

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Secondary Education
Higher Tier
June 2013

Science A 1

Unit 5

Wednesday 5 June 2013 1.30 pm to 3.00 pm

SCA1HP

H

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 4(c) 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
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TOTAL	



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SCA1HP

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

Biology Questions

- 1 A healthy diet gives the right balance of different foods you need and the right amount of energy.



- 1 (a) Give **two** possible effects on the body of a diet that is **not** balanced.

1

2 (2 marks)

- 1 (b) The food we eat can affect how much cholesterol is in the blood.

Give **one** other factor that can affect how much cholesterol is in the blood.

..... (1 mark)

- 1 (c) Eating a balanced diet can help people to stay healthy.

What else can people do to stay healthy?

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..... (1 mark)



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ANSWER IN THE SPACES PROVIDED**

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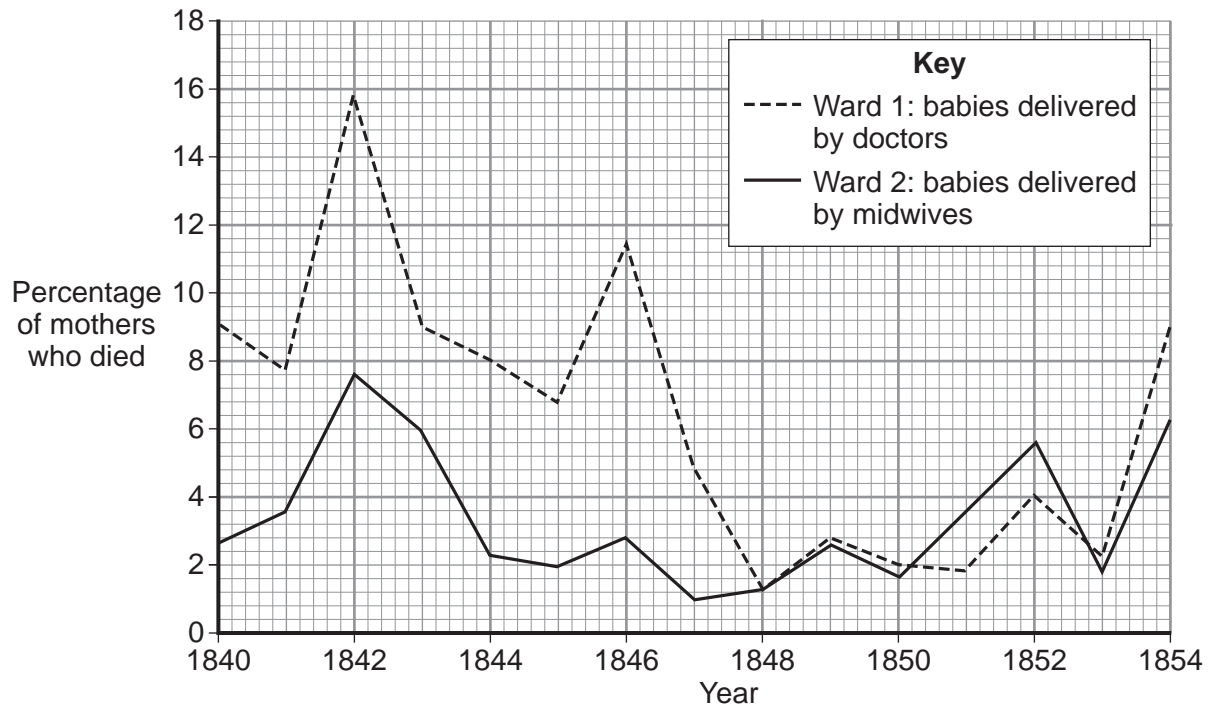


- 2 In the 1800s, many women died in hospital of childbed fever after giving birth.

The graph shows the percentage of mothers who died from childbed fever each year in a hospital in Vienna.

Death rates are shown for two wards at the hospital.

- In **Ward 1** doctors delivered the babies. The doctors worked in many different wards. The doctors also carried out investigations on dead bodies.
- In **Ward 2** midwives delivered the babies. The midwives only worked in **Ward 2**.



- 2 (a) What conclusion can be made from the data between 1840 and 1846?

.....

.....

Suggest a reason for this.

.....

.....

(2 marks)



- 2 (b)** Ignaz Semmelweis was a doctor at the hospital. He was very worried about the number of women who died after child birth.

In 1847, Semmelweis introduced a new policy. This policy led to a reduction in the number of deaths.

- 2 (b) (i)** What policy did Semmelweis introduce?

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(2 marks)

- 2 (b) (ii)** Suggest why this policy led to a reduction in the number of deaths.

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(1 mark)

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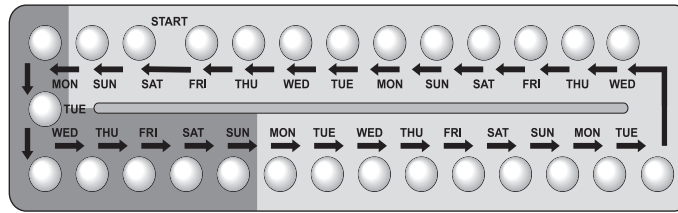
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3 Hormones can be used to control human fertility.

Many women take the oral contraceptive pill so they do not become pregnant.



3 (a) Name **two** hormones used in contraceptive pills.

1

2

(2 marks)

3 (b) Explain how these hormones stop a woman from becoming pregnant.

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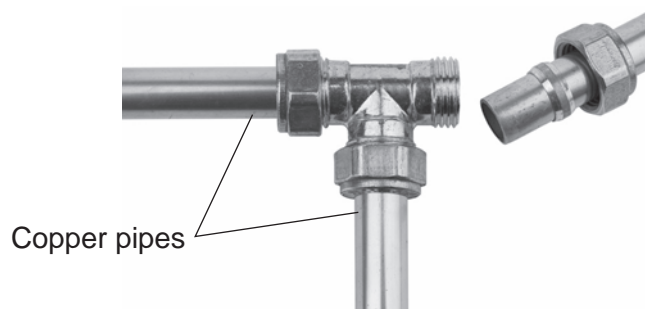
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(2 marks)



Chemistry Questions

- 4** Copper is used in plumbing.



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

Elements in the central block of the periodic table, eg copper, iron and zinc, are called
..... metals.

(1 mark)

- 4 (b)** State three properties that make copper suitable for use in plumbing.

- 1
-
- 2
-
- 3
-

(3 marks)

Question 4 continues on the next page

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

Copper can be extracted from copper ores by two methods:

Method 1 mining and smelting

or

Method 2 phytomining.

The main stages in the two methods are shown in the flow diagrams.

Mining and smelting



The copper ore is mined from the earth.



The copper ore is heated in a furnace with carbon (smelting).
This produces impure copper.

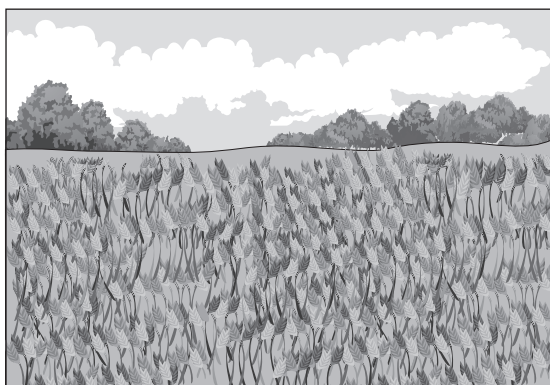


The copper is purified by electrolysis.



Pure copper is produced.

Phytomining



Plants are grown on soil containing low grade ores.



The plants absorb copper compounds from the soil.



The plants are burned.
The ash contains copper compounds.



Copper is extracted from a solution made from the ash by electrolysis.



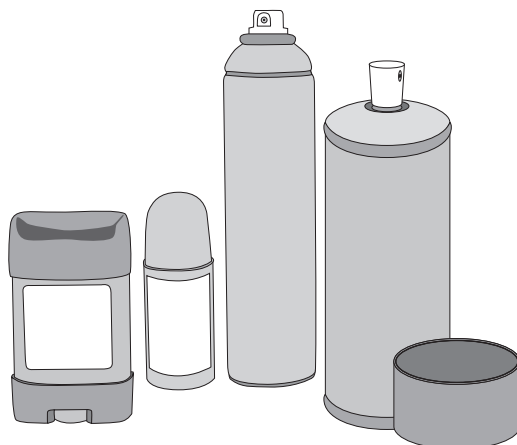
Pure copper is produced.



