

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Secondary Education
June 2008

APPLIED SCIENCE (DOUBLE AWARD)
Unit 2 Science for the Needs of Society
Foundation Tier

APSC/2F
F



Thursday 5 June 2008 9.00 am to 10.30 am

<p>For this paper you must have:</p> <ul style="list-style-type: none"> • a ruler • a calculator.
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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. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The maximum mark for this paper is 90.
- The marks for questions are shown in brackets.
- 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.

For Examiner's Use			
Question	Mark	Question	Mark
1		7	
2		8	
3		9	
4			
5			
6			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			



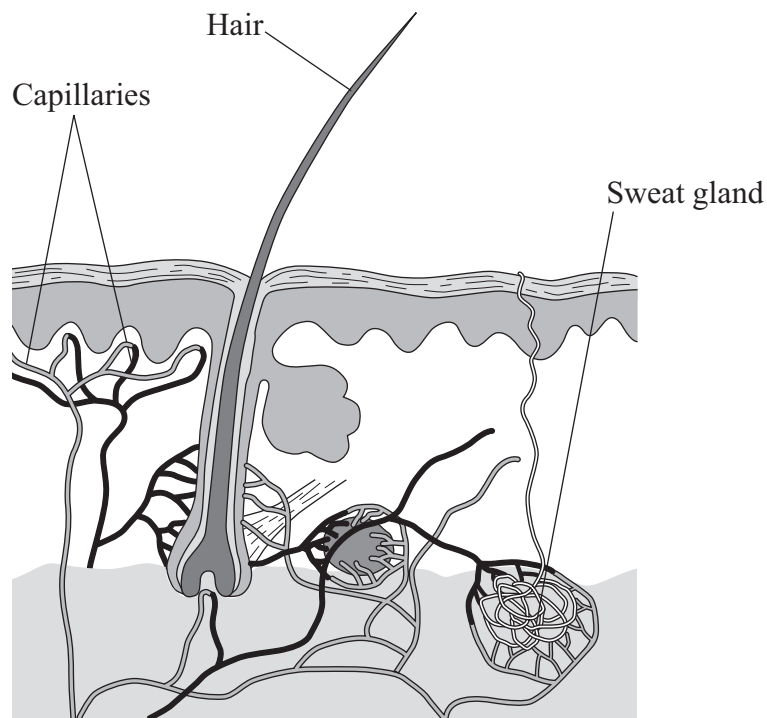
J U N O 8 A P S C 2 F O 1

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

- 1 Nurses must know about preventing infection and controlling body temperature when they are caring for patients.

The skin is an important organ that protects us from infection. The skin also helps us to control our body temperature.

The diagram shows a cross-section through the skin.



- 1 (a) Patients are at risk of infection from bacteria when their skin is damaged.

- 1 (a) (i) Draw a ring around the type of chemical that can prevent bacteria growing on the surface of the skin near a wound.

antiseptic

disinfectant

herbicide

pesticide

(1 mark)

- 1 (a) (ii) Give **one** other method that a nurse would use to prevent bacteria from entering the body through a wound.

.....

.....

(1 mark)



1 (b) Capillaries carry blood to the surface of the skin.

1 (b) (i) Draw a ring around the part of the blood that helps to form a barrier to prevent bacteria from entering the body through a wound.

plasma platelets red blood cells white blood cells

(1 mark)

1 (b) (ii) Draw a ring around the part of the blood that helps to fight harmful bacteria if they enter the body through a wound.

plasma platelets red blood cells white blood cells

(1 mark)

1 (c) Patients maintain a constant body temperature by sweating and changing the diameter of blood capillaries.

Use the diagram on page 2 to help you to complete the following sentences.

When a patient is too hot, sweat is released from the sweat in the skin.

Sweat contains, which evaporates from the surface of the skin to cool down the patient.

The diameter of the patient's blood capillaries gets to allow more to flow to the surface of the skin to cool down the body.

(4 marks)

1 (d) When the patient is cold, the hairs on the skin become erect to trap a layer of air on the surface of the skin to keep the patient warm.

