

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education
June 2005



**SCIENCE DOUBLE AWARD A (MODULAR)
HIGHER TIER
Paper 2**

3468/2H

H

Thursday 16 June 2005 9.00 am to 10.30 am

<p>In addition to this paper you will require:</p> <ul style="list-style-type: none"> • the Data Sