

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education  
January 2005



**APPLIED SCIENCE (DOUBLE AWARD)  
FOUNDATION TIER  
Unit 2 Science for the Needs of Society**

**3860/2F**

**F**

Tuesday 18 January 2005 9.00 am to 10.30 am

**In addition to this paper you will require:**  
a ruler.  
You may use a calculator.

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

Time allowed: 1 hour 30 minutes

**Instructions**

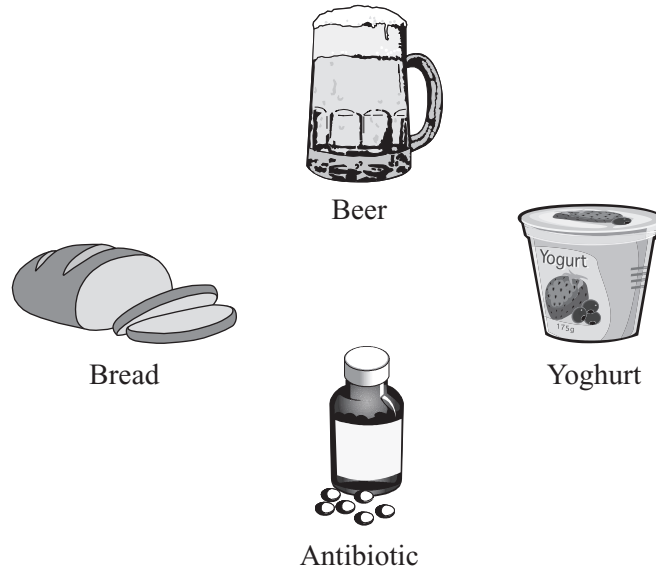
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

**Information**

- The maximum mark for this paper is 80.
- Mark allocations are shown in brackets.

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

1 The diagram shows some examples of the uses of microbes.



(a) Complete the table to show whether the useful microbe is a bacterium, a yeast or a fungus.

You may use the same answer twice.

Product	Useful microbe
Bread	
Beer	
Yoghurt	
Antibiotic	

(4 marks)

(b) Wine is made from grapes by fermentation.

The grapes are crushed and the yeast growing on the skin of the grapes comes into contact with the sugar in the fruit.

Draw a ring around the **two** substances that are made when the yeast breaks down the sugar.

**alcohol**

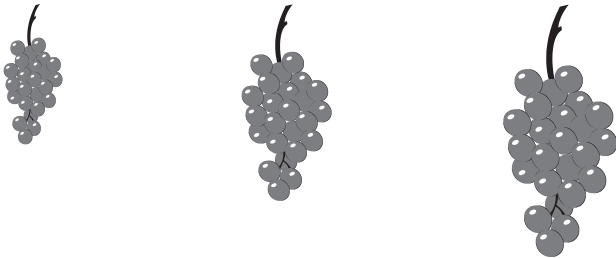
**carbon dioxide**

**oxygen**

**water**

(2 marks)

(c) A farmer grew some grapes under **three** different conditions.

Condition	A	B	C
Where grown	In a field	In a greenhouse	In a greenhouse
Percentage of CO <sub>2</sub>	0.04%	0.04%	0.5%
Result			

(i) Why have the grapes in the greenhouses grown bigger?

.....  
(1 mark)

(ii) Why have the grapes in C grown even bigger?

.....

Explain your answer.

.....

.....  
(2 marks)

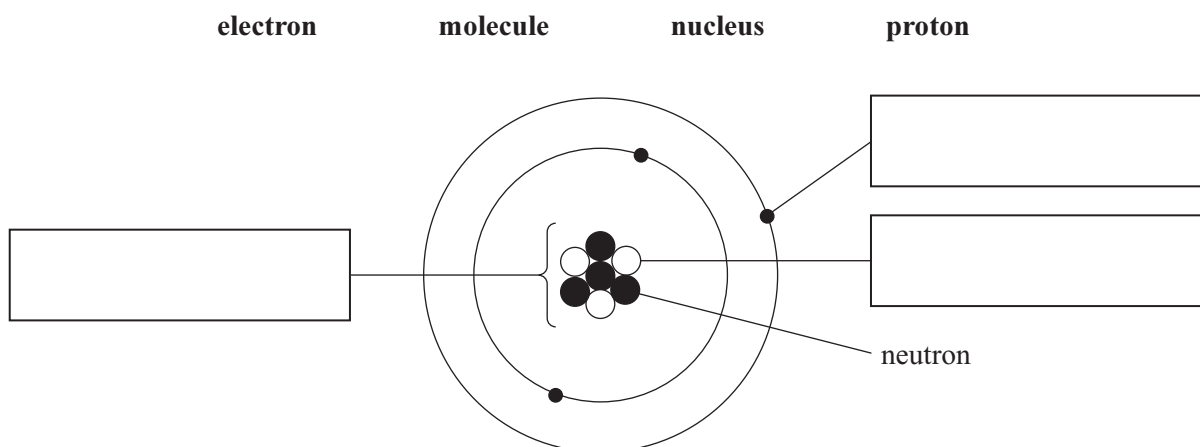
9

**TURN OVER FOR THE NEXT QUESTION**

Turn over ►

2 Elements are the simplest kind of substance because they contain only one kind of atom.

(a) (i) Use words from the list to label the diagram of an atom.



(3 marks)

(ii) Complete the following sentence.

Atoms are neutral because they contain an equal number of .....  
and .....

(2 marks)

(b) The table shows the names and symbols of five elements.

(i) Complete the table by writing in the missing symbols.

Name	Symbol
Aluminium	
Chlorine	Cl
Iron	
Oxygen	O
Sulphur	

(3 marks)

(ii) Select an element from the table to fit the following descriptions.

Description	Element
An element found in air	
A shiny metal with a low density	
An element used straight from the ground	

(3 marks)

11

**TURN OVER FOR THE NEXT QUESTION**

**Turn over** ►

3 Fossil fuels are valuable energy resources which can be used to generate electricity.

(a) Name **two** fossil fuels.

1 .....

2 .....

(2 marks)

(b) When fossil fuels are burned, they produce a gas that causes global warming.

(i) Name a gas that causes global warming.

.....

(1 mark)

(ii) Give **one** problem that might be caused by global warming.

.....

.....

(1 mark)

(c) Use the words from the list to complete the sentences about the generation of electricity from a fossil fuel.

**air**

**generator**

**heat**

**steam**

**turbine**

The fossil fuel is burned in ..... to release ..... energy.

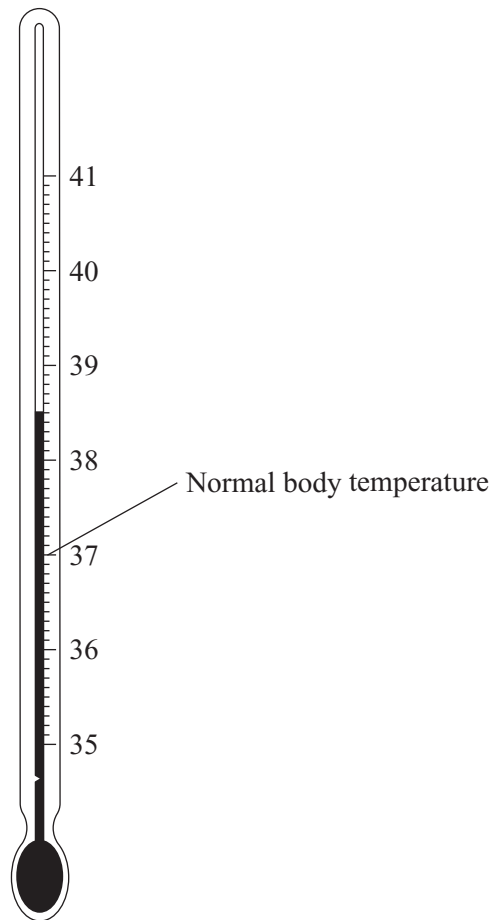
The energy is used to boil water to make ..... which is used to turn a

..... . This rotates a ..... to make electricity.

