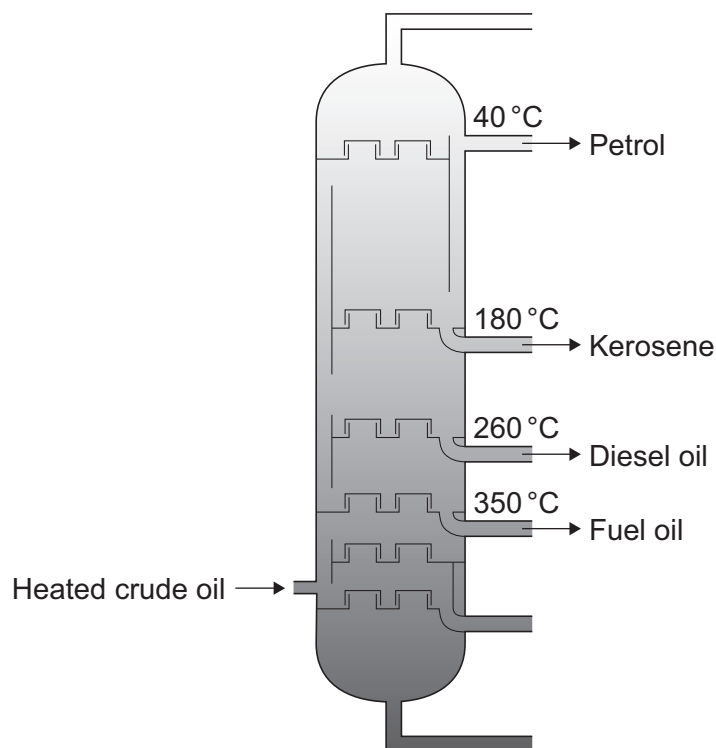
**Question 6 continues on the next page**

**Turn over ►**



- 6 (c)** Kerosene is obtained from crude oil.
- Crude oil is separated into fractions.
- The process is called fractional distillation.

**Diagram 2**



Use **only** information from **Diagram 2** to help you to answer these questions.

- 6 (c) (i)** Which of the named fractions has the lowest boiling point?

.....  
(1 mark)

- 6 (c) (ii)** Which of the named fractions is the most viscous (thickest)?

.....  
(1 mark)



**6 (c) (iii)** Use the correct word from the box to complete the sentence.

**fuels**

**metals**

**plastics**

All the fractions listed in **Diagram 2** can be used as .....  
(1 mark)

**6 (d)** Crude oil is separated by fractional distillation.

The statements, **A**, **B**, **C**, **D** and **E**, describe how different fractions are obtained from crude oil.

- A** crude oil is heated
- B** hydrocarbons condense
- C** hydrocarbon vapours enter the fractionating column
- D** hydrocarbons with higher boiling points condense near the bottom of the column
- E** crude oil vaporises

Complete the sequence below. Put the statements, **A**, **B**, **C**, **D** and **E**, in the correct order to show how crude oil is separated into fractions.

The first and last boxes have been completed for you.



(2 marks)

8

**Turn over for the next question**

**Turn over ►**



- 7 Lithium batteries are used in laptops.



The batteries contain a lithium compound.  
The formula of the compound is  $\text{LiCoO}_2$

- 7 (a) Complete the table to show the number of atoms of each element in the formula,  $\text{LiCoO}_2$   
Lithium has been completed for you.

Element	Number of atoms in the formula $\text{LiCoO}_2$
Lithium, Li	1
Cobalt, Co	
Oxygen, O	

(2 marks)

- 7 (b) Some laptops have caught fire.

Scientists think sparks caused the fires.  
The sparks caused small particles of lithium in the batteries to react with oxygen.

- 7 (b) (i) Suggest where the oxygen reacting with the lithium came from.

.....  
.....

(1 mark)

- 7 (b) (ii) Name the product of the reaction between lithium and oxygen.

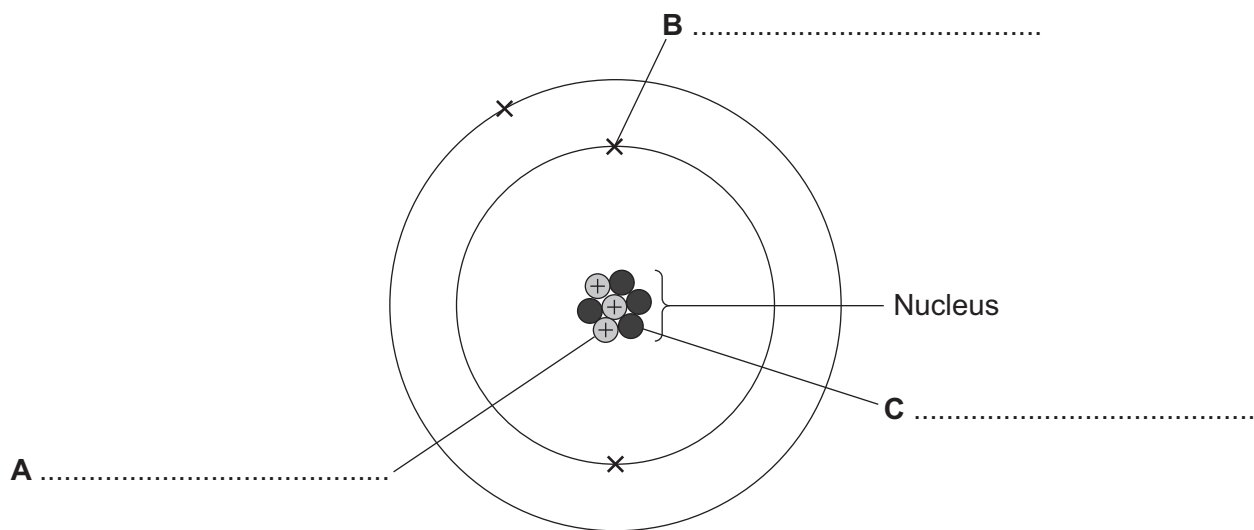
.....

(1 mark)



**7 (c)** The diagram below shows the structure of a lithium atom.

Name the particles labelled **A**, **B** and **C** on the diagram.



(3 marks)

**7 (d)** Lithium is a metal.

A lithium atom forms a lithium ion.

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

**7 (d) (i)** A lithium atom forms an ion by

gaining

losing

one electron.

sharing

(1 mark)

**7 (d) (ii)** A lithium ion is

negative.

neutral.

positive.

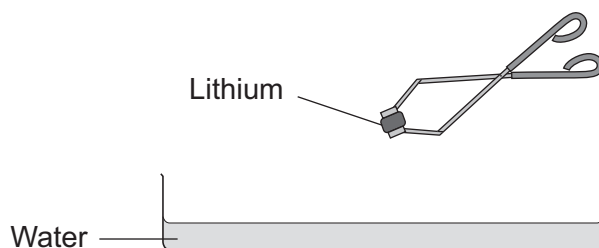
(1 mark)

**Question 7 continues on the next page**

**Turn over ►**



- 7 (e) Lithium hydroxide and hydrogen are produced when lithium reacts with water.



- 7 (e) (i) Describe what you would **see** when lithium is added to water.

.....

.....

.....

.....

(2 marks)

- 7 (e) (ii) Complete the word equation for the reaction between lithium and water.

lithium + water → ..... + .....  
(1 mark)



### Physics Questions

**8** The pictures show some electrical devices found in the home.

The power output for each electrical device is shown below each picture.



Drill  
1000 W



Halogen lamp  
50 W



Heater  
2000 W



MP3 player  
0.01 W

- 8 (a)** Which device usefully transfers electrical energy to:
- sound energy? .....
- light energy? .....
- energy that heats the surroundings? .....

(3 marks)

- 8 (b)** Which device will cost the most to use for 1 hour?
- .....

(1 mark)

4

Turn over for the next question

Turn over ►



**9** Several factors affect how quickly an object cools down.

**9 (a)** A student investigated how much time boiling water takes to cool to room temperature.

She used three **insulated** containers. The containers had different shapes.

She poured the **same volume** of boiling water into each container.

**9 (a) (i)** Which of the following is the independent variable?

Draw a ring around the correct answer.

**shape of container**

**temperature of the room**

**time of day**

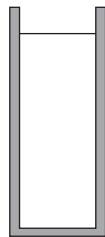
(1 mark)

**9 (a) (ii)** The diagram shows the shapes of the containers and the amount of time the water in them took to cool to room temperature.

Draw **one** line from each container to the amount of time the water took to cool to room temperature.

**Container**

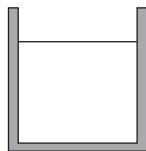
**Amount of time**



42 minutes



18 minutes



60 minutes

(2 marks)





- 9 (b)** The desert fox lives in a hot climate.



- 9 (b) (i)** Draw a ring around the correct answer to complete the sentence.

When it is hot, the desert fox needs to lose \_\_\_\_\_ quickly.

energy

fat

water

(1 mark)

- 9 (b) (ii)** What feature of the desert fox's ears helps the fox to stay cool?

Draw a ring around the correct answer.

**large surface area**

**pointed shape**

**smooth surface**

(1 mark)

- 9 (b) (iii)** Complete the following sentences.

The fox's ears warm the surrounding air.

The air particles move further apart and the warm air rises because it is

less .....

The warm air is replaced by more dense, ..... air.

This movement of air is called a ..... current.

(3 marks)



**10** The cost of electricity is increasing. People want to use devices that are more energy efficient.

**10 (a)** What does *energy efficient* mean?

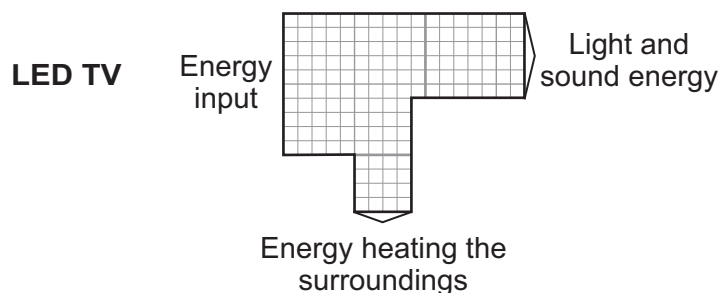
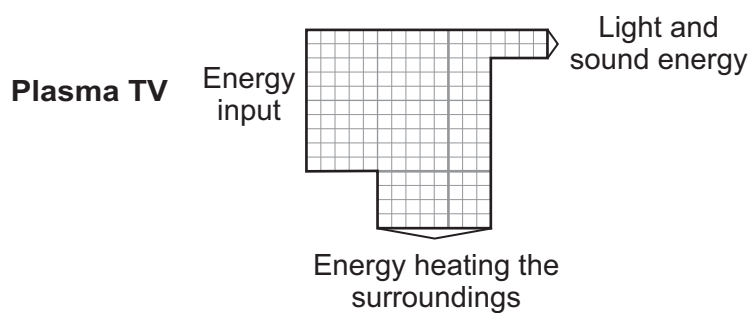
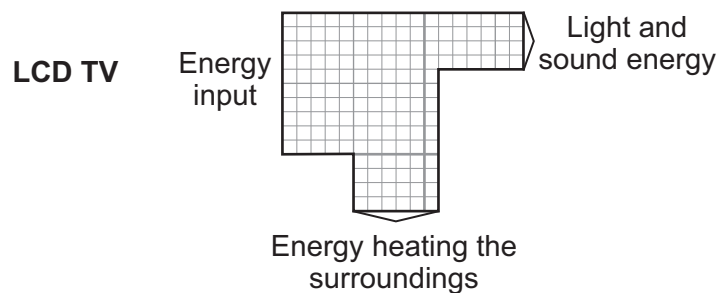
Tick (✓) **one** box.

Statements	Tick (✓)
Energy efficient means a low energy input.	
Energy efficient means a small proportion of wasted energy.	
Energy efficient means a small proportion of useful energy.	

(1 mark)

**10 (b)** A householder is trying to decide which TV to buy. The choice is between an LCD TV, a Plasma TV and an LED TV. The TVs had the same sized screens.

The Sankey diagrams show the proportion of the input energy that is transferred to different energy forms by the three TVs.



Which TV wastes the largest proportion of the input energy?

.....  
(1 mark)

**10 (c)**

The power rating of a TV when in use is 0.3kW.

Calculate the energy used by the TV when in use for 6 hours.

Use the correct equation from the Physics Equations Sheet.

Draw a ring around the correct unit.

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

Energy used = .....

kW

kWh

W

(3 marks)

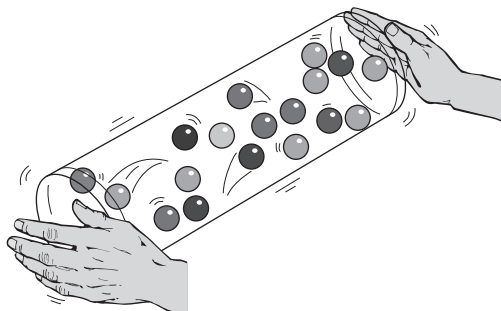
5

**Turn over for the next question**

**Turn over ►**



- 11** A student shakes a tube containing small balls to model the movement of particles in a gas.



- 11 (a)** Why is this a good model for the movement of particles in a gas?

Tick (✓) **two** boxes.

The balls move slowly.

☐

The balls are far apart from each other.

☐

The balls are different colours.

☐

The balls move randomly.

☐

(2 marks)

- 11 (b)** For a given material, in which state of matter:  
are the particles in a regular arrangement?

.....

do the particles have the most kinetic energy?

.....

(2 marks)



**Turn over for the next question**

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### Biology Questions

**12** This question is about metabolic rate.

**12 (a)** Describe what *metabolic rate* is.

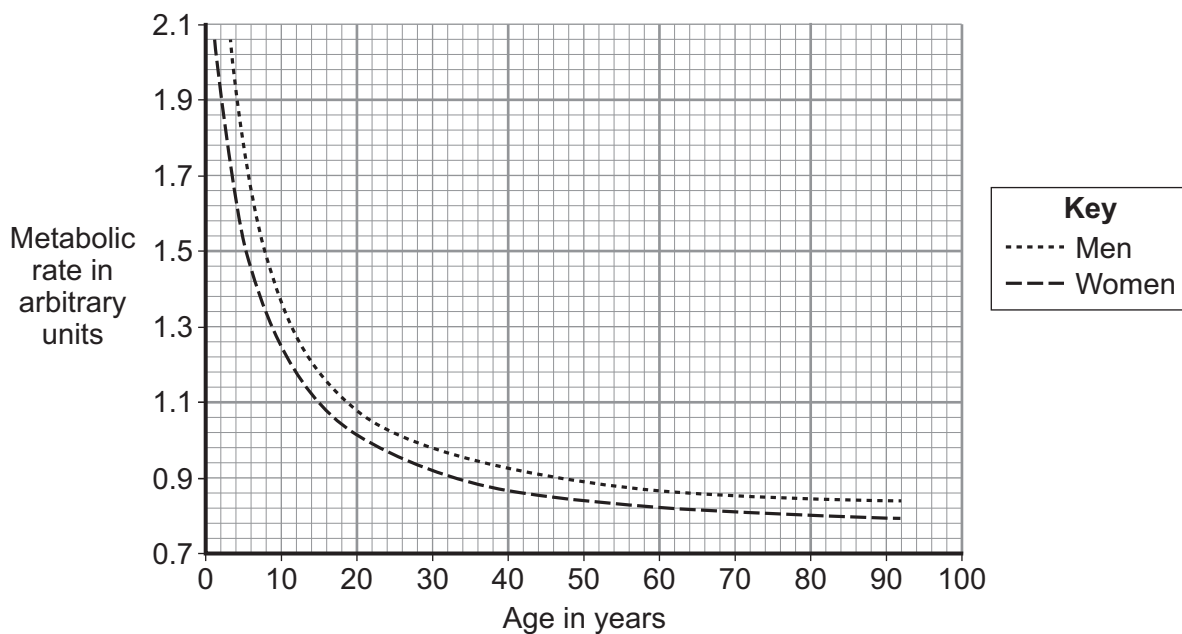
.....

.....

.....

(1 mark)

**12 (b)** The graph shows the metabolic rate in people of different ages.



**12 (b) (i)** Use the graph to describe how metabolic rate changes with age.

.....

.....

.....

.....

(2 marks)

**12 (b) (ii)** Suggest how the change in metabolic rate might affect older people.

.....

(1 mark)





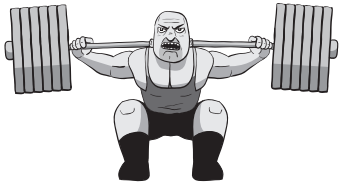
**12 (b) (iii)** Use the graph to give **one** conclusion about the effect of gender on metabolic rate.

.....

.....

(1 mark)

**12 (c)** The table gives information about three different people, **A**, **B** and **C**.

	Person A	Person B	Person C
			
Age in years	30	30	30
Body mass in kg	70	70	70
Amount of physical activity	Moderate	Low	High

Person **C** has the highest metabolic rate.

Suggest **two** reasons why.

.....

.....

.....

.....

(2 marks)

7

Turn over ►



**Chemistry Questions**

**13 (a)** Iron is produced in a blast furnace.

Explain why most of the iron produced in a blast furnace is converted into steels.

.....

.....

.....

.....

(2 marks)

**13 (b)** Three types of steel are low-carbon steel, high-carbon steel and stainless steel.



Which type of steel is used to make cutlery?

Give a reason why this steel is used.

.....

.....

.....

.....

(2 marks)





**Turn over for the next question**

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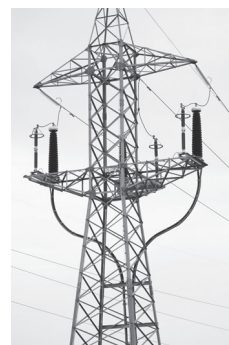
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14

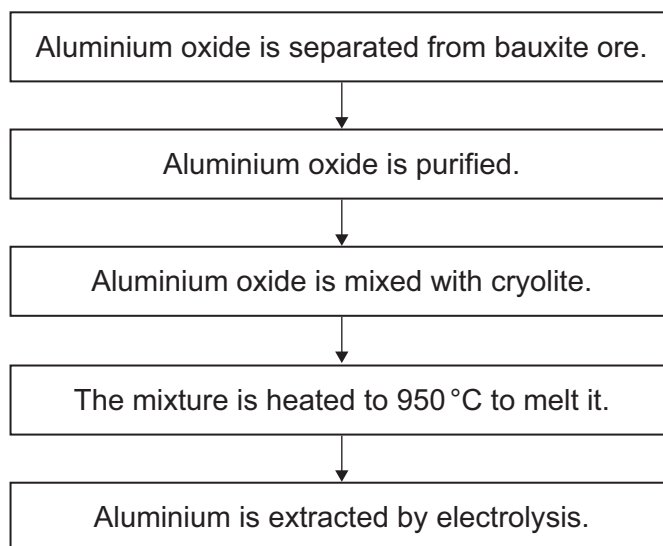
*In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Aluminium is used to make many items.



Aluminium is extracted from aluminium ore. Aluminium ore is called bauxite, which is impure aluminium oxide.

The flow chart shows the main steps in the extraction of aluminium from aluminium ore.



Most aluminium is recycled.

Aluminium is recycled by melting scrap aluminium at 700 °C.



Use your own knowledge and the information given to answer the question.  
Suggest why most aluminium is recycled.

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(6 marks)

6

**Turn over for the next question**

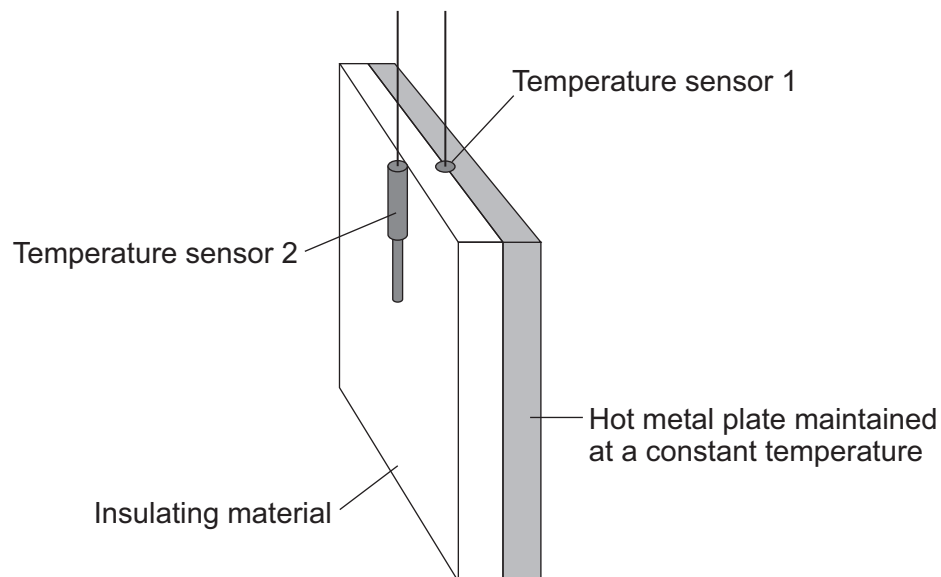
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**Physics Questions**

**15 (a)** A student investigated the insulating properties of three materials.

The diagram shows the apparatus the student used.

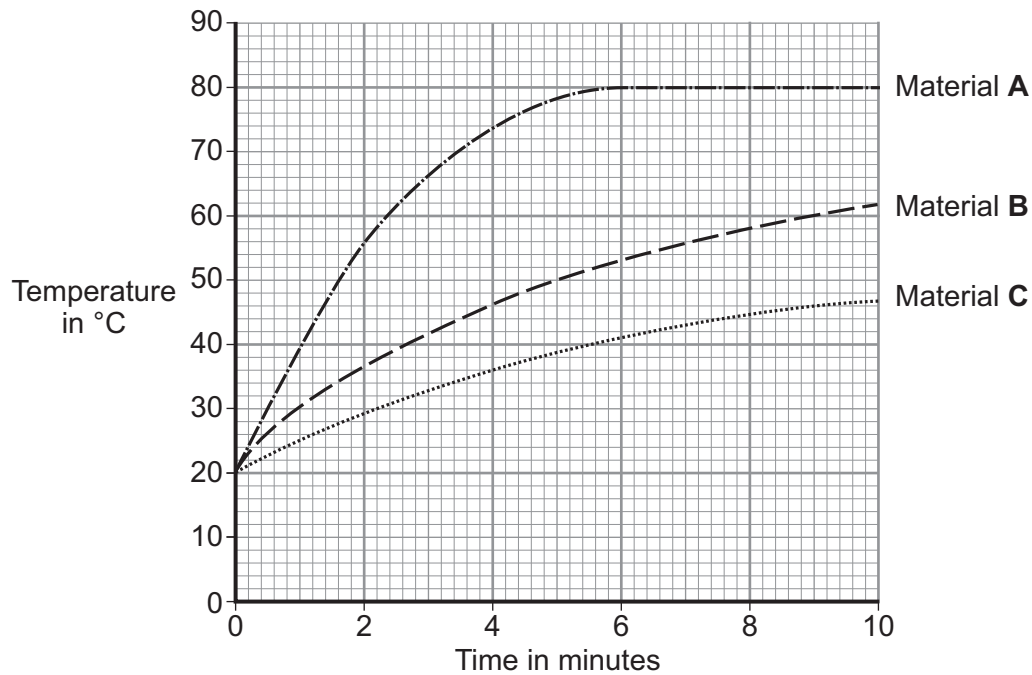


In the investigation:

- different insulating materials, **A**, **B** and **C**, were placed in contact with the hot metal plate
- temperature sensors measured the temperature on each side of the material
- the difference in temperature across the insulating material was then calculated
- the differences in temperature were compared to measure the effectiveness of each insulating material.



The graph shows how the temperature measured by temperature sensor 2 changed over 10 minutes for each of the materials.



**15 (a) (i)** What was the temperature of the hot metal plate?

..... °C  
(1 mark)

**15 (a) (ii)** Which material, **A**, **B** or **C**, is the best insulator?

Material: .....

Give a reason for your answer.

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

**15 (a) (iii)** Which material, **A**, **B** or **C**, has the highest U-value?

Material: .....

Give a reason for your answer.

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

**Question 15 continues on the next page**

**Turn over ►**



**15 (b)**

The table shows information about three home insulation methods for an average sized home.

Insulation method	Cost of insulation in £	Savings per year in £
Double glazing	5000	60
Draught excluders	90	30
Loft insulation	350	150

Which method of home insulation is the most cost-effective over 10 years?

You must include calculations in your answer.

.....

.....

.....

.....

.....

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.....

.....

(4 marks)

9
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**END OF QUESTIONS**



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