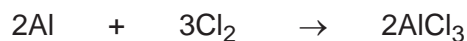
This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

10

- 5 Aluminium chloride is used in antiperspirants.



- 5 (a) The balanced symbol equation for the formation of aluminium chloride is:



Name the reactants shown in the equation.

Give the numbers of atoms of each reactant shown in the equation.

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(2 marks)

- 5 (b) (i) An aluminium atom contains three different types of sub-atomic particles.

Name the three types of particles and give their relative electrical charges.

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(3 marks)



5 (b) (ii) State why an aluminium atom has no overall charge.

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(1 mark)

6

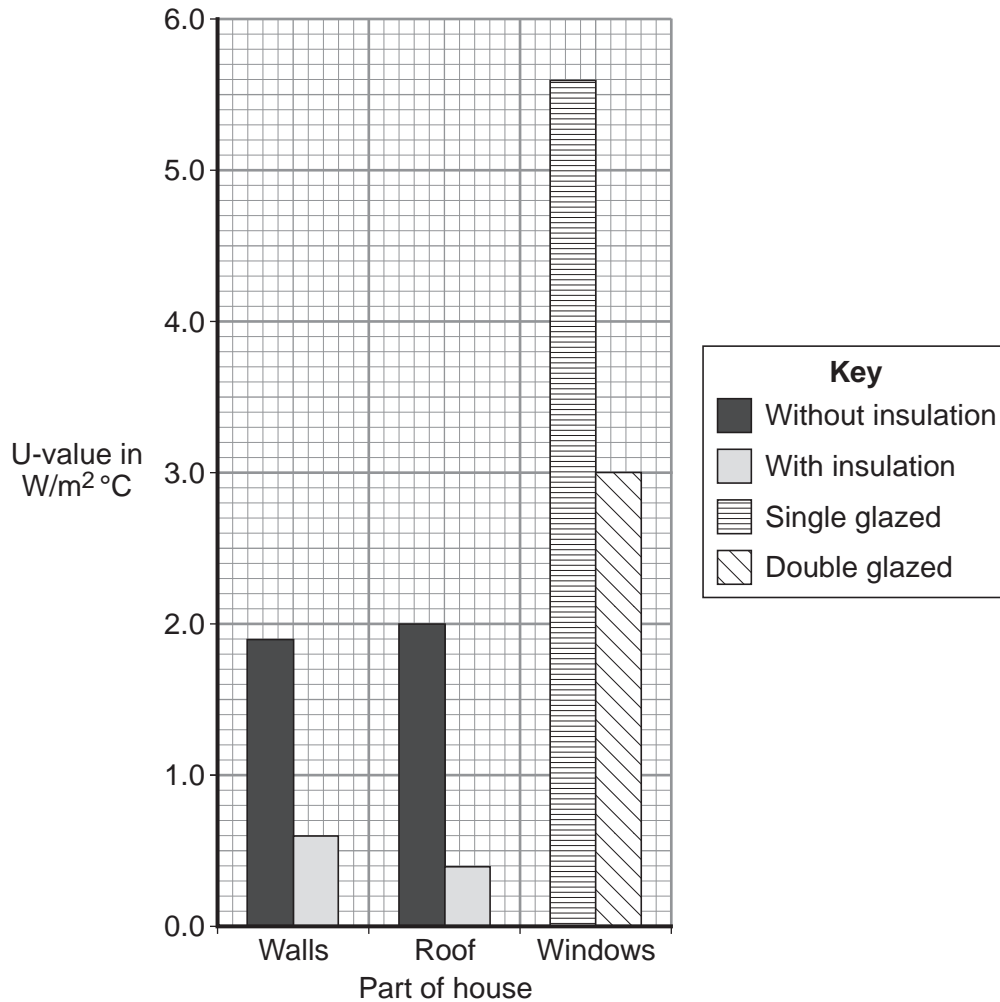
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Physics Questions

- 6** A salesman for a double-glazing company shows the following bar chart to possible customers. The bar chart shows U-values for different parts of a house.



- 6 (a) (i)** What type of variable is 'Part of house'?

Draw a ring around the correct answer.

categoric

control

continuous

(1 mark)

- 6 (a) (ii)** It is better to build houses using materials with low U-values.

State why.

.....

.....

(1 mark)



- 6 (b)** The salesman says, "Double glazing is twice as good an insulator as single glazing".

The salesman is incorrect.

Explain why.

Use information from the bar chart to support your answer.

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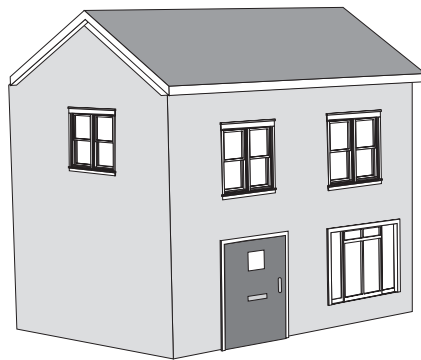
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(2 marks)

- 6 (c)** A customer's house is shown in the diagram.



Area of roof = 72 m^2

Area of walls = 140 m^2

Area of windows = 24 m^2

U-values are calculated using areas of 1 m^2 .

What should the customer consider before deciding which part of the house to insulate first?

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(3 marks)

Question 6 continues on the next page

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6 (d) In a magazine, the customer reads:

'Roof insulation is a good idea because hot air rises.'

Explain why air rises when it is heated.

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(2 marks)

9



- 7** A hairdryer is supplied with 800 J of energy every second.



- 7 (a)** Describe **all** the energy transfers that take place in the hairdryer when it is being used.

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(4 marks)

- 7 (b)** Why must the total energy output of the hairdryer always equal the total energy input to the hairdryer?

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(1 mark)

5

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Biology Questions

- 8** A student did an investigation to see if reaction time was affected by the sense organ stimulated.

A computer measured how quickly she clicked the mouse when she:

- saw a shape appear on the screen

or

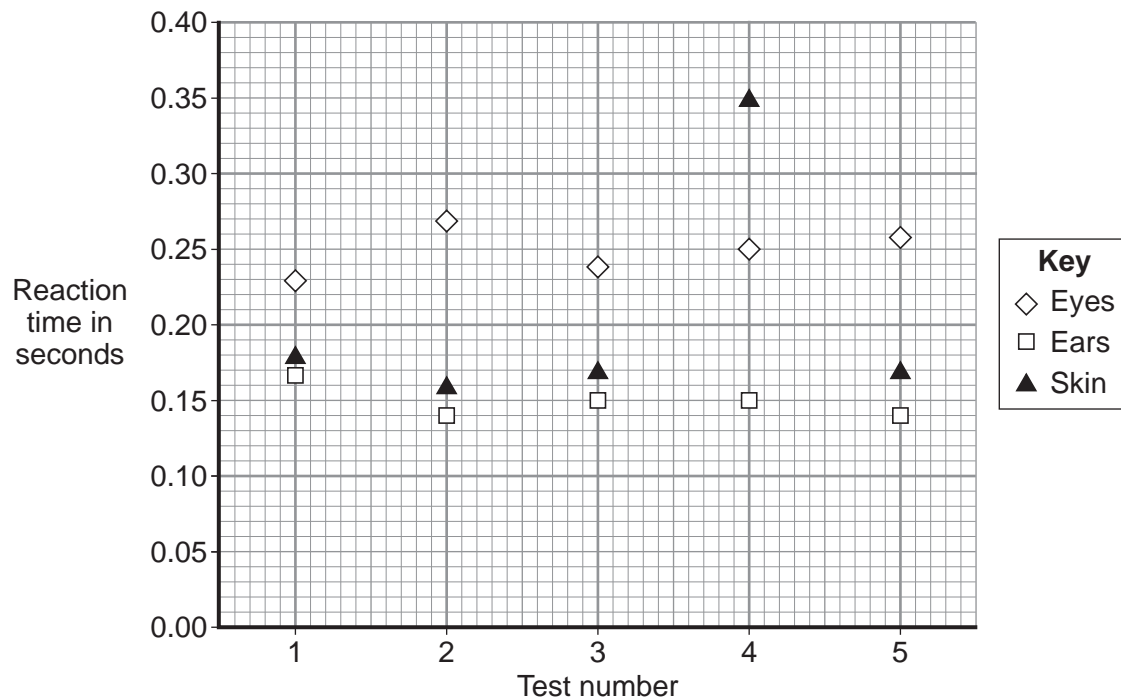
- heard a man shout 'Stop!'

or

- felt a bar vibrate in her hand.

Each sense organ was tested 5 times.

The scatter graph shows her results.



- 8 (a) (i)** The data is shown as a scatter graph rather than a line graph.

Suggest why.

.....

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(1 mark)



- 8 (a) (ii)** The results shown in the scatter graph might be easier to understand if they were drawn as a bar chart.

Describe what would have to be done with these results before they could be shown in a bar chart.

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(2 marks)

- 8 (b)** Give **one** conclusion that can be made from these results.

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(1 mark)

4

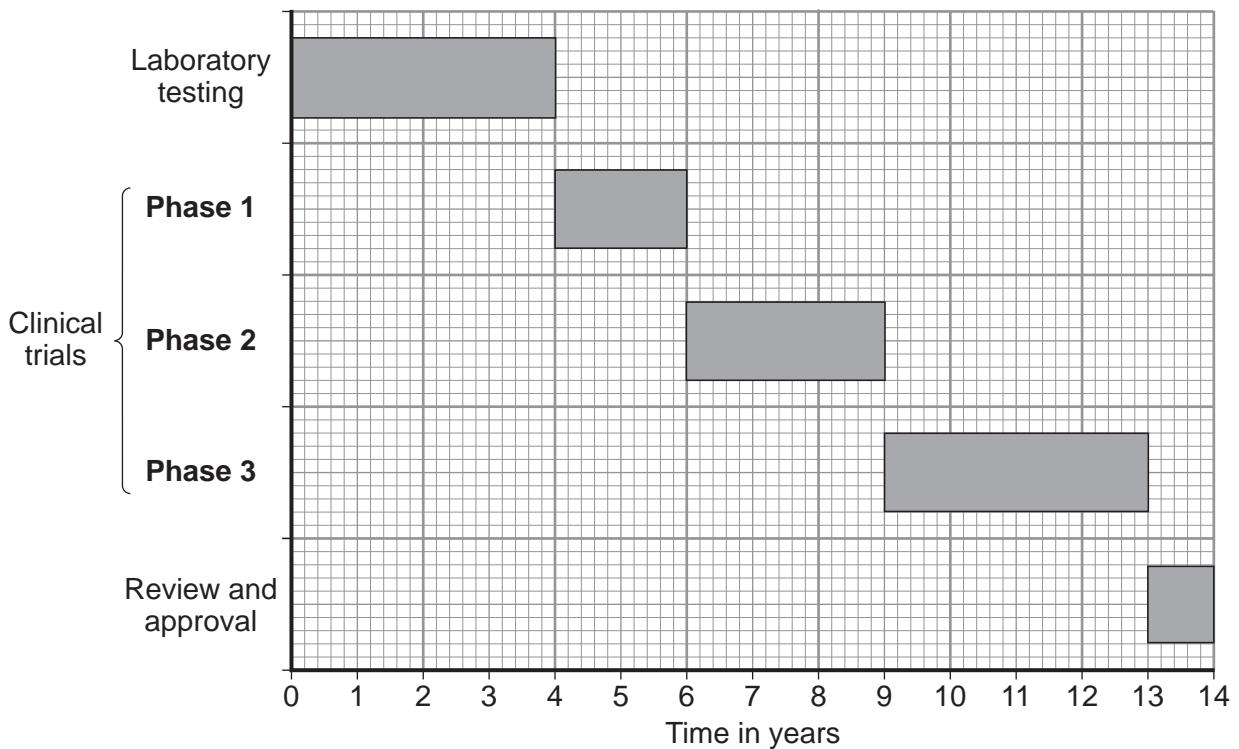
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- 9** New drugs have to be tested before they can be sold.

The graph shows how much time the different stages of testing took for a new drug.



- 9 (a) (i)** How much more time did the clinical trials take than the laboratory testing?

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..... years
(1 mark)

- 9 (a) (ii)** Apart from the time taken, what other difference is there between laboratory testing and clinical trials?

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(1 mark)



9 (b) (i) During **Phase 1** clinical trials, the drug is tested on healthy volunteers using low doses.

Suggest why **only** healthy volunteers and **only** low doses are used at this stage of drug testing.

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(2 marks)

9 (b) (ii) In **Phase 2** and **Phase 3** clinical trials, a double blind trial is usually done.

Explain what a double blind trial is and why a double blind trial is good practice.

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(3 marks)

7

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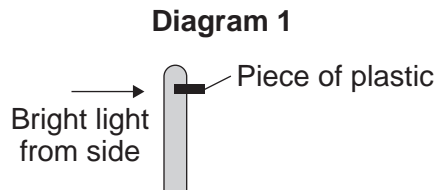


10 The growth of a plant shoot is controlled by a hormone. This hormone is produced at the tip of the shoot.

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

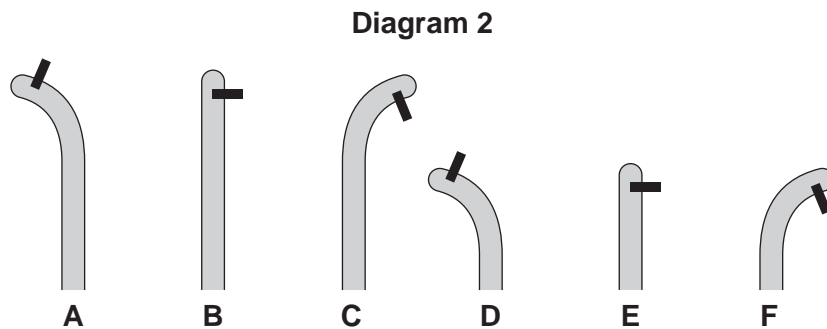
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(1 mark)

10 (b) A solid piece of plastic was inserted just below the tip of a plant shoot as shown in **Diagram 1**.



The plant shoot was left for a few days with bright light shining on it from one side.

10 (b) (i) Which diagram, **A**, **B**, **C**, **D**, **E** or **F**, shows how this shoot would look after a few days?



Diagram

(1 mark)



10 (b) (ii) Explain why the plant shoot would look like this after a few days.

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(4 marks)

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Chemistry Questions

- 11** Many fuels are obtained from crude oil. Some of these fuels can be used for transport.



- 11 (a)** The table shows different properties of some fuels obtained from crude oil.

Fuel	Size of molecules	Boiling point range in °C	Flash point in °C
Diesel	$C_{15}H_{32} - C_{20}H_{42}$	250–300	63
Kerosene	$C_{10}H_{22} - C_{15}H_{32}$	180–250	38
Petrol	$C_5H_{12} - C_{10}H_{22}$	40–180	–43

Flash point is the lowest temperature at which the fuel will catch fire.



- 11 (a) (i)** How does increasing the number of carbon atoms in the fuels affect the properties shown in the table?

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(2 marks)

- 11 (a) (ii)** Which fuel in the table would you expect to be the most viscous?

Give a reason for your answer.

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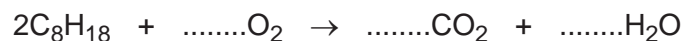
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(2 marks)

- 11 (b) (i)** Octane is one of the compounds in petrol.

Balance the chemical equation for the complete combustion of octane.



(2 marks)

- 11 (b) (ii)** Octane is both a hydrocarbon and an alkane.

Explain how the chemical formula of octane, C_8H_{18} , shows this.

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(2 marks)

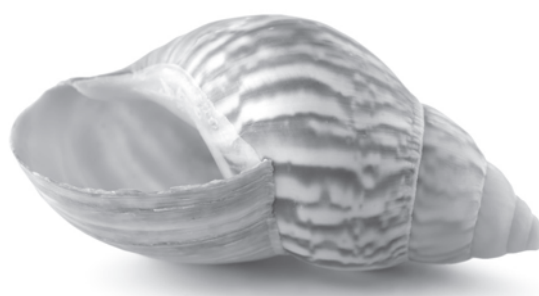


- 12** Many sea creatures have shells containing calcium carbonate.

Crab



Whelk



Scallop



- 12 (a)** The seas are becoming more acidic.

Suggest and explain how acids affect the shells of sea creatures.

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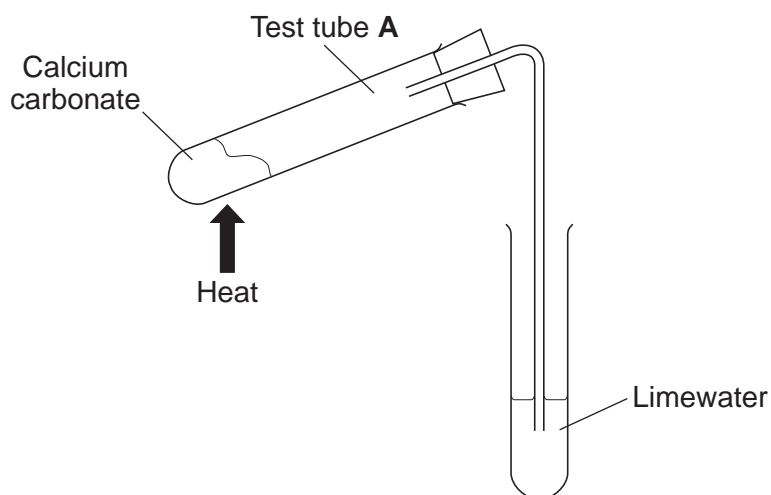
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(2 marks)



- 12 (b)** A student investigated the effect of heating calcium carbonate.



- 12 (b) (i)** A student heated 10.0g of calcium carbonate. At the end of the investigation, there was 5.6g of a white powder in test tube **A**.

Explain how this information about masses shows that a gas was produced.

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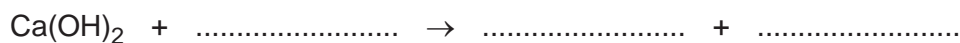
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(2 marks)

- 12 (b) (ii)** Limewater is a solution of calcium hydroxide in water.

Complete the symbol equation to show the reaction that occurs when carbon dioxide reacts with limewater.



(2 marks)



Physics Questions

- 13** A householder wants to reduce his electricity bill. He records the power rating of four electrical appliances and how much time each appliance is used in one day.

Appliance	Power rating	Time in use in one day in hours	Energy transferred in one day in kWh
Shower	10 kW	0.50	5.0
Fridge-freezer	160 W	24	
Plasma TV	400 W	6.0	2.4
Kettle	3000 W	0.25	0.75

- 13 (a) (i)** Complete the table by calculating the energy transferred in one day by the fridge-freezer.

Use the correct equation from the Physics Equations Sheet.

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Energy transferred = kWh
(2 marks)

- 13 (a) (ii)** Which appliance would cost the least to use each day?

.....
(1 mark)



- 13 (b)** The householder decides to change his 10kW electric shower. A gas boiler heats the water for the new shower.

The electric shower transfers 5kWh of energy to heat the water each day.

The cost of electricity is 12 pence per kWh. The cost of gas is 5 pence per kWh.

Calculate the saving the householder will make if the water is heated using gas.

Assume that the efficiency of the two methods of heating water is the same.

Use the correct equation from the Physics Equations Sheet.

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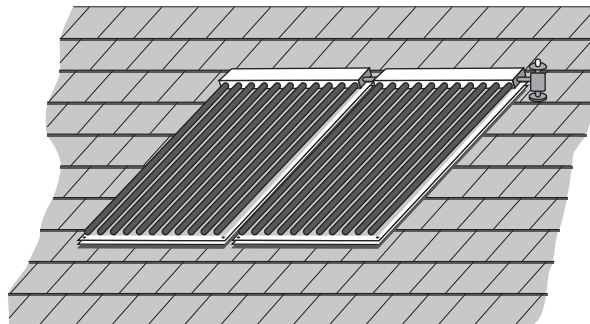
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Saving =
(3 marks)

- 13 (c)** As an alternative method to heat water for his shower, the householder installs solar panels on his roof. The householder could use solar panels on the roof to heat all the water for his house.



The Sun transfers energy to the solar panels at a rate of 8400 J/s. The mass of water in the pipes is 20 kg. The water has a specific heat capacity of 4200 J/kg °C.

Calculate the temperature rise of the water per minute.

Use the correct equation from the Physics Equations Sheet.

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Temperature rise per minute = °C
(3 marks)



14 An athlete runs in a marathon race. As he runs, his body gets hotter.

His body produces sweat to help him cool down.

14 (a) Explain in terms of particles, how sweating helps the athlete to cool down.

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(4 marks)



14 (b)

At the end of the race, the athlete is covered with a 'space blanket' made from shiny foil to prevent him from cooling too quickly.



He wraps the space blanket around his body to reduce energy transfer to the surroundings.

How does the space blanket reduce energy transfer to the surroundings?

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(3 marks)

7

END OF QUESTIONS



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