(5 marks)

9

- 4 (a) The diagram shows a clinical thermometer, which has been used to measure the body temperature of a patient in a hospital.



- (i) By how many degrees Celsius ( $^{\circ}\text{C}$ ) was this patient's temperature above normal body temperature?

.....  
(1 mark)

- (ii) Where would you place this thermometer to measure the patient's body temperature?

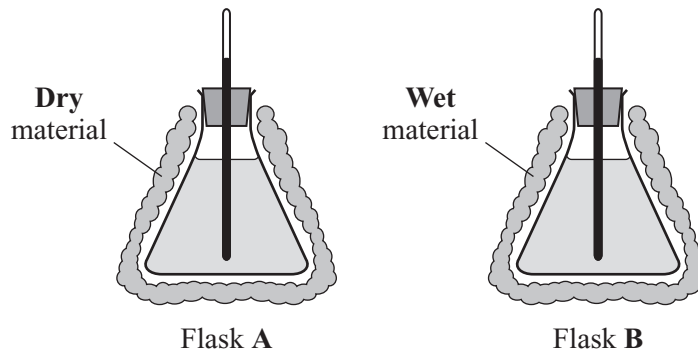
.....  
(1 mark)

**QUESTION 4 CONTINUES ON THE NEXT PAGE**

**Turn over** ►

- (b) Hypothermia occurs if the body loses too much heat.

A student was worried about getting hypothermia if he got soaking wet during a field trip. He set up an experiment to test how much heat was lost through wet clothing and how much was lost through dry clothing, as shown in the diagram.



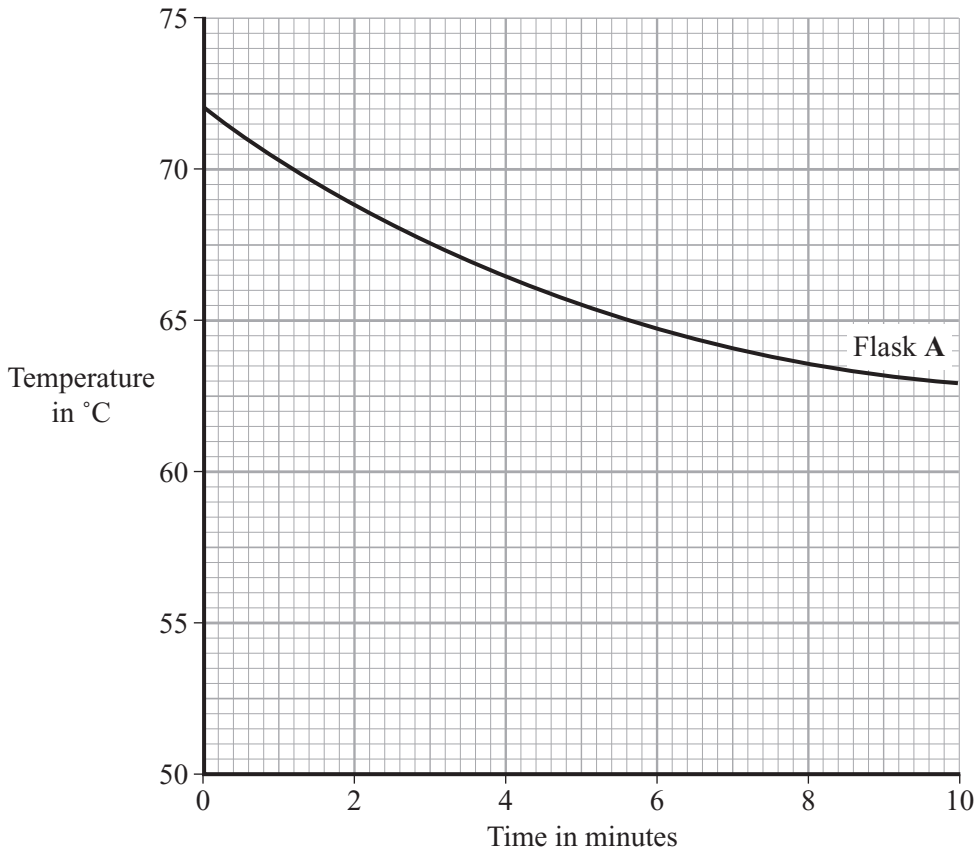
He measured the temperature of the water in the conical flasks every 2 minutes for 10 minutes.

The results for Flask A have been plotted on the graph. The table shows his results for Flask B.

Time in minutes	Temperature of water in °C
	Flask B
0	72
2	68
4	65
6	62
8	59
10	57



(i) Draw a line graph for Flask **B** on the same axes.



(3 marks)

(ii) After 10 minutes, how much cooler was the water in Flask **B** than the water in Flask **A**?

.....  
(1 mark)

(iii) Explain why the water in Flask **B** cooled faster.

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

(iv) Suggest **two** ways in which the student could prevent hypothermia on his field trip.

1 .....

2 .....

(2 marks)

(v) Suggest another group of people who are likely to suffer from hypothermia.

.....  
(1 mark)


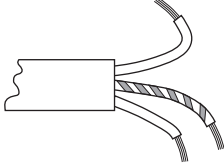
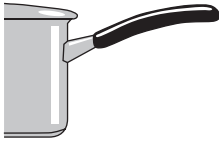
(c) Give **one** method used by the human body to keep the body temperature constant.

.....  
(1 mark)

Turn over ►

5 In industry, materials are chosen for a particular use because they have the right properties.

(a) Complete the table by naming a material that is suitable for each use.

Use	Suitable material
 The frame of a bicycle	
 Electrical wiring	
 The handle of a saucepan	

(3 marks)

(b) The list below gives some words used to describe the properties of materials.

- |                                |                             |                         |
|--------------------------------|-----------------------------|-------------------------|
| <b>electrical conductivity</b> | <b>malleability</b>         | <b>hardness</b>         |
| <b>flexibility</b>             | <b>melting point</b>        | <b>tensile strength</b> |
| <b>density</b>                 | <b>thermal conductivity</b> | <b>appearance</b>       |

Choose properties from the list to help you answer the following questions.

(i) Give **two** reasons why the material that you have chosen is suitable for making the frame of a bicycle.

1 .....

.....

2 .....

.....

(2 marks)

(ii) Give **two** reasons why the material that you have chosen is suitable for making electrical wiring.

1 .....

.....

2 .....

.....

*(2 marks)*

(iii) Give **two** reasons why the material that you have chosen is suitable for making the handle of a saucepan.

1 .....

.....

2 .....

.....

*(2 marks)*

9

**TURN OVER FOR THE NEXT QUESTION**

**Turn over** ►

6 When making chips, a chef soaks them in water before cooking them.

The water enters the potato by a process called osmosis.

(a) Complete the following definition of osmosis.

Osmosis is the movement of water

from .....

to .....

through .....

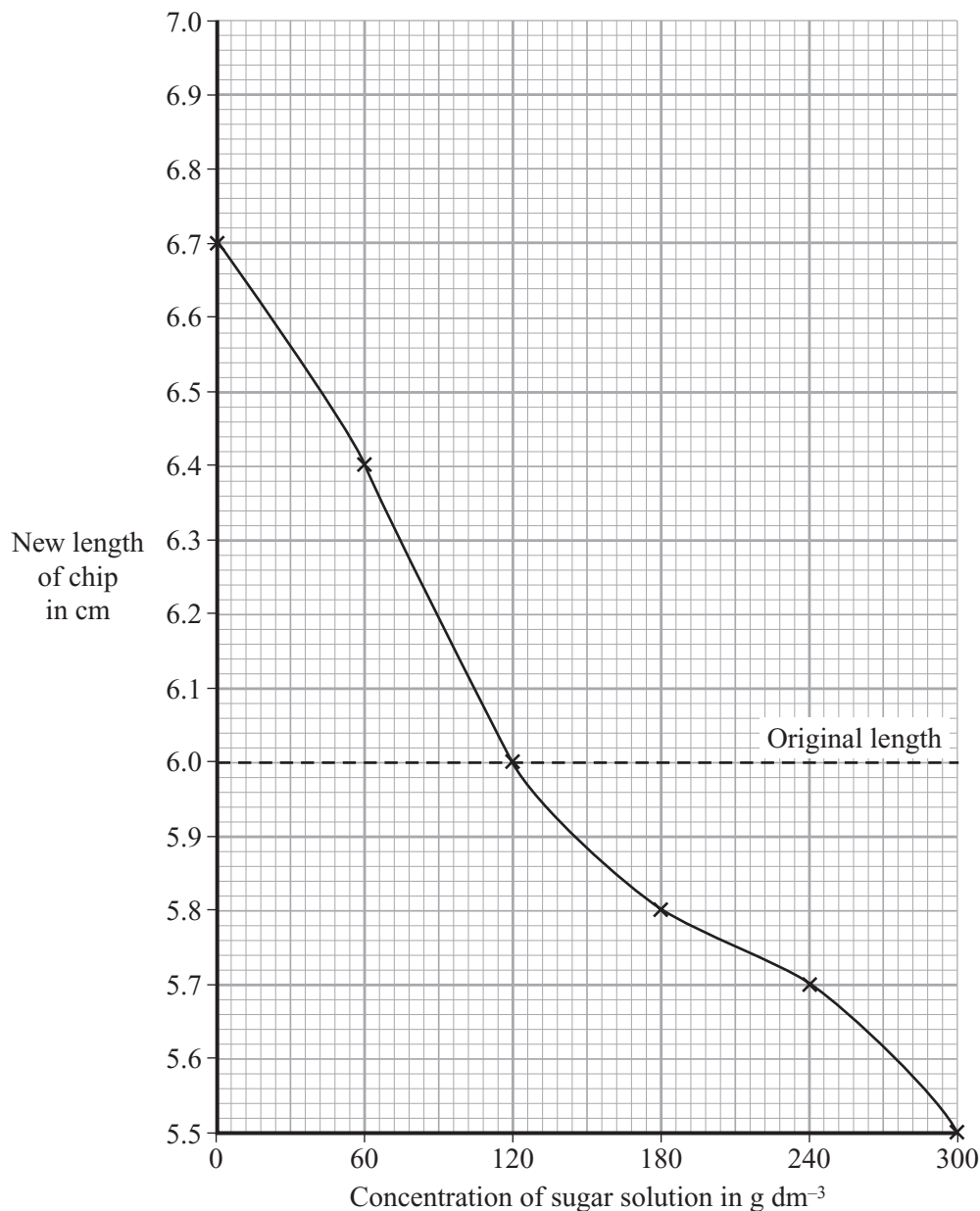
(3 marks)

(b) The chef wondered whether soaking the chips in a sugar solution would give her better chips.

She did an experiment to find out.

The graph shows the results when she soaked some chips in different concentrations of sugar solution.

Each chip was 6 cm long at the start of the experiment.



(i) Describe the results of the experiment.

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

(2 marks)

(ii) The chef used potato, different concentrations of sugar solution, water and ordinary kitchen equipment.

Describe how the chef would carry out this experiment.

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

(3 marks)



**TURN OVER FOR THE NEXT QUESTION**

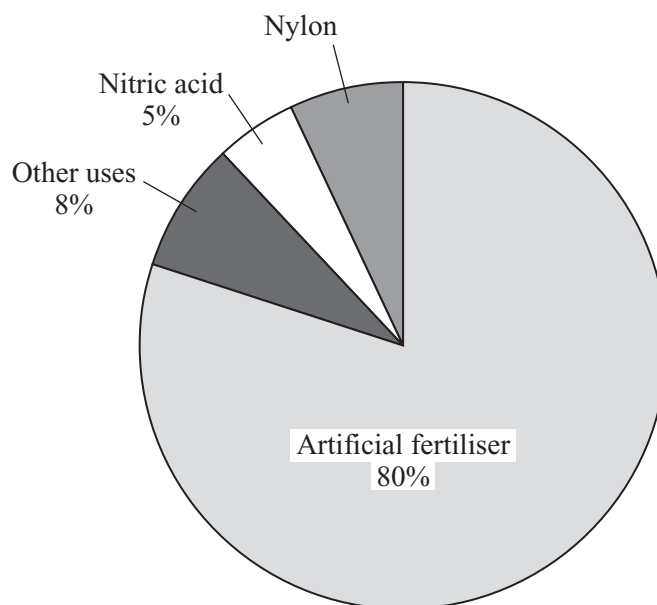
**Turn over** ►

7 Over one million tonnes of ammonia are made in the UK each year.

(a) Why is ammonia described as a *bulk chemical*?

.....  
(1 mark)

(b) The chart shows the main uses of ammonia.



(i) Calculate the percentage of ammonia used to make nylon.

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

(ii) What type of material is nylon?

Tick **one** box.

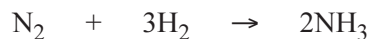
Metal	
Polymer	
Ceramic	
Composite	

(1 mark)

(iii) Give **one** use for nylon.

.....  
(1 mark)

(c) Ammonia (NH<sub>3</sub>) is an inorganic compound which is made by joining two elements together.



(i) Why is ammonia described as *inorganic*?

.....  
(1 mark)

(ii) Name the elements used to make ammonia.

.....  
(2 marks)

(d) One of the elements used to make ammonia is separated from liquid air.

The table shows some gases from the air and their boiling points.

Gas	Boiling point in °C
N <sub>2</sub>	-196
O <sub>2</sub>	-183
Ar	-186

(i) At which temperature will all three gases have condensed into liquids?

.....  
(1 mark)

(ii) Name the process used to separate a mixture of liquids with different boiling points.

.....  
(1 mark)

**QUESTION 7 CONTINUES ON THE NEXT PAGE**

Turn over ►

- (e) Ammonium sulphate,  $(\text{NH}_4)_2\text{SO}_4$ , is used as an artificial fertiliser.

It is made by reacting ammonia with an acid.



- (i) Name the acid used to make ammonium sulphate.

.....  
(1 mark)

- (ii) Describe how to make crystals of ammonium sulphate from a solution of ammonium sulphate.

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

- (iii) Why are artificial fertilisers used in intensive farming?

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



8 Domestic users of electricity are charged for the number of kilowatt-hours (units) of electrical energy that they use.

(a) Information from a domestic electricity bill is given below.

## The Power Company

*Your electricity statement*

---

Present reading: 92005 units taken on 30 January 2004

Previous reading: 89383 units taken on 30 October 2003

1 unit is 1 kilowatt-hour (kWh)

(i) Calculate the number of units of electricity used between the two dates.

.....  
(1 mark)

(ii) One unit costs 7p.

Calculate the cost of the electrical energy used between the two dates.

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

(iii) Calculate the average cost of the electrical energy used per month.

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

**QUESTION 8 CONTINUES ON THE NEXT PAGE**

**Turn over ►**

- (b) (i) An electrical appliance transferred 18 kilowatt-hours of electrical energy when it was switched on for six hours.

Use the equation to calculate the power of the electrical appliance.

$$\text{power (kilowatts)} = \frac{\text{energy transferred (kilowatt-hours)}}{\text{time (hours)}}$$

.....  
.....

..... kilowatts  
(2 marks)

- (ii) Use the equation to calculate the current used by the electrical appliance when it is operated with a potential difference (voltage) of 240 volts.

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

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

..... amps  
(3 marks)

**END OF QUESTIONS**

9

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