OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
General Certificate of Secondary Education

APPLIED SCIENCE: DOUBLE AWARD

Science for the needs of society

1497 4882/02

HIGHER TIER

Wednesday **18 JANUARY 2006** Morning 1 hour 30 minutes

Candidates answer on the question paper.
Calculators may be used.
Additional materials:
Pencil
Ruler (cm/mm)

Candidate Name

Centre Number

Candidate Number

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre number and candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers in the spaces provided on the question paper.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do not write in the bar code. Do not write in the grey area between the pages.
- **DO NOT** WRITE IN THE AREA **OUTSIDE** THE BOX BORDERING EACH PAGE. ANY WRITING IN THIS AREA WILL NOT BE MARKED.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The marks allocated and the spaces provided for your answers are a good indication of the length of answers required.

FOR EXAMINER'S USE		
1	14	
2	12	
3	12	
4	10	
5	10	
6	6	
7	6	
TOTAL	70	

This question paper consists of 17 printed pages and 3 blank pages.

Answer all the questions.

1 The World Health Organisation records outbreaks of 'flu in different countries.

(a) Look at the map. It shows information about outbreaks of 'flu in Europe in 2002.

A map has been removed due to third party copyright restrictions.

Details:

A map of Europe showing out breaks of flu in most European countries.

(i) Countries that recorded a large amount of 'flu tend to be close together.

Explain why.

.....

.....

..... [2]

(ii) One country on the map registered no 'flu.

Does that mean that no one caught 'flu in that country during that period?

Explain why.

.....

.....

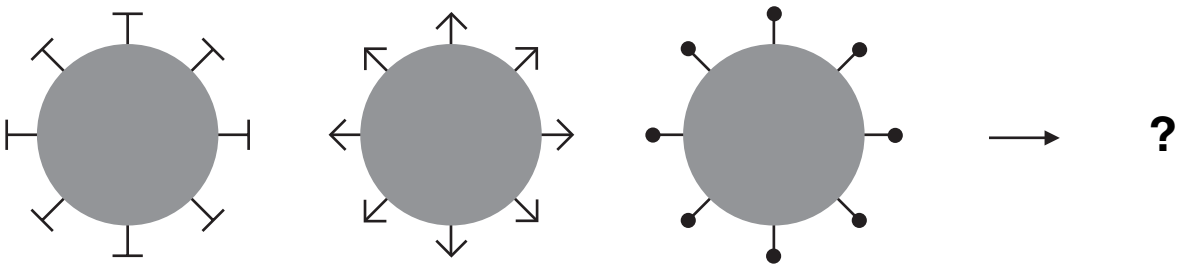
..... [2]

(b) Some people have a vaccination to protect them from 'flu.

They need a different 'flu vaccination **each year**.

Explain why.

Use your knowledge of vaccinations and the following diagrams of a 'flu microorganism to help you.



.....

.....

.....

..... [3]

(c) The following types of microorganisms can all cause disease.

Put a tick (✓) in the box next to the one that causes measles.

bacteria ☐

fungi ☐

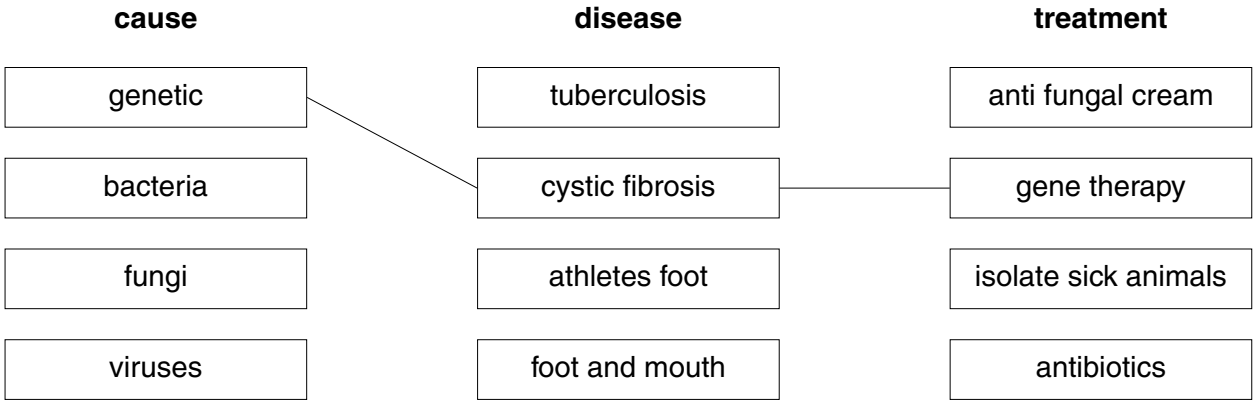
viruses ☐

[1]

(d) Different microorganisms cause different diseases and have different treatments.

Draw a straight line from each **disease** to its correct **cause** and to its best **treatment**.

The first one has been done for you.



[6]

[Total: 14]

BLANK PAGE

2 Mary is a lecturer at a technical college.

(a) She makes a crossword about energy for her students.

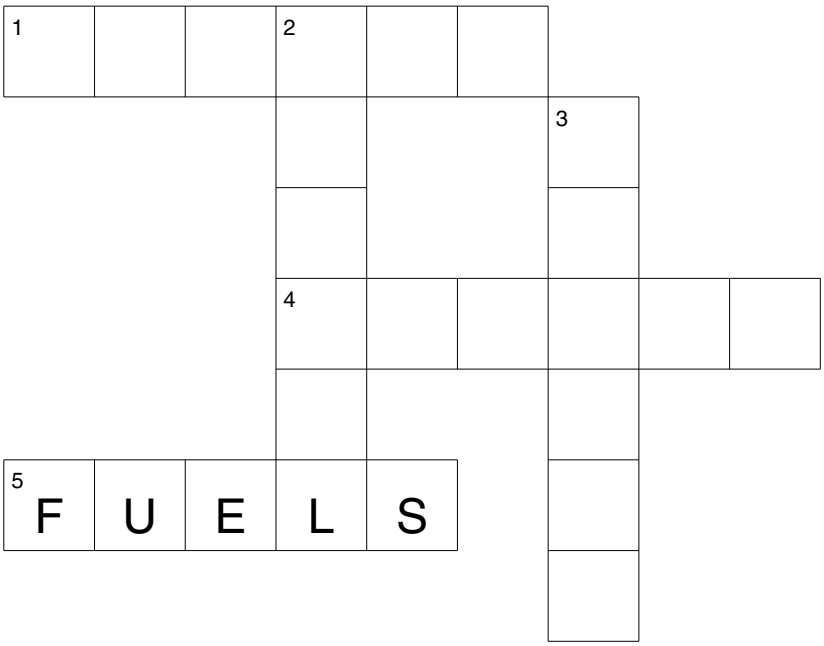
Complete Mary's crossword.

One has been done for you.

Choose from the following words.

Each word may be used once, more than once, or not at all.

energy fossil fuels safely solids spread useful wasted



Across

1 energy that is not wasted

4 energy is less useful when it is …… out

5 concentrated sources of energy

Down

2 this type of fuel will eventually run out

3 obtained from fuels [4]

(b) Mary teaches her students about energy efficiency.

There are **two** different meanings of energy efficiency.

Put a tick (✓) in the **two** boxes, next to the **two** correct meanings.

Energy efficiency is getting as much oil out of the ground as possible. ☐

Energy efficiency is converting as much of the energy in fuel into useful energy as possible. ☐

Energy efficiency is burning as much coal as possible. ☐

Energy efficiency is being able to use as many different kinds of fuels as possible. ☐

Energy efficiency is reducing energy losses such as heat as much as possible. ☐

[2]

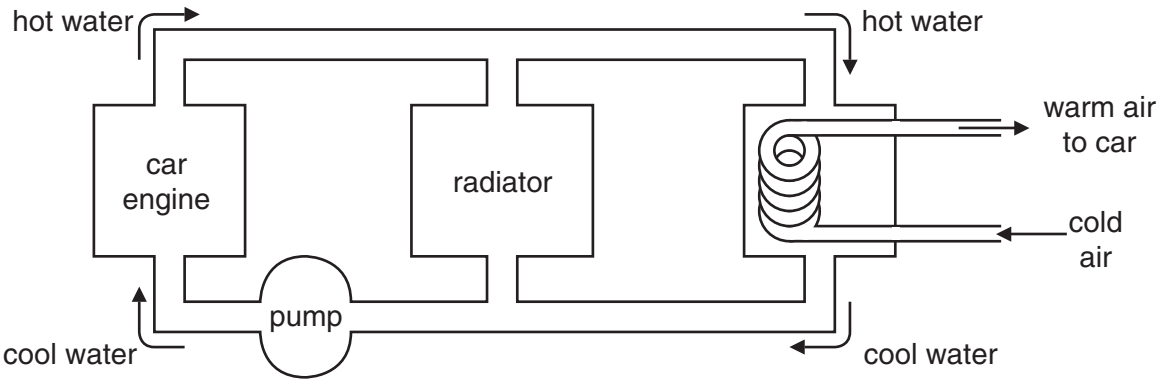
(c) Car engines get hot.

Heat must be removed from the engine.

The heat can be:

- used to warm the **inside** of the car
- given to the air **outside** the car by the radiator.

A heat exchanger is used to provide heat for the **inside** of the car.



(i) On the diagram above, put a (ring) round the heat exchanger. [1]

(ii) When the heater is on, the percentage energy efficiency of the engine increases.

Explain why.

.....

.....

..... [2]

(d) The diagram shows part of a radiator.

A diagram has been removed due to third party copyright restrictions

Details:

A diagram of part of a radiator

It is made of metal .

It has lots of fins with gaps between them.

Explain how this design helps to cool the water.

Use ideas about conduction, convection and radiation to help you answer the question.

.....

.....

.....

.....

..... [3]

[Total: 12]

BLANK PAGE

3 In the 1930s, two men went on the first deep-sea dives.

They used a diving tank to go down 900 m.

A diagram has been removed due to third party copyright restrictions

Details:

A diagram of a diving tank used in the 1930s. The casing is made of iron and the windows are made of silicon dioxide

(a) Use the substances in bold type on the diagram to help you answer the following questions.

(i) Name a compound from the diagram.

.... [1]

(ii) Name a mixture from the diagram.

.... [1]

(iii) Name an element from the diagram and give the element symbol .

element name .....

symbol ..... [1]

(b) Give one advantage and one disadvantage of using iron to make diving tanks for using in the sea.

advantage ....

disadvantage ..... [2]

(c) The dive took several hours.

The divers were worried that there would be a dangerous build up of carbon dioxide in the air in the tank.

(i) What process in the divers' body produces carbon dioxide?

..... [1]

(ii) The divers put trays of sodium oxide in the diving tank.

The sodium oxide got rid of all the carbon dioxide by reacting with it.

This is part of the equation for the reaction.

Finish the equations by filling in the empty boxes.

WORD EQUATION

	+ carbon dioxide $\longrightarrow$	

SYMBOL EQUATION

Na_2O + | | $\longrightarrow$ Na_2CO_3

[3]

(iii) What happens to the mass of the tray of sodium oxide when it reacts with carbon dioxide in the tank?

Put a (ring) round the correct answer.

gets lighter **gets heavier** **stays the same**

[1]

(d) Diving deeper in the sea takes more time and the sea pressure gets much higher.

Suggest **two** reasons why it would not be safe for this diving tank to dive any deeper.

.....

..... [2]

[Total: 12]

4 Liz is a garden designer. She wants to buy some lights for a garden path.

A photo has been removed due to third party copyright restrictions.

Details:

A photo of some garden lights.

Liz goes to buy the lights.

She finds two types of lights that use different energy sources.

One type uses mains electricity. The other type uses a solar panel.

Electric garden lights

Solar lights

An image has been removed due to third party copyright restrictions

Details:

An image of 2 different types of lights, one using mains electricity and one using solar power

includes 50 m of cable

each light fitted with a solar panel

(a) Give two disadvantages, other than cost , of using each type of energy source for garden lights.

	disadvantage 1	disadvantage 2
mains electricity		
solar		

[4]

(b) Liz decides to find out the running costs of the mains lights.

(i) She knows that the lights will be on for **6 hours** each night.

The total power of the lights is **200 W**.

She knows the formula

$$\text{power (kW)} = \frac{\text{energy (kWh)}}{\text{time (hours)}}$$

Use the formula to work out how much energy the lights use **each night**.

You are advised to show how you work out your answer.

energy per night ..... kWh [3]

(ii) Use your answer to work out the running cost of the lights **per week**.

(1 kWh of electricity costs 10 p)

You are advised to show how you work out your answer.

cost per week ..... [2]

(c) Liz knows that she still does not have enough information to compare the costs of setting up and running the two types of lights.

Give one **other** piece of information that Liz needs to find out.

.....

..... [1]

[Total: 10]

5 Joe grows water plants for garden ponds.

He sells his plants to garden centres.

