

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
Higher Tier

APSC/2H
H



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.

Time allowed: 1 hour 30 minutes

Instructions

- Use black ink or 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		4	
2		5	
3		6	
		7	
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		9	
Total (Column 1) →			
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TOTAL			
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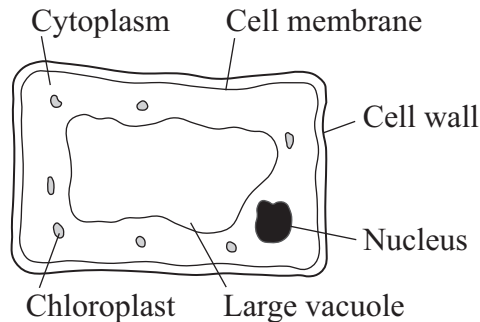


Answer **all** questions in the spaces provided.

1 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.

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

The diagram shows the structure of a typical plant cell.



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

.....
(1 mark)

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

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(2 marks)

1 (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



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

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(1 mark)

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

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(2 marks)

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

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

.....
.....

(1 mark)

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

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(1 mark)

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

.....
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(1 mark)

9

Turn over ►



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

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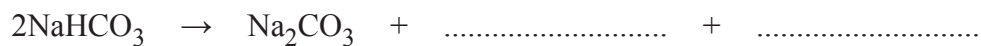
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(2 marks)

- 2 (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)

- 2 (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)

- 2 (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.

.....

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(1 mark)

9

Turn over ►

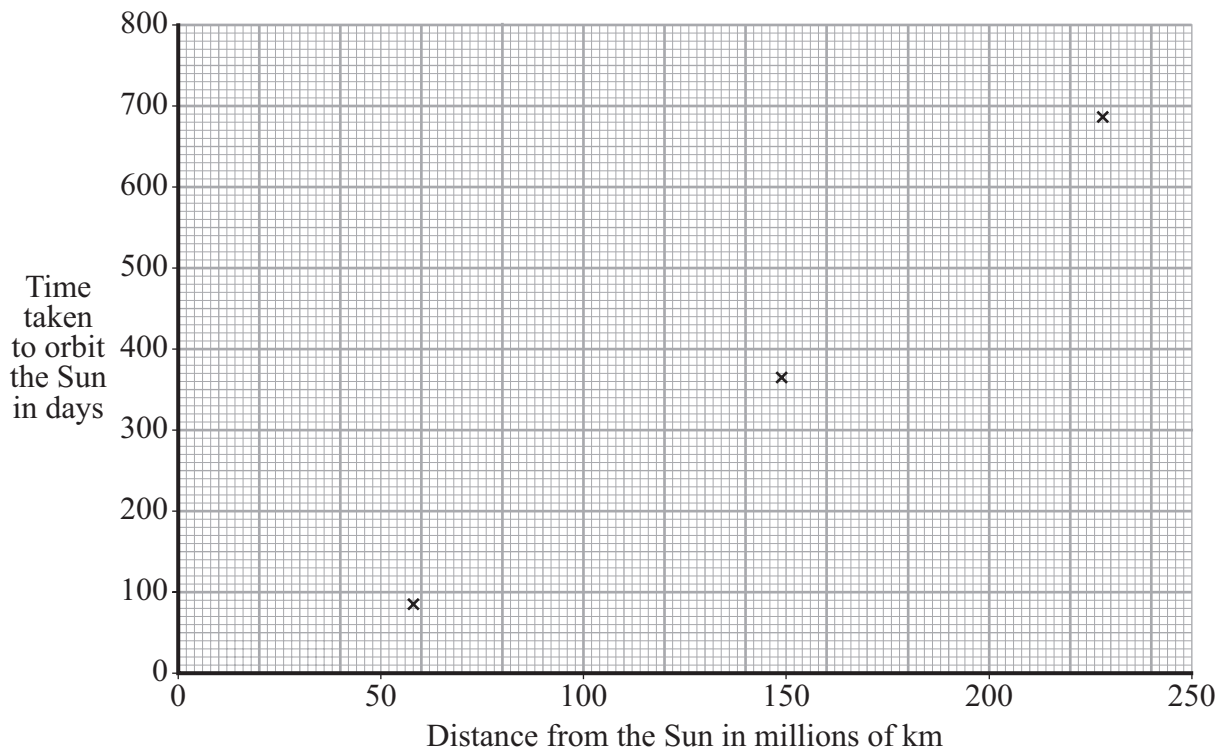


3 Astronomers use telescopes to observe the movements of planets and stars.

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

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



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

3 (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)

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

Time taken = days
(1 mark)



- 3 (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

- 3 (b) (i) What type of radiation has the highest energy?
- (1 mark)

- 3 (b) (ii) Why are radio waves used for telescopes that are based on Earth?
- (1 mark)

- 3 (b) (iii) Suggest **two** reasons why large telescopes are often built high up in remote areas.
- 1
-
- 2
- (2 marks)

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

- 3 (c) (i) Describe how the frequency of the radiation from distant stars is different from what the astronomers expected.
-
- (1 mark)

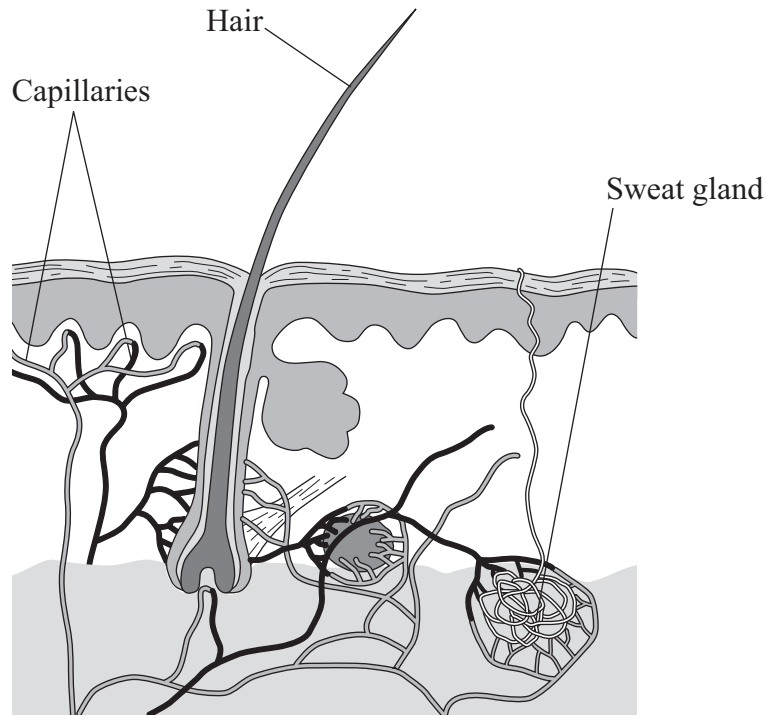
- 3 (c) (ii) How were ideas about the universe changed to fit these observations?
-
- (1 mark)



- 4 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.



- 4 (a) Why are patients at risk of infection when their skin is damaged?

.....

 (1 mark)

- 4 (b) Give **two** methods used by a nurse to prevent infection through a wound.

1

 2

 (2 marks)



4 (c) Capillaries carry blood to the surface of the skin.

Describe **two** ways in which the blood protects us from infection.

1

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2

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(4 marks)

4 (d) The skin helps to control body temperature.

4 (d) (i) Describe how changes to the diameter of blood capillaries in the skin lower body temperature.

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(2 marks)

4 (d) (ii) Explain how sweating lowers body temperature.

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(2 marks)

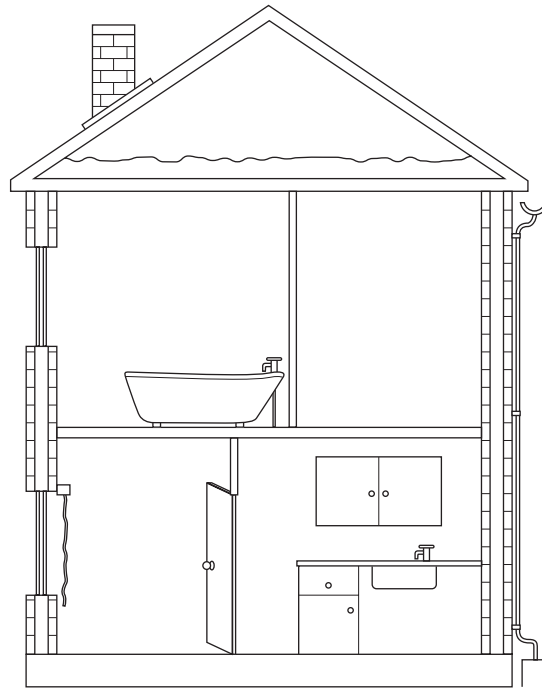
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5 The diagram shows a cross-section of a modern house.



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

5 (a) (i) Name a polymer and give a use for this polymer in the house.

Name of polymer

Use

.....

(2 marks)

5 (a) (ii) Name a material that is obtained from a living organism and give a use for this material in the house.

Name of material

Use

.....

(2 marks)



5 (a) (iii) Name a metal alloy and give a use for this metal alloy in the house.

Name of metal alloy

Use

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.....

(2 marks)

5 (b) The external walls have a double layer of bricks with a cavity between.

The bricks in the walls are held together with mortar.

Describe how to make some mortar for brick laying.

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(3 marks)

5 (c) The builder will choose a source of energy to provide central heating and hot water for the home.

Name a source of energy the builder could choose and explain why it would be suitable.

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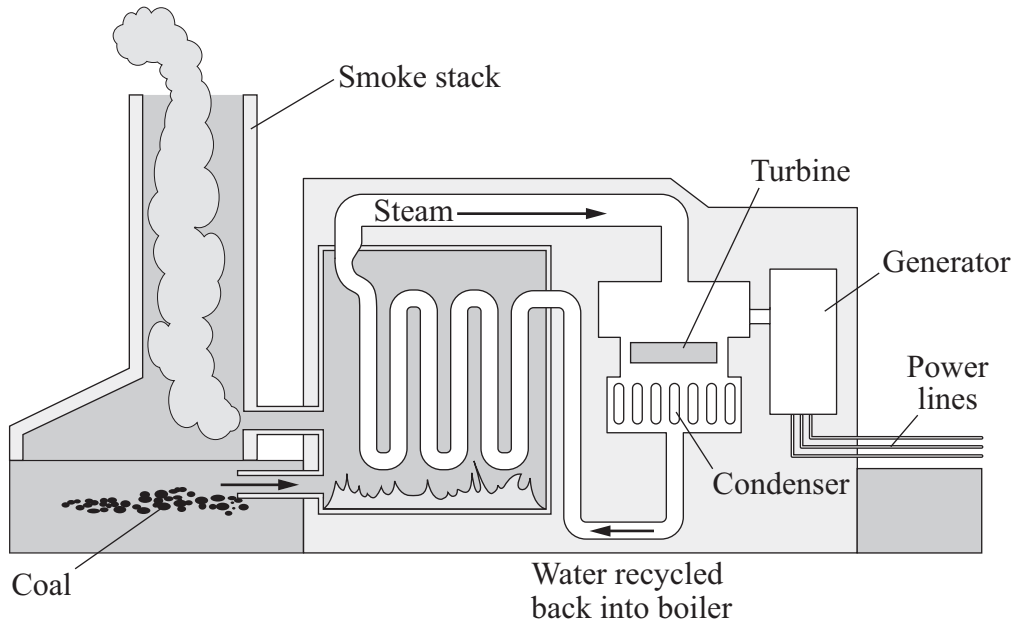
(2 marks)



6 Large quantities of electricity are generated in power stations by burning fossil fuels.

Fuel scientists and engineers are developing more efficient and less polluting ways of generating electricity.

6 (a) The diagram shows the large-scale generation of electricity in a coal-fired power station.



Describe the steps involved in the generation of electricity in a coal-fired power station. Use the diagram to help you.

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(4 marks)



6 (b) Each tonne of coal burned in the power station produces 30 million kilojoules of energy.

The coal-fired power station produces 12.5 million kilojoules of electrical energy for every tonne of coal burned.

6 (b) (i) Calculate the percentage efficiency of the power station.

..... %
(3 marks)

6 (b) (ii) What happens to the energy from the coal that is not converted into electrical energy?

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

6 (b) (iii) Suggest **one** way in which the large-scale generation of electricity could be made more efficient.

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

6 (c) The combustion of fossil fuels produces large amounts of carbon dioxide, and this has contributed to global warming.

Describe **one** other major environmental effect of burning large quantities of fossil fuels for the generation of electricity.

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(2 marks)



7 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.

7 (a) Calculate the approximate number of deaths caused by cigarette smoke each year in the UK.

Number of deaths
(2 marks)

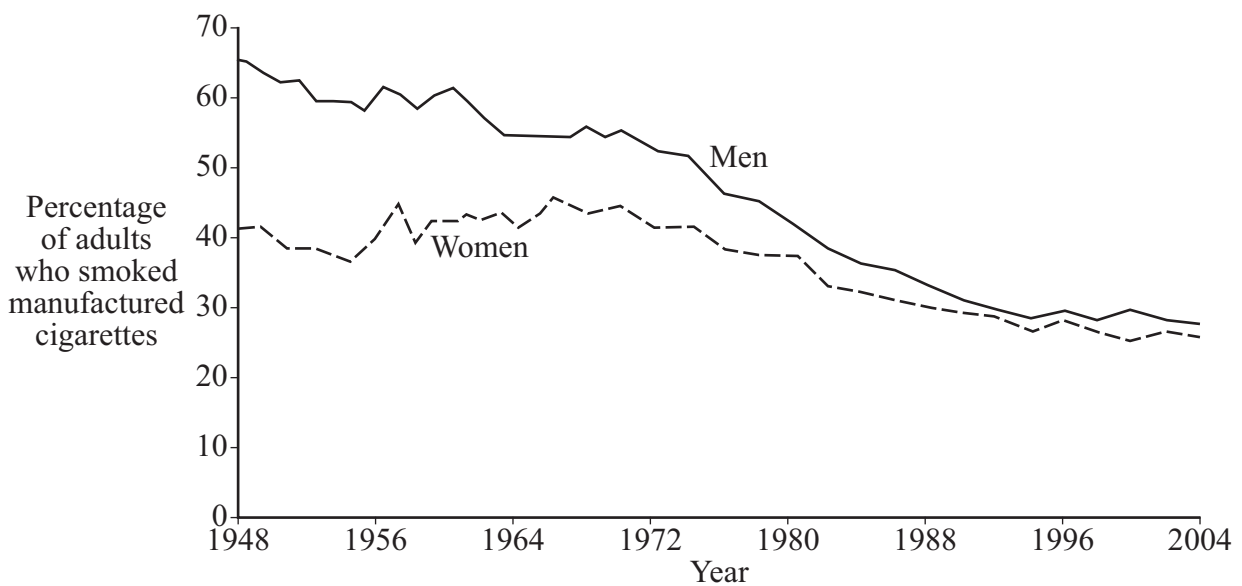
7 (b) Chemicals in cigarette smoke cause cancer.

Describe **one** other way in which cigarette smoke causes harm to the body.

.....

(2 marks)

7 (c) 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

Use the information in the graph and in the table to describe and explain how you expect these numbers to change in the future.

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(4 marks)

7 (d) Describe how high-energy electromagnetic radiation can be used for the diagnosis and treatment of lung cancer.

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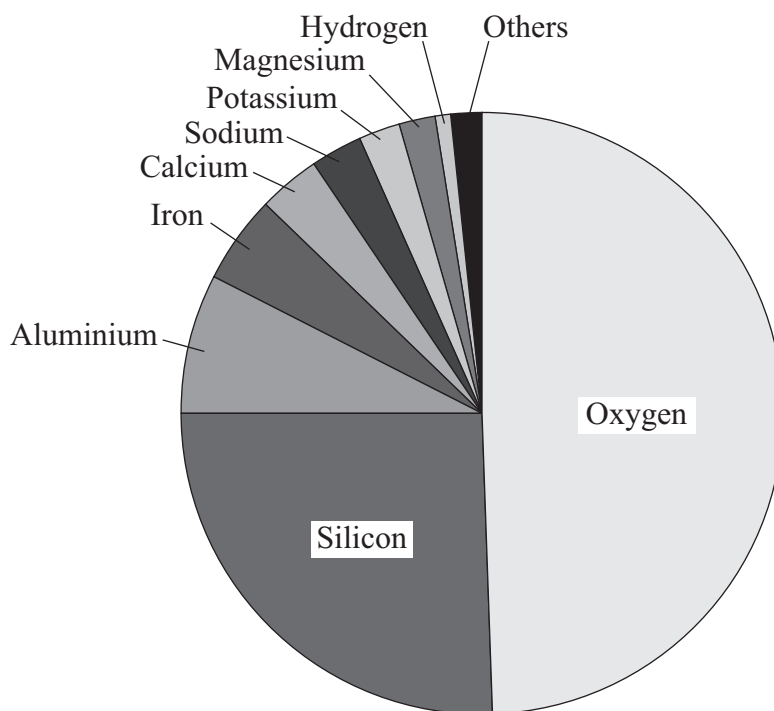
(4 marks)



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

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

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



8 (a) The percentage by volume of oxygen in the Earth's atmosphere is 21%.

Estimate the percentage by mass of oxygen in the Earth's crust.

.....
(1 mark)

8 (b) A large amount of oxygen is bonded to silicon to form silica, SiO_2 , which is a mineral found in rocks.

8 (b) (i) Name the type of chemical bonding in silica.

.....
(1 mark)

8 (b) (ii) Explain why silica has a very high melting point.

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



- 8 (c) Aluminium is the most common metal in the Earth's crust.

Describe an experiment that you could carry out in the laboratory to show that an element is a metal and not a non-metal.

You may use a labelled diagram as part of your description.

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(3 marks)

- 8 (d) Galena, PbS, is an important lead ore found in the Earth's crust. Galena is converted to lead oxide, PbO, when it is heated in air.

Describe how lead can be extracted from lead oxide by reduction.

You may use a chemical equation as part of your description.

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(3 marks)

9

Turn over ►



- 9 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

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

Calculate the power rating of the toaster in kilowatts (kW).

Power rating = kW
(4 marks)

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

- 9 (b) (i) Calculate the energy used by the vacuum cleaner in kilowatt-hours (kWh).

Energy used = kWh
(3 marks)



9 (b) (ii) Calculate the cost of using the vacuum cleaner in pence (p).

Cost = p
(2 marks)

9

END OF QUESTIONS



There are no questions printed on this page

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