Complete the sentences using words from the box.

conduction convection insulation radiation

Air provides good

A layer of air prevents heat being lost by

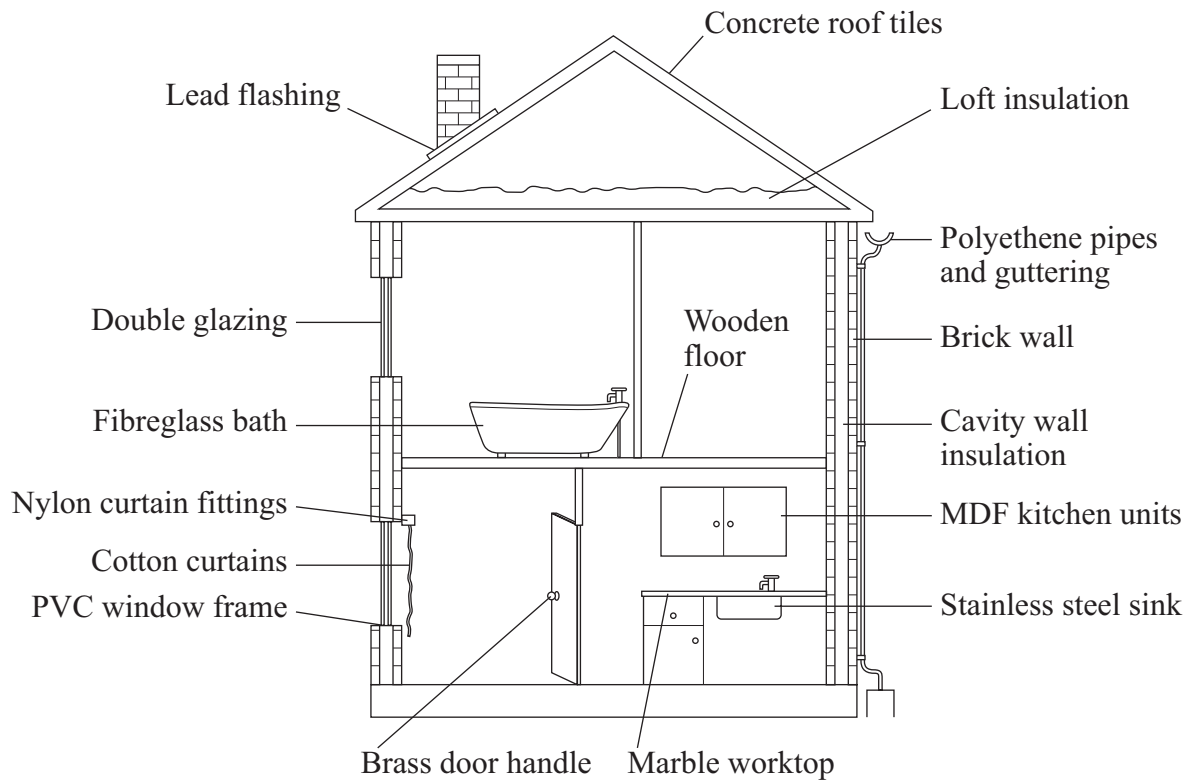
(2 marks)

10

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2 The diagram shows a cross-section of a modern house.



2 (a) A builder uses a variety of materials to make the house.

Select **one** material from the diagram to fit each of the following descriptions.

2 (a) (i) A polymer

.....
(1 mark)

2 (a) (ii) A composite material

.....
(1 mark)

2 (a) (iii) A metal alloy

.....
(1 mark)

2 (a) (iv) A material obtained directly from a living organism

.....
(1 mark)



2 (a) (v) A material that can be used straight from the ground

.....
(1 mark)

2 (b) Give **two** ways in which the house is designed to prevent the loss of heat energy.

1
2
(2 marks)

2 (c) The bricks in the walls are held together with mortar.

A suitable mortar mix contains sand and cement in the ratio 5 to 1.

Describe how to make some mortar for brick laying.

.....
.....
.....
.....
.....
.....
.....
(3 marks)

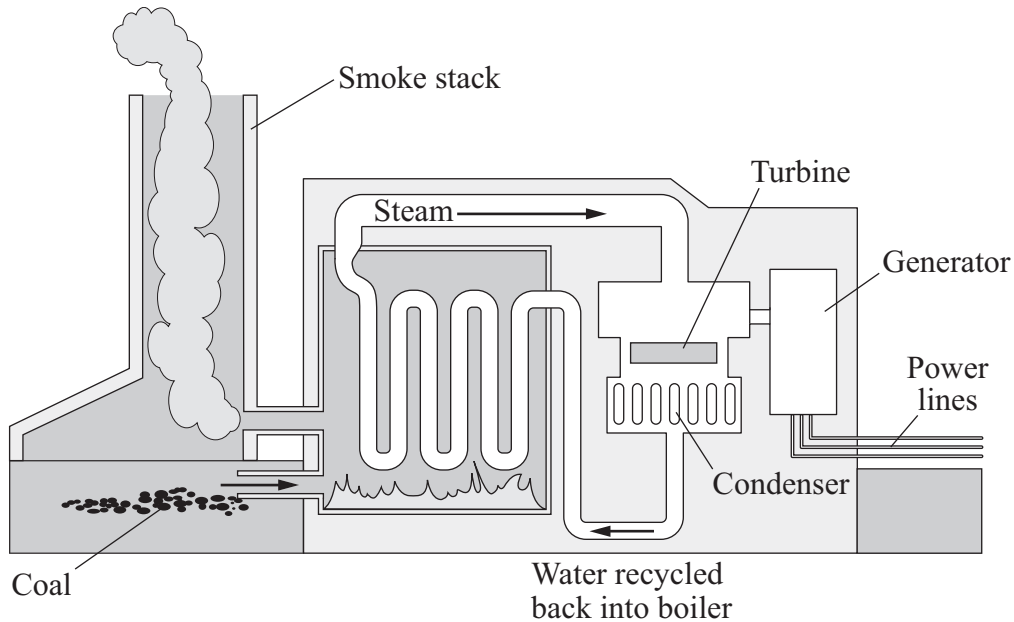
2 (d) The builder would like some energy for the house to come directly from a renewable energy resource.

Describe how energy could be obtained from a renewable energy resource.

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



- 3 Large quantities of electricity are generated in power stations by burning coal. Fuel scientists are developing more efficient and less polluting ways of generating electricity.
- 3 (a) The diagram shows the large-scale generation of electricity in a coal-fired power station.



Use the diagram and words from the box to complete the sentences about generating electricity in a coal-fired power station.

generator	heat	smoke	steam	turbine	transformer	water
------------------	-------------	--------------	--------------	----------------	--------------------	--------------

Coal is burned to produce

This energy is used to change into ,
which drives the

Electricity is produced by a

(5 marks)



- 3 (b) A fuel scientist was asked to consider some suggestions to make the generation of electricity more efficient. The suggestions are given in the list below.

Which method would make the process more efficient? Put a tick (✓) in the box next to your choice. Tick **one** box.

Burn less coal

Generate less electricity

Produce more steam

Recycle the waste heat

(1 mark)

- 3 (c) Explain why burning large quantities of coal to generate electricity can damage the environment.

.....

.....

.....

.....

(2 marks)

- 3 (d) Nuclear fuel can be used instead of coal for the large-scale generation of electricity.

- 3 (d) (i) Give **one** advantage of using nuclear fuel instead of coal.

.....

.....

(1 mark)

- 3 (d) (ii) Give **one** disadvantage of using nuclear fuel.

.....

.....