He grows his plants in tanks.

The diagram shows what he needs to do to make the plants grow faster.

A diagram has been removed due to third party copyright restrictions

Details:

A diagram of a tank used for growing plants

(a) (i) Draw lines to show why the plant needs each substance.

substance	why needed
carbon dioxide	to make chlorophyll
nitrates	respiration
magnesium	photosynthesis
	to make proteins

[3]

(ii) Joe keeps the light above the tank on all the time.

Why does this make the plants grow faster?

.....

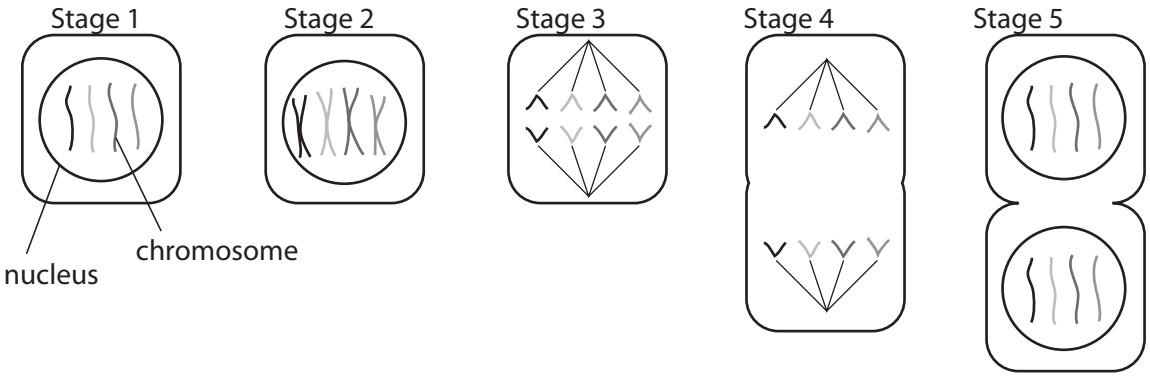
.....

.....

..... [2]

(b) When the plants grow, the plant cells divide.

These diagrams show what happens when the plant cells divide.



In stage 1, the chromosomes become visible.

Describe what happens in the remaining stages.

.....

.....

.....

.....

.....

..... [4]

(c) Garden centres like all the plants to look the same.

Joe grows new plants by taking cuttings from a stock plant.

A diagram has been removed due to third party copyright restrictions

Details:

A diagram of a stock plant with cuttings from it growing in a separate tank

All the new plants from one stock plant look exactly the same.

Explain why.

.....

..... [1]

[Total: 10]

6 Plastic carrier bags are made from polymers.

An image has been removed due to third party copyright restrictions

Details:

An image of a plastic bag

plastic bag

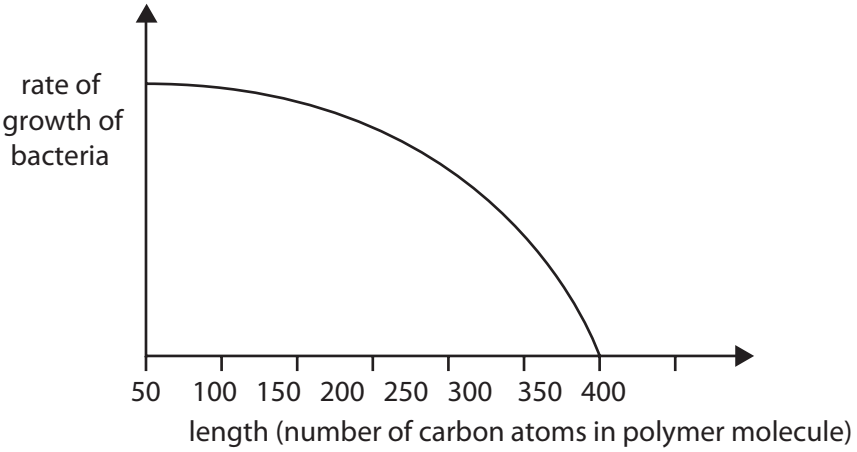
molecules of polymer

Chemists are trying to make biodegradable polymers that easily rot away.

Polymer molecules rot away if bacteria can grow on them and use them as food.

(a) Eve carries out some research on the rate of growth of bacteria on polymer molecules of different lengths.

This graph shows her results for one type of polymer.



What does the graph show about the growth of bacteria on this polymer?

.....

