General Certificate of Secondary Education
June 2006

SCIENCE: DOUBLE AWARD A (MODULAR)   **3468/2F**
Paper 2
Foundation Tier

AQA
ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Wednesday 14 June 2006   9.00 am to 10.30 am

For this paper you must have:
- the Data Sheet (enclosed)
- a ruler

You may use a calculator.

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.
- Answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.
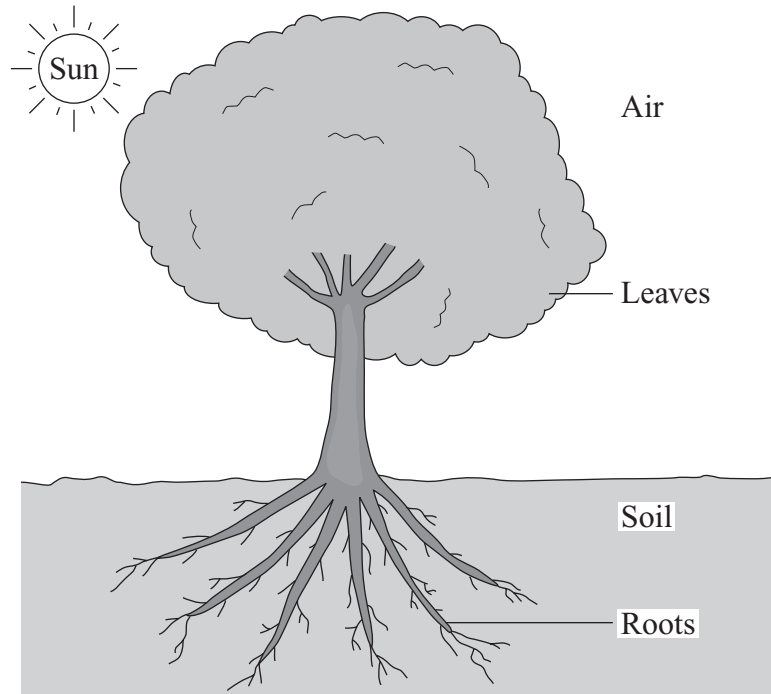
Information
- The maximum mark for this paper is 90.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

3468/2F

ENVIRONMENT

1 (a) Plants use light energy, carbon dioxide and water to make carbohydrates.

Complete the sentences by using the correct words from the picture.

Water is absorbed from the .... by the ....

Carbon dioxide diffuses from the .... into the ....

(3 marks)

(b)   In autumn, fallen leaves can be collected and used to make compost. This can be done in a compost bin like the one shown.

A compost bin
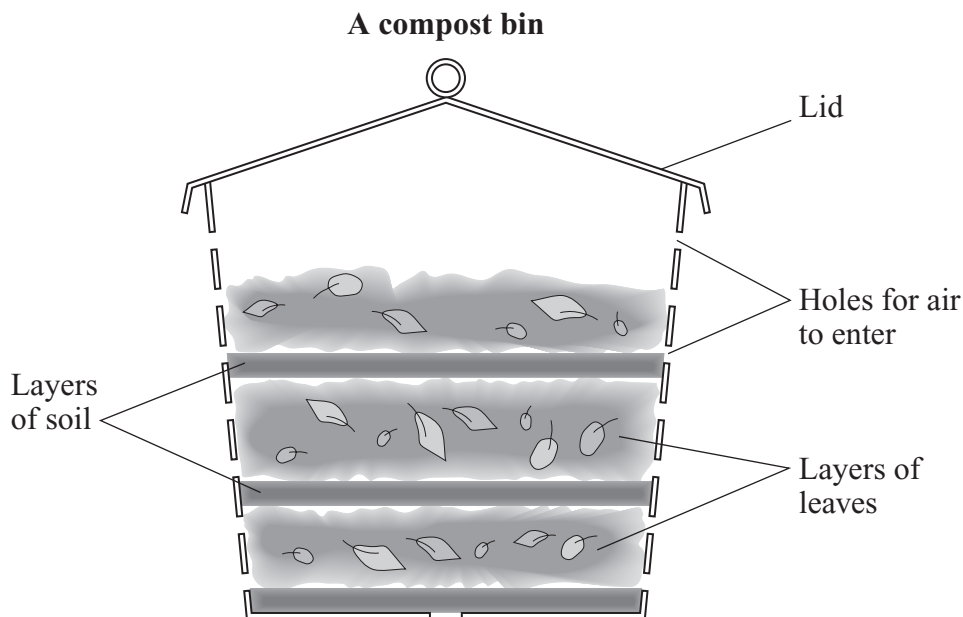
Complete the sentences by crossing out the **two** words that are wrong in each box.

The soil contains microorganisms that | digest / respire / excrete | the leaves.

The air contains oxygen that is used by microorganisms for | digestion / respiration / excretion |.

These microorganisms are more active in | cold / hot / warm |, moist conditions.

The compost that is formed is useful because it contains | nutrients / sewage / gases |.

This compost can be used as a natural | fertiliser / herbicide / pesticide |.

(5 marks)

8

Turn over ▶

2 Gases from coal-fired power stations can cause damage to forests, over several years.
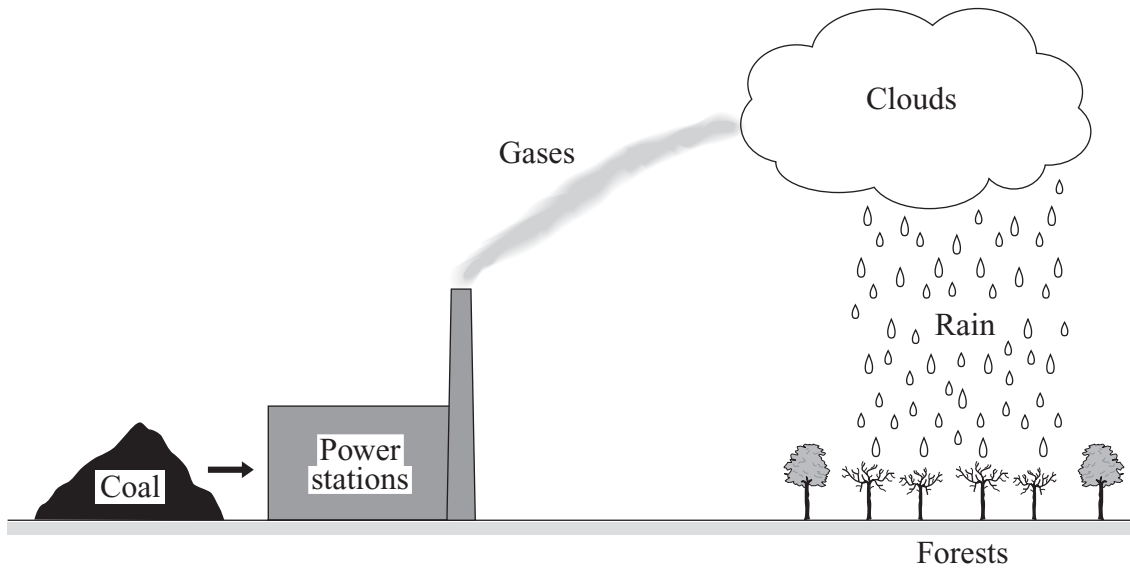
Describe, in as much detail as you can, how power stations cause damage to the forests.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use correct scientific words.

....

....

....

....

....

....

(5 marks)

5

PATTERNS OF CHEMICAL CHANGE

3 In the laboratory, this apparatus was used to demonstrate fermentation.

....
solution

Enzymes in
....

— Limewater
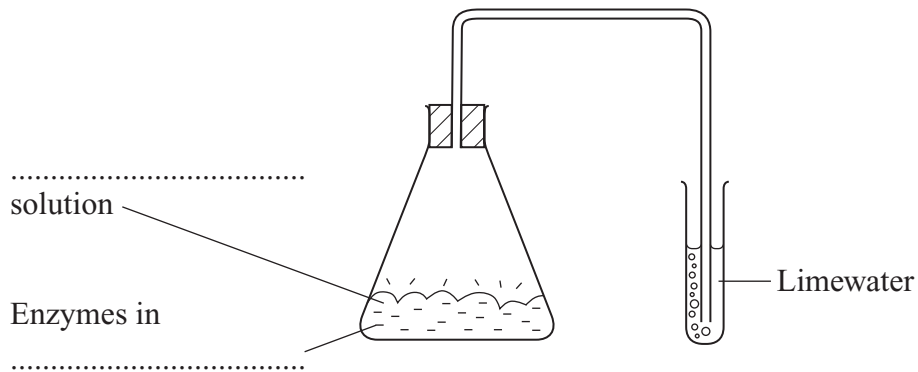
(a) Complete the labels on the diagram by using the correct words from the box.

acid	**bread**	**detergent**	**protein**	**sugar**	**yeast**

(2 marks)

(b) What **liquid** is produced during fermentation?

....

(1 mark)

(c) Which temperature is best to use for fermentation?
Put a circle around the best temperature.

– 5 °C   **15 °C**   **35 °C**   **55 °C**   **75 °C**

(1 mark)

(d) The limewater changes during the fermentation reaction.

(i) What change in the limewater would you see during the fermentation?

....

....

(1 mark)

(ii) What causes this change?

....

....

(1 mark)

6

Turn over ▶

4 The gases shown are in the air. Some of these gases are used to make other useful substances.

Argon
Carbon dioxide
Nitrogen
Oxygen
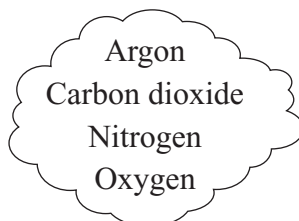
(a) Hydrogen, H_2, is reacted with a gas from the air to make ammonia, NH_3. The balanced symbol equation for this reaction is:

$$N_2 \ + \ 3H_2 \ \rightleftharpoons \ 2NH_3$$
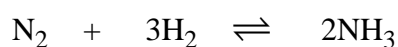
(i) Which gas in the air has the formula N_2?

....
(1 mark)

(ii) The arrows, $\rightleftharpoons$, show that this is a reversible reaction. What is a *reversible reaction*?

....

....
(1 mark)

(b) Ammonia is used to make nitric acid, HNO_3.

Complete the table about the chemical formula of nitric acid.

Each part of the formula of nitric acid	Name of the element	Number of atoms of the element in the formula
H	hydrogen	1
N	nitrogen	1
O_3		

(2 marks)

(c)   Nitric acid will react with most metals.
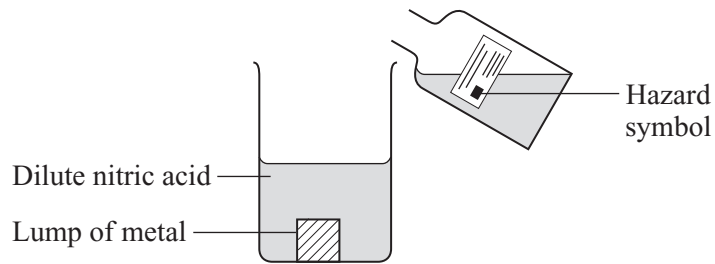
(i)   What does this hazard symbol on the bottle of nitric acid mean?

....
(1 mark)

(ii)   Give **two** ways of making this reaction go faster.

1...

2...
(2 marks)

Turn over for the next question

7

Turn over ▶

FORCES

5 A teacher lifts a bag from her car.

Complete the calculation by using the correct words from the box.

Each word should be used only once.

distance	force	joules	metres	newtons

The bag weighs 200 ....

The teacher lifts the bag 0.5 ....

The work done by the teacher can be calculated using the formula

work done   = ... × ....

=   200   ×   0.5

=   100 ....

(4 marks)

4

6 The diagram shows the inner part of our solar system.

Draw a straight line from each of the words to the correct object on the diagram.

One line has been done for you.
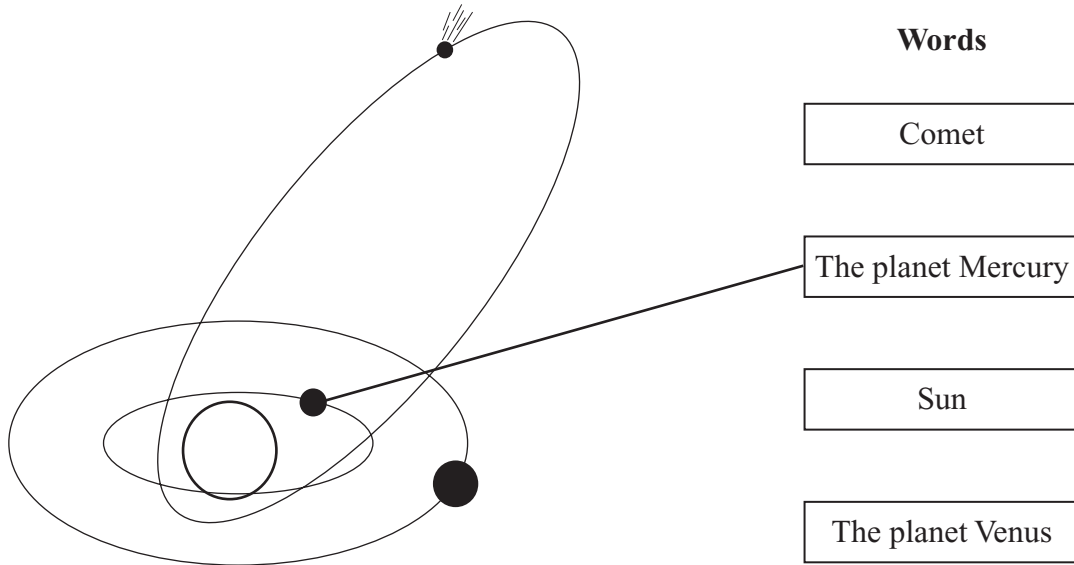
Words

Comet

The planet Mercury

Sun

The planet Venus

(2 marks)

2

Turn over for the next question

Turn over ▶

7 A car is stationary on a road. The opposing forces are balanced.

Reaction force
of the road

Driving
force

Frictional
force

Gravitational force
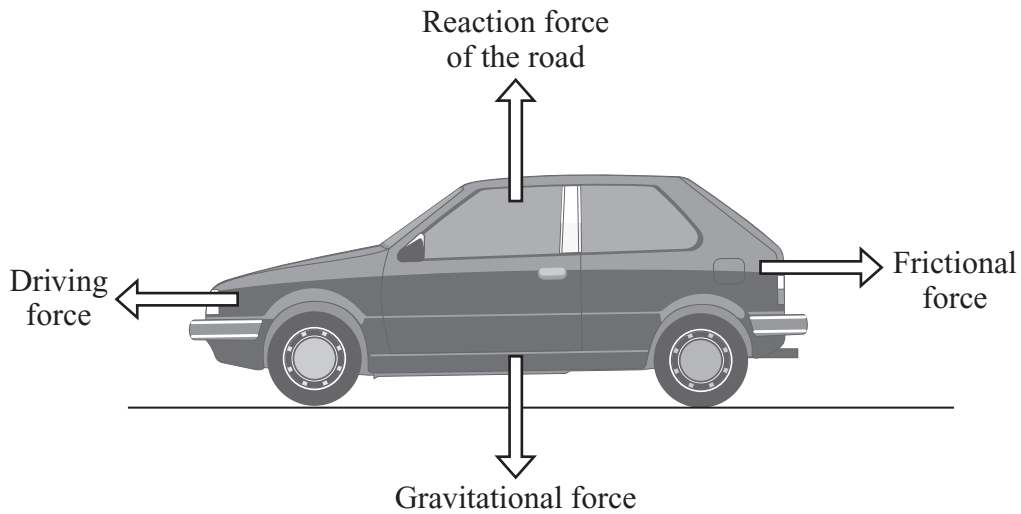
(a) The car engine is started and the car moves forwards.

(i) Complete the sentence by crossing out the **two** lines that are wrong in the box.

The car moves forwards because the driving force is

| greater than |
| less than |
| the same as |

the frictional force.

(1 mark)

(ii) As the car moves forwards, when will the driving force and the frictional force become balanced?

....

....

(1 mark)

(b)   If a person steps out in front of the car, the driver has to stop the car quickly.

Complete these sentences by using the correct words from the box.

alcohol	**braking**	**dry**	**fast**	**slow**	**thinking**	**tired**	**wet**

The stopping distance of the car depends on

the distance the car travels while the driver is ....

and the distance the car travels under the .... force.

It takes longer to stop

if the car is moving ....

if the driver is under the influence of ....

if the road is ....

(5 marks)
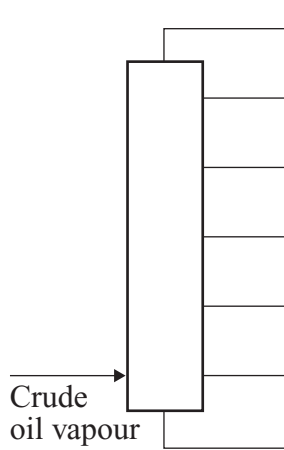
7

Turn over for the next question

QUESTIONS RELATING TO PREVIOUSLY TESTED MODULES

8 Crude oil is a mixture of mostly hydrocarbons. The table shows some information about each fraction in crude oil.

Fraction	Average number of carbon atoms in hydrocarbon molecules	Approximate boiling point in °C
Gases	3	below 35
Petrol	8	65
Naphtha	10	140
Paraffin	12	180
Diesel	20	250
Fuel oil	40	over 300
Bitumen	120	over 400

Crude oil vapour

(a) What process is used to separate crude oil into these fractions?

....
(1 mark)

(b) Describe the pattern between the number of carbon atoms and the boiling point of these fractions.

....

....
(1 mark)

(c)   One hydrocarbon in the gases fraction is butane, C_4H_{10}.

(i)   This hydrocarbon is made up of carbon and which other element?

....

(1 mark)

(ii)   Butane is used as a fuel.

Which **two** gases are formed when butane burns in oxygen?

Tick (✓) your **two** answers.

Gas	Tick (✓)
Carbon dioxide	
Hydrogen	
Sulphur dioxide	
Water vapour	

(2 marks)

5

Turn over for the next question

Turn over ▶

9 Solar panels are used to heat water.

A solar panel

Radiation from the Sun

Clear glass front
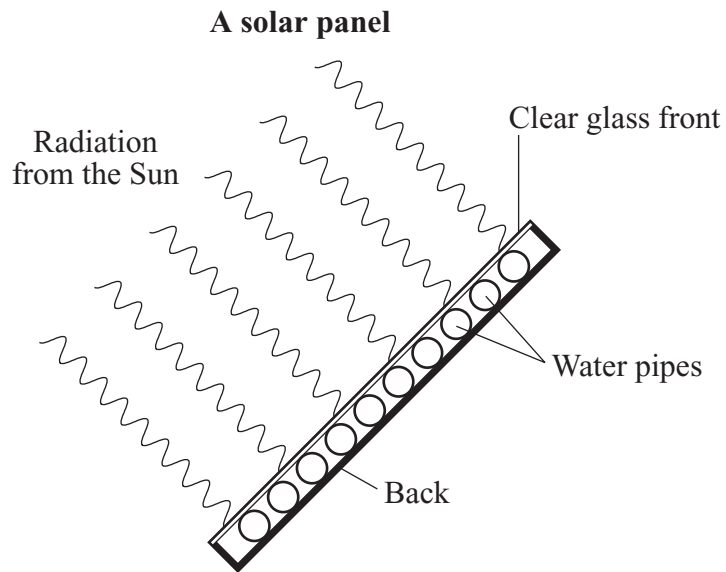
Water pipes

Back

(a) Name the type of radiation from the Sun that will heat the water.

....
(1 mark)

(b) What is the best type of surface to have on the water pipes and the back to absorb this radiation?

....
(1 mark)

(c) Every home loses heat (thermal energy).

2000 J
through ceilings

1500 J
through windows

1500 J
through draughts

4000 J
through walls

1000 J
through floors

Floors					

0   1000   2000   3000   4000

Heat in joules
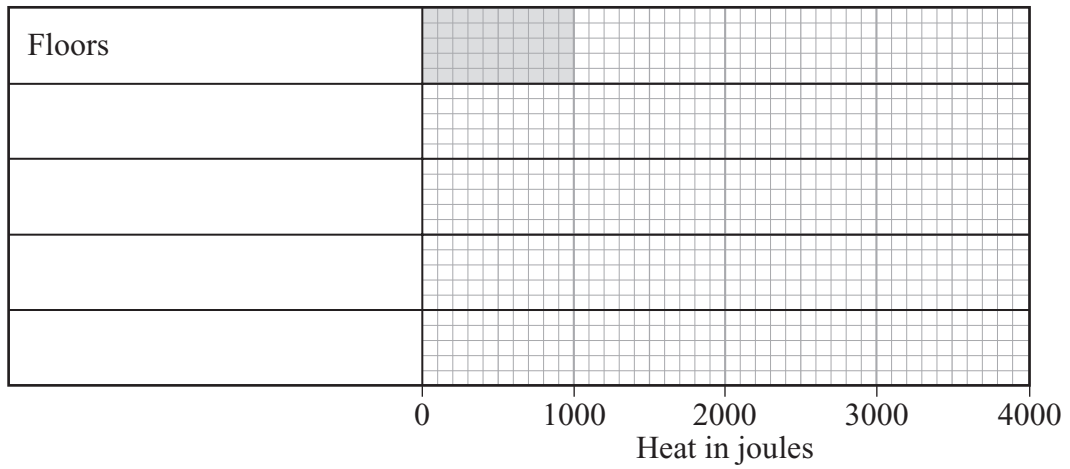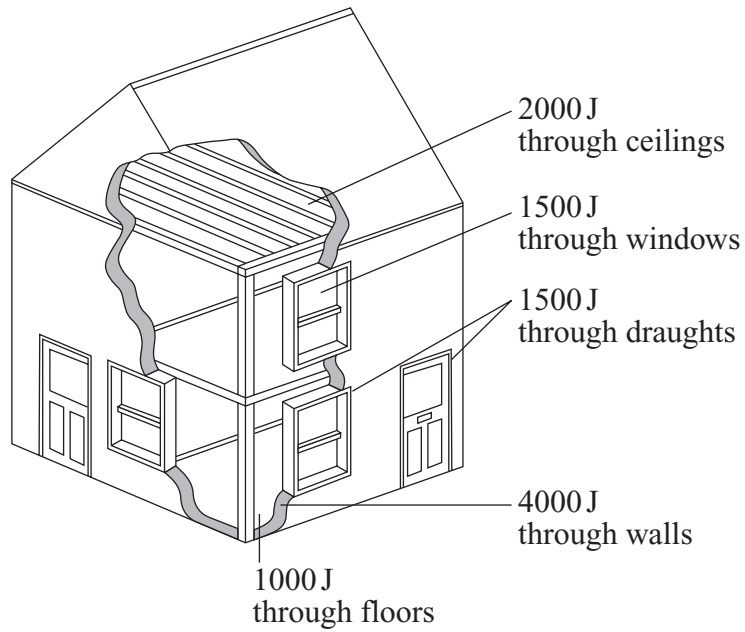
Use the information in the diagram to complete and label the bar chart so that it shows
how much heat escapes from the different parts of this house.
One has been done for you.   *(4 marks)*

6

Turn over ▶

ENVIRONMENT

10 Over-fishing has caused a large decrease in the number of cod in the North Sea. In 2004, a ban on cod fishing was proposed.

This is part of a food web for the North Sea.
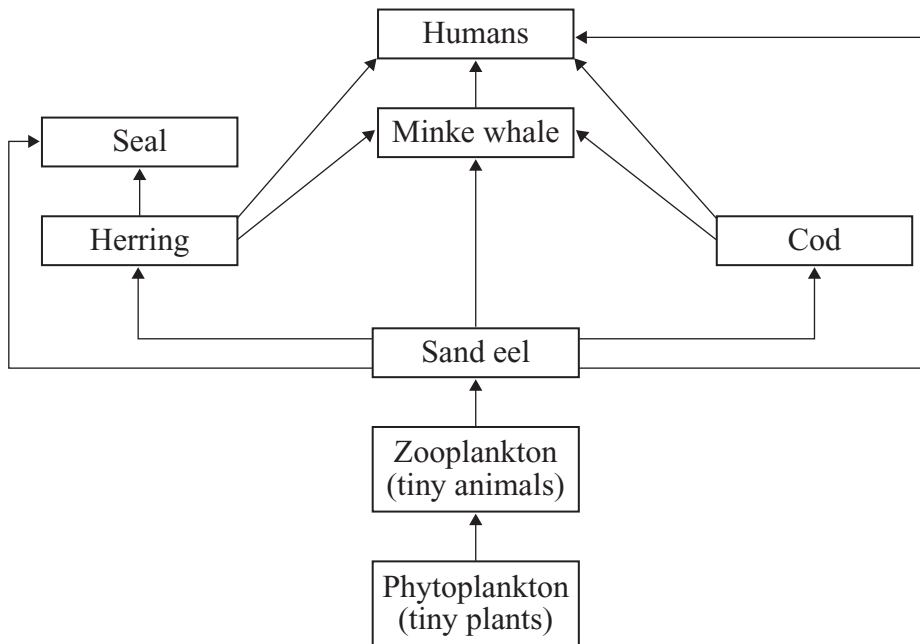
(a) Which of the organisms is a producer?

....

(1 mark)

(b)   One group of scientists states that the ban on cod fishing will **decrease** the number of sand eels.

Another group of scientists states that the ban will **increase** the number of sand eels.

Explain why both groups of scientists could be correct.

Sand eels could **decrease** in number because...

....

....

....

Sand eels could **increase** in number because...

....

....

....

(4 marks)

5

Turn over for the next question

Turn over ▶

11   The greenhouse effect is causing environmental problems on Earth.
Carbon dioxide is one of the greenhouse gases.

The table shows some sources of carbon dioxide in the atmosphere.

Source	Emission of carbon dioxide in kg per day
A human	1
A motorbike	5
A cow	7
A car	10
A lorry	165
A bus	351
A train	3 448
A ship	41 660
A plane	770 267
Total emissions	815 914

The data in the table suggest that the largest proportion of carbon dioxide emissions comes from transport.

(a)   What other factor must be considered when calculating the proportion of carbon dioxide emissions?

....

(1 mark)

(b)   What process in humans and cows releases carbon dioxide?

....

(1 mark)

(c) Use information in the table to suggest **two** ways in which carbon dioxide emissions could be reduced.

1 ....

....

2 ....

....

(2 marks)

(d) Give **one** way in which the greenhouse effect is causing environmental problems on Earth.

....

....

(1 mark)

5

Turn over for the next question

Turn over ▶

PATTERNS OF CHEMICAL CHANGE

12 The rate of the reaction between copper carbonate and hydrochloric acid was investigated as shown in the diagram.
The reaction was done at room temperature, 20 °C. At the end of the reaction, some of the copper carbonate remained unreacted.

Cotton wool

Flask

$100 \, cm^3$ of dilute hydrochloric acid

20 g of copper carbonate

−3.05g
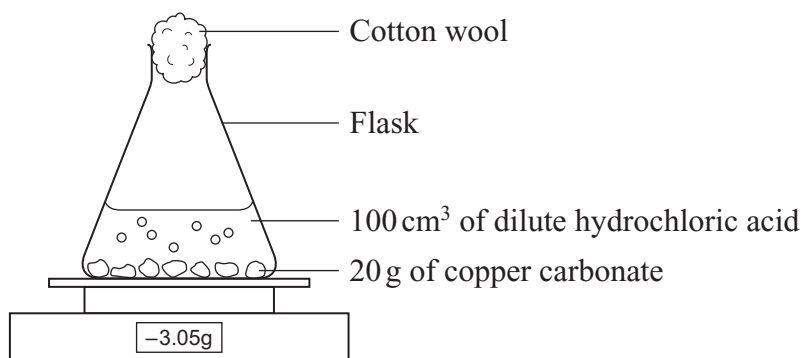
The word equation for this reaction is:

copper carbonate + hydrochloric acid → copper chloride + water + carbon dioxide

This is a graph of the results.

Loss of mass from the flask in grams

Time in minutes
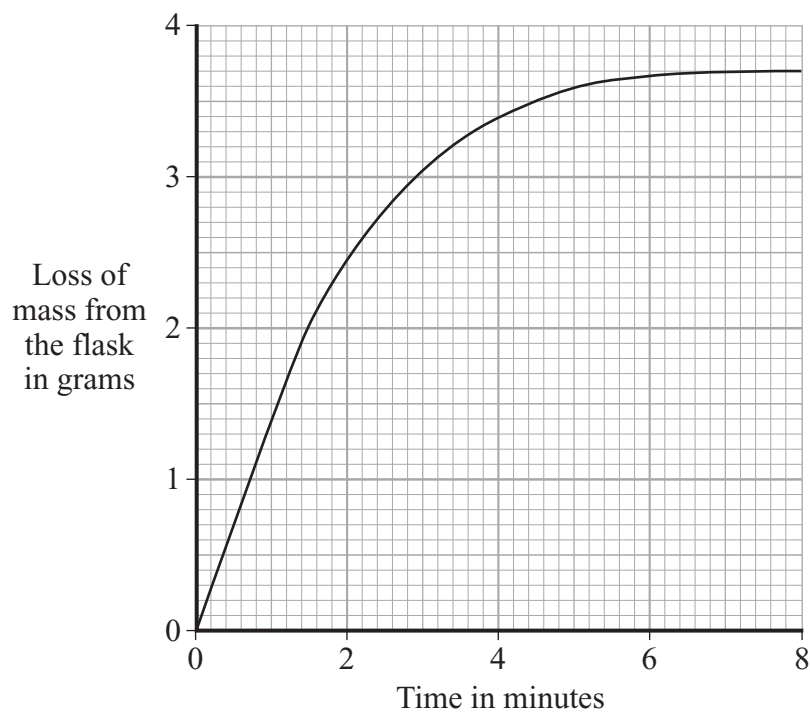
(a)   Why is there a loss of mass from the flask?

....

....
(1 mark)

(b)   (i)   Describe how the rate of reaction changes during the experiment.

....

....

....

....
(2 marks)

(ii)   Explain these changes in rate, as fully as you can, in terms of:

- collisions between particles;
- concentration of the acid.

....

....

....

....

....

....
(4 marks)

(c)   Calculate the percentage of copper in copper carbonate, $CuCO_3$.
Relative atomic masses: C = 12, O = 16, Cu = 64
Show your working.

....

....

....

....

Percentage of copper in copper carbonate = ... %
(3 marks)

10

Turn over ▶

FORCES

13 Two skiers, **A** and **B**, start a straight downhill race.
The graph shows how the motion of skier **A** changes during the race.
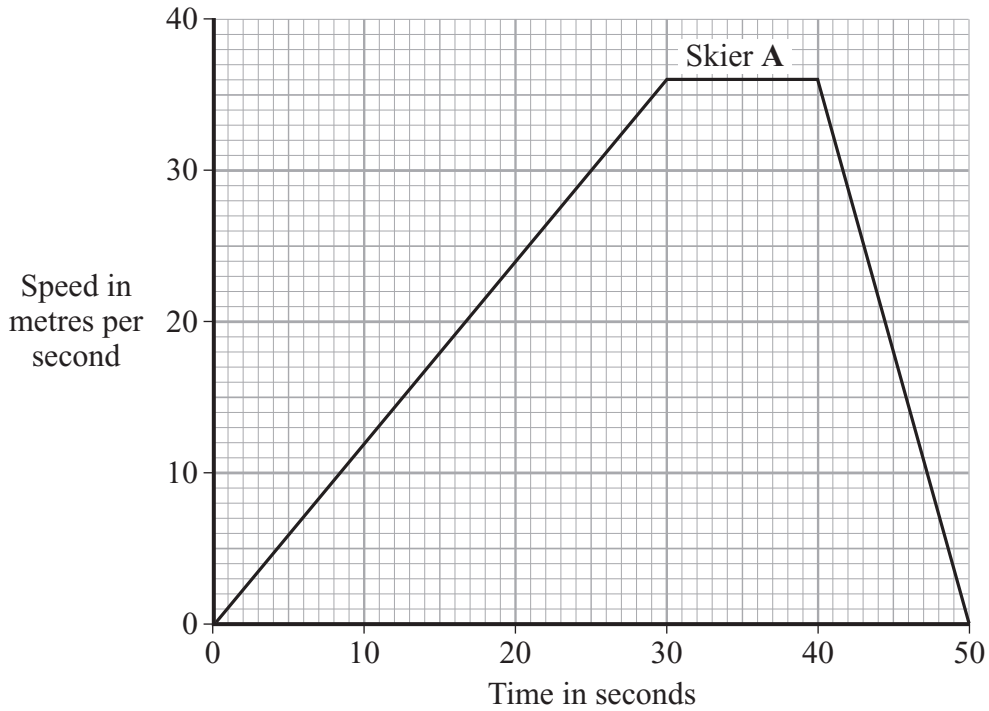
(a) (i) What does the graph tell you about the speed of skier **A** between 30 and
40 seconds?

....

....
(1 mark)

(ii) What distance did skier **A** travel between 30 and 40 seconds?

....

....

....

Distance = ... m
(2 marks)

(iii) Describe the motion of skier **A** after 40 seconds.

....

....
(1 mark)

(iv) Calculate the acceleration of skier **A** between 10 and 20 seconds.

Show clearly how you work out your answer and give the unit.

....

....

....

....

....

....

Acceleration of skier **A** = ...
(4 marks)

(b) Skier **B** wins the race.

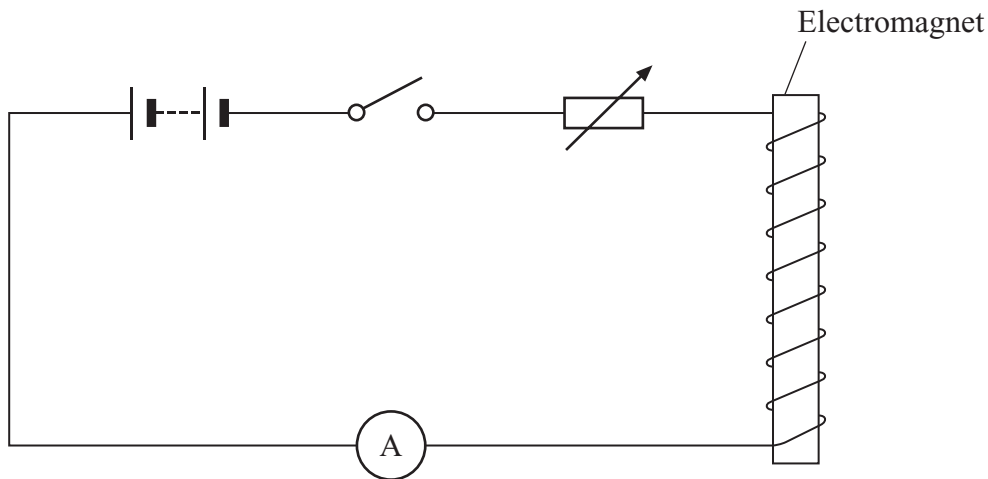On the grid, draw a possible graph for skier **B**.   *(2 marks)*

10

Turn over for the next question

QUESTIONS RELATING TO PREVIOUSLY TESTED MODULES

14 The diagram shows an electromagnet in a circuit.

Electromagnet

(a) (i) What is used in this circuit to control the strength of the electromagnetic field?

....

(1 mark)

(ii) On the circuit, draw the symbol for a voltmeter connected so that it can measure the potential difference across the electromagnet. *(1 mark)*

(iii) The ammeter reading was 0.5 A and the resistance of the coil on the electromagnet was 24 Ω.

Calculate the potential difference across the electromagnet.

Show clearly how you work out your answer.

....

....

....

....

Potential difference = ... V

(3 marks)

(b) Circuit breakers are often used instead of fuses in many appliances. They use an electromagnet to work.

Switch made of iron

Current
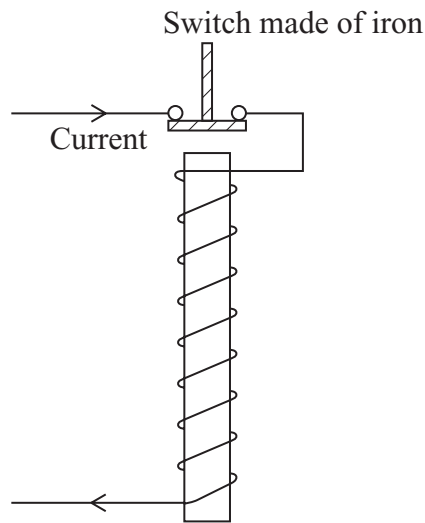
Describe, in as much detail as you can, how the electromagnet makes the circuit breaker work.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

....

....

....

....

....

....

....

....

....

....

(5 marks)

10

END OF QUESTIONS

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