(1 mark)

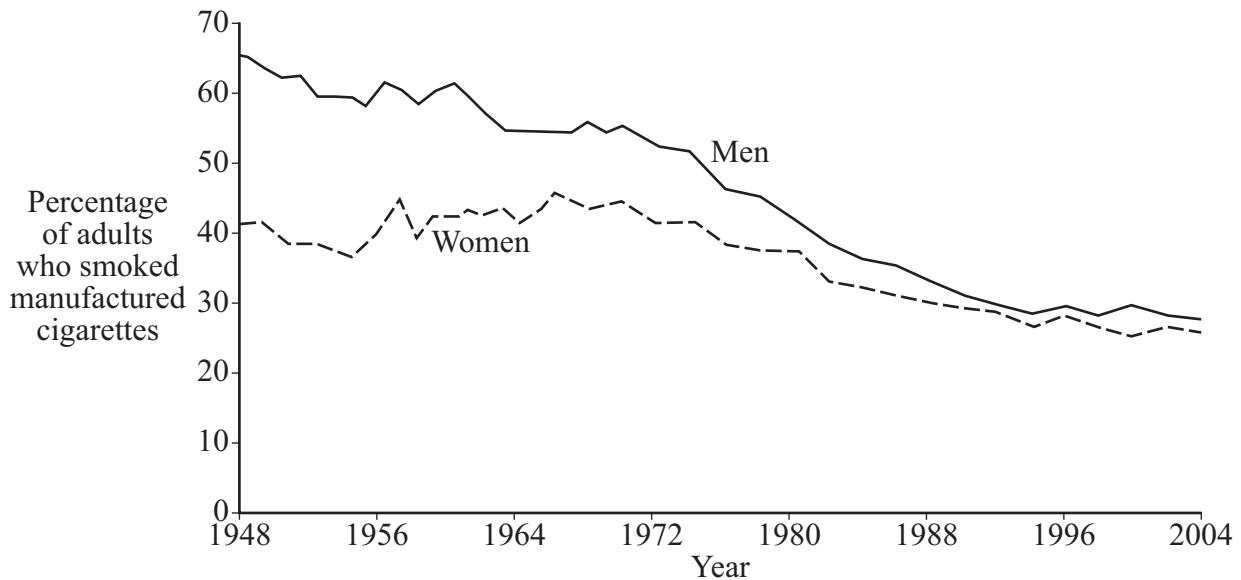
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- 4 Smoking is recognised as the UK's single greatest cause of preventable illness and early death. Around 90% of lung cancer cases are caused by cigarette smoke. Each year, lung cancer causes approximately 33 000 deaths in the UK.

The graph shows how the percentage of adults who smoked manufactured cigarettes changed between 1948 and 2004.



The table shows the number of new cases of lung cancer in the UK in 2003.

Men	21 754
Women	15 373
Total	37 127

- 4 (a) There are more cases of lung cancer in men than in women but doctors think the pattern will change in the future.

- 4 (a) (i) Why are there more cases of lung cancer in men than in women?

.....

 (1 mark)

- 4 (a) (ii) Give **one** reason why the pattern will change in the future.

.....

 (1 mark)



4 (a) (iii) Describe how you think the pattern will change in the future.

.....
.....
(1 mark)

4 (b) Explain why most smokers find it difficult to give up smoking.

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

4 (c) Tobacco smoke contains carbon monoxide.

Complete the sentence about how carbon monoxide affects the body.

Carbon monoxide reduces the ability of blood cells to carry

(2 marks)

4 (d) Cancer can be diagnosed and treated using electromagnetic radiation.

4 (d) (i) Put a tick (✓) in the box next to the **two** types of radiation that are used for diagnosis and treatment. Tick **two** boxes.

- Gamma rays
- Microwaves
- Radio waves
- X-rays

(2 marks)

4 (d) (ii) Describe **one** way in which radiologists protect themselves from harmful electromagnetic radiation.

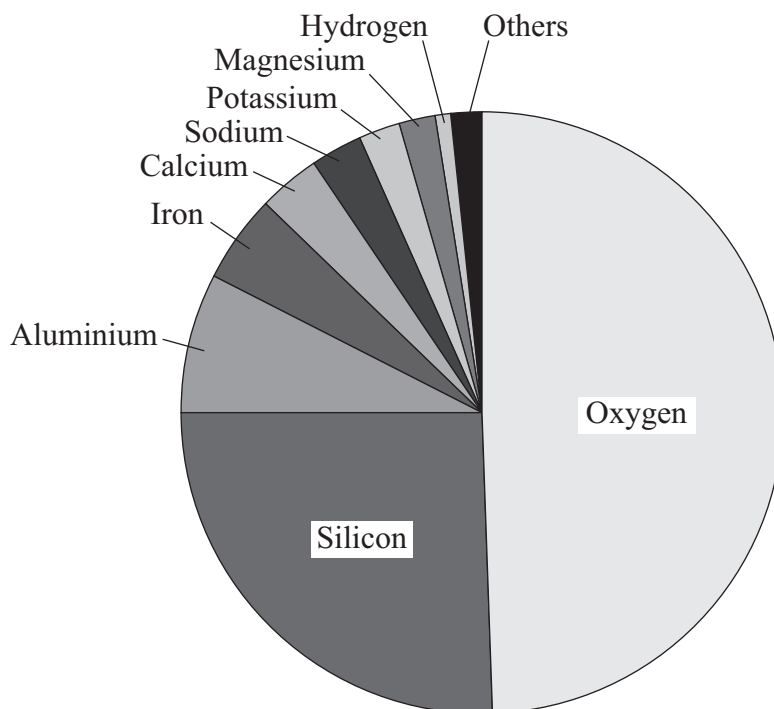
.....
.....
(1 mark)



5 Geologists study the rocks that make up the Earth's crust.

Geologists can advise mining companies about which rocks contain valuable and useful metal ores.

The pie chart shows the composition of the Earth's crust by mass.



5 (a) The two most common elements in the Earth's crust are non-metals.

5 (a) (i) Name the most common **metal** in the Earth's crust.

.....
(1 mark)

5 (a) (ii) Draw a ring around the percentage of this metal in the Earth's crust.

50%

26%

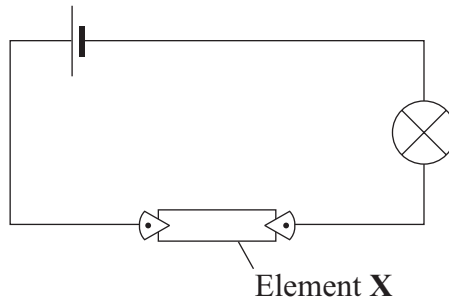
7.5%

1%

(1 mark)



5 (b) The diagram shows a circuit that can be used to show that Element X is a metal.



5 (b) (i) Describe the result that shows that Element X is a metal.

.....

 (1 mark)

5 (b) (ii) Draw a ring around the property shown by the experiment.

good electrical conductor **good heat conductor** **high tensile strength** **high melting point**
 (1 mark)

5 (b) (iii) Draw a ring around **one** other property of metals.

low density **low melting point** **shiny**
 (1 mark)

5 (c) Silica, SiO₂, is a mineral found in rocks.

It has a similar structure to many ceramic materials.

5 (c) (i) Draw a ring around **one** property of ceramic materials.

flexible **high density** **high melting point** **shiny**
 (1 mark)

5 (c) (ii) Give **one** use for a ceramic material.

.....
 (1 mark)

Question 5 continues on the next page

Turn over ►



5 (d) Chalcopyrite, CuFeS_2 , is an important copper ore that can be separated from rock.

5 (d) (i) Complete the table with the names of the elements in the copper ore.

Symbol	Name
Cu	Copper
Fe	
S	

(2 marks)

5 (d) (ii) What type of substance is chalcopyrite?

Draw a ring around the correct answer.

composite

compound

element

mixture

(1 mark)

5 (d) (iii) Give **one** use for the copper extracted from copper ore.

.....

(1 mark)



Turn over for the next question

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- 6 A householder calculated the cost of operating several electrical appliances in her home.

Details of her calculations are given in the table.

Some information is missing.

Appliance	Power rating in kilowatts (kW)	Time used in hours (h)	Energy used in kilowatt-hours (kWh)	Cost in pence (p)
Electric fire	3	0.5	1.5	12
Television set	0.085	4.5	0.3825	3.06
Vacuum cleaner	1.5	0.4		
Toaster		0.1	0.0943	0.75

- 6 (a) The toaster operates with a voltage of 230 volts (V) and a current of 4.1 amps (A).

- 6 (a) (i) Use the formula to calculate the power rating of the toaster in watts (W).

$$\text{power (watts)} = \text{voltage (volts)} \times \text{current (amps)}$$

$$\text{Power} = \dots\dots\dots \text{ W}$$

(2 marks)

- 6 (a) (ii) Calculate the power rating of the toaster in kilowatts (kW).

$$\text{Power rating} = \dots\dots\dots \text{ kW}$$

(1 mark)

- 6 (b) The vacuum cleaner was used for 24 minutes (0.4 hours).

- 6 (b) (i) Use the formula to calculate the energy used by the vacuum cleaner in kilowatt-hours (kWh).

$$\text{energy used (kilowatt-hours)} = \text{power (kilowatts)} \times \text{time (hours)}$$

$$\text{Energy used} = \dots\dots\dots \text{ kWh}$$

(2 marks)






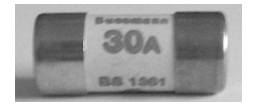
6 (b) (ii) The cost of electricity is 8p per kilowatt-hour.

Calculate the cost of using the vacuum cleaner, in pence.

Cost = p
(2 marks)

6 (c) The plug attached to an electrical appliance is fitted with a fuse.

A selection of fuses is shown.

3 A	5 A	13 A	30 A
			

The current passing through the television set and through the vacuum cleaner is shown in the table.

Write the size of fuse needed for each appliance in the table.

Appliance	Current in amps	Size of fuse needed
Television set	0.37	
Vacuum cleaner	6.5	

(2 marks)

6 (d) The mains electricity supply to the house is protected by a circuit breaker.

Give **one** advantage of using a circuit breaker instead of a fuse.

.....
.....

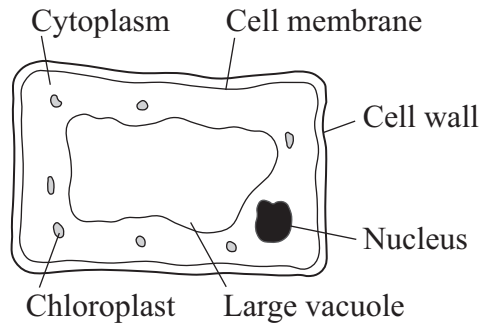
(1 mark)



7 Agricultural scientists carry out research so that they can advise farmers on how to improve their crop production. The research helps the scientists to understand how to provide the best conditions for the growth of plants and plant cells.

7 (a) Plant cells are often specialised to suit their function.

The diagram shows the structure of a typical plant cell.



7 (a) (i) Apart from shape, describe **one** way in which a leaf cell is different from the plant cell in the diagram.

.....
 (1 mark)

7 (a) (ii) Explain the difference that you have described.

.....

 (2 marks)

7 (b) An agricultural scientist grew some tomato plants in three different conditions.

The results of her experiment are shown in the table.

	Plant grown outdoors	Plant grown in a greenhouse	Plant grown in a greenhouse with an atmosphere enriched with carbon dioxide
Percentage of carbon dioxide in the air	0.04%	0.04%	0.5%
Relative size of plant	Small, poor yield	Large, good yield	Large, very good yield



7 (b) (i) Suggest why the plants grown in a greenhouse were larger than the plants grown outdoors.

.....
.....

(1 mark)

7 (b) (ii) Explain why the plants grown in an atmosphere enriched with carbon dioxide gave a very good yield.

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

(2 marks)

7 (c) Other intensive farming methods are used to improve crop production, but these methods can harm the environment.

7 (c) (i) Describe **one** intensive farming method, **other than** the use of greenhouses, that is used to improve crop production.

.....
.....

(1 mark)

7 (c) (ii) How does the method that you have described improve crop production?

.....
.....

(1 mark)

7 (c) (iii) Explain how the method that you have described can harm the environment.

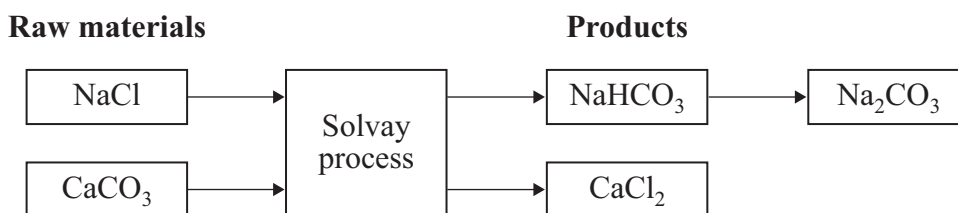
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(1 mark)



8 Sodium carbonate, Na_2CO_3 , is an important chemical used in glass making.

Sodium carbonate is manufactured in the Solvay process. The flow diagram shows the chemicals involved.



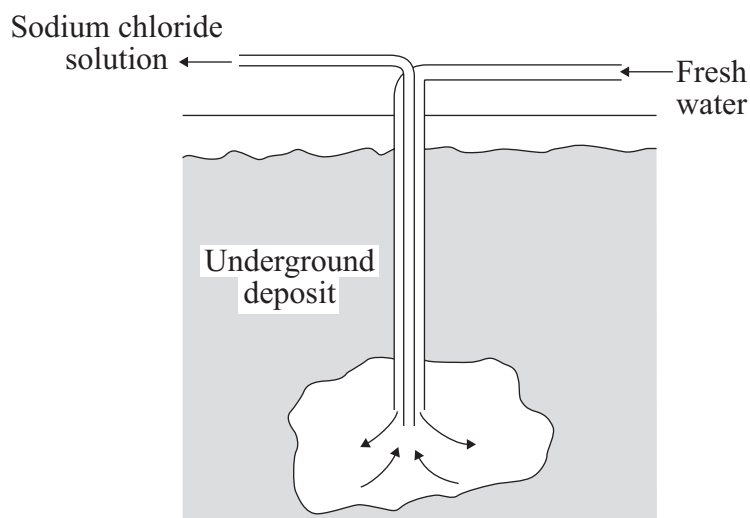
8 (a) Sodium chloride, NaCl , is one of the raw materials used in the Solvay process.

Give the chemical name of the other raw material.

.....
(1 mark)

8 (b) Sodium chloride solution can be obtained from underground deposits by solution mining.

The diagram shows the extraction of sodium chloride solution from an underground deposit of sodium chloride.



8 (b) (i) Describe how sodium chloride solution is extracted from the underground deposit.

.....

.....

.....

.....

(2 marks)



- 8 (b) (ii) Describe how crystals of sodium chloride could be obtained from sodium chloride solution.

.....

.....

.....

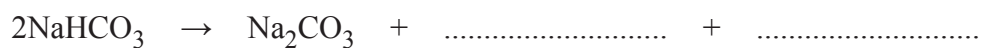
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(2 marks)

- 8 (c) Sodium hydrogencarbonate, NaHCO_3 , is obtained from the Solvay process as a crude product.

Sodium carbonate is obtained by heating sodium hydrogencarbonate. This decomposition reaction also produces carbon dioxide and one other product.

Complete the balanced symbol equation for this reaction.



(2 marks)

- 8 (d) (i) Much of the sodium carbonate produced in the Solvay process is used to make glass containers.

Name **one** other raw material that is used in glass making.

.....

(1 mark)

- 8 (d) (ii) Less sodium carbonate has been produced in recent years because less glass is used to make containers.

Suggest why less glass is used to make containers.

.....

.....

(1 mark)

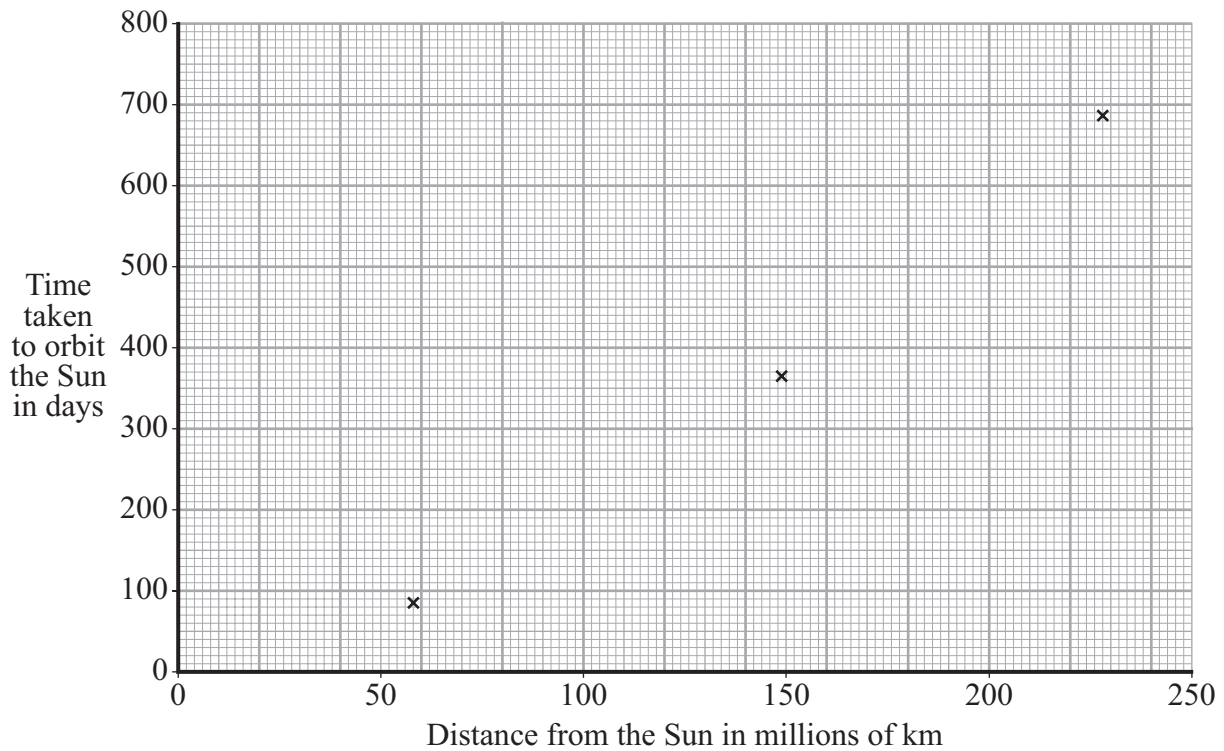


9 Astronomers use telescopes to observe the movements of planets and stars.

Data for four planets is given in the table.

	Mercury	Venus	Earth	Mars
Distance from the Sun in millions of km	58	108	149	228
Time to orbit the Sun in days	88		365	687

9 (a) Data for three of the planets has been plotted on the graph.



9 (a) (i) Draw a smooth curve through the points on the graph. (1 mark)

9 (a) (ii) The data for Venus is missing from the graph.
 Draw a point on the curve to show the position of Venus. (1 mark)

9 (a) (iii) Use the graph to estimate the time Venus takes to orbit the Sun.

Time taken = days
 (1 mark)



9 (b) The table shows types of electromagnetic radiation and how well they pass through the Earth's atmosphere.

Gamma rays	↓ Decreasing frequency	
X-rays		
Ultraviolet		
Light		
Infrared		
Microwaves		
Radio waves		

Key

- Do not pass through the atmosphere
- Partly pass through the atmosphere
- Mostly pass through the atmosphere

9 (b) (i) What type of radiation has the highest energy?

 (1 mark)

9 (b) (ii) Why are radio waves used for telescopes that are based on Earth?

 (1 mark)

9 (b) (iii) Suggest **two** reasons why large telescopes are often built high up in remote areas.

1

.....

2

.....
 (2 marks)

9 (c) When astronomers used telescopes to observe distant stars, they found that the radiation from the stars was not as they expected.

9 (c) (i) Describe how the frequency of the radiation from distant stars is different from what the astronomers expected.

 (1 mark)

9 (c) (ii) How were ideas about the universe changed to fit these observations?

 (1 mark)

END OF QUESTIONS



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