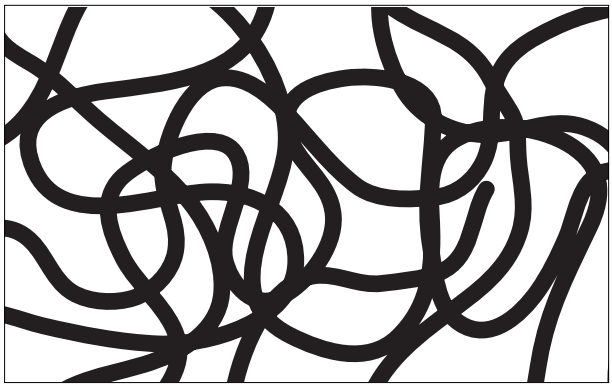
.....

.....

..... [3]

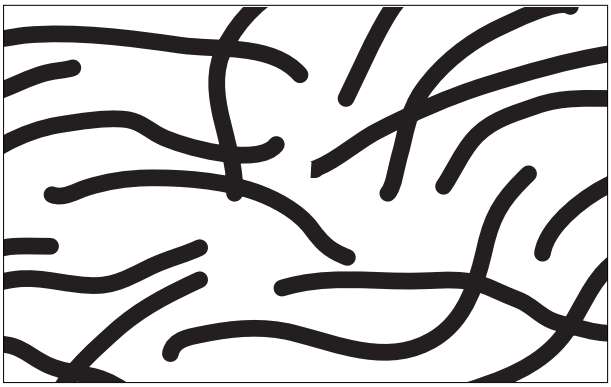
(b) Eve made some new bags from shorter chain polymer molecules.

normal bag



structure of long chain polymer molecules

new bag



structure of short chain polymer molecules

When Eve tested the new bags, she found that they were too weak to use.

They split and snapped too easily when they were stretched.

Use ideas from the diagrams to explain why the bags snapped when they were stretched.

.....

.....

..... [2]

(c) Suggest a way, **other** than changing chain length, that the polymer molecules could be altered to make the bags stronger.

..... [1]

[Total: 6]

7 Hydrogen is a fuel that can be used by cars.

(a) Put ticks (✓) in **two** boxes to show why hydrogen is a good fuel for using in cars.

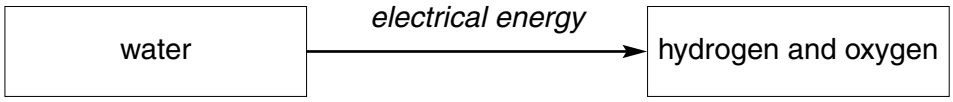
hydrogen is an element	☐
hydrogen is renewable	☐
only water is made when hydrogen burns	☐
hydrogen is a gas	☐
the bonding in hydrogen is covalent	☐

[2]

(b) Scientists are researching to find a method to make hydrogen cheaply from water.

One way of making hydrogen is to pass electricity through water.

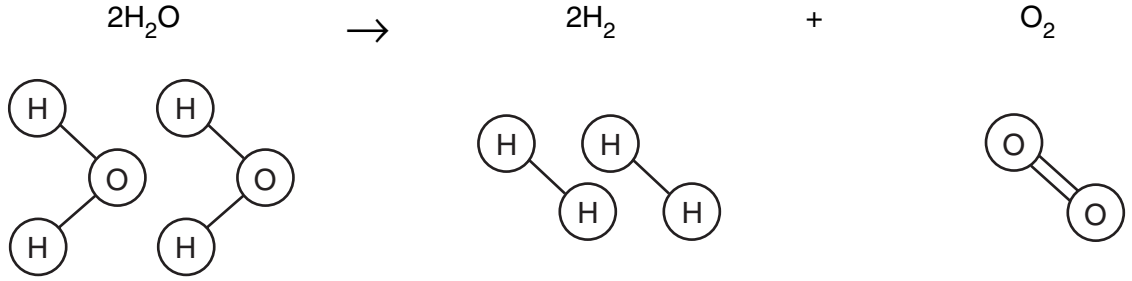
The disadvantage of this method is that it uses large amounts of electrical energy.



(i) What word is used for reactions that take in energy?

..... [1]

(ii) This diagram shows what happens to the molecules during the reaction.



Use ideas about bond making and breaking to explain why this reaction takes in energy.

.....

.....

..... [3]

[Total: 6]

END OF QUESTION PAPER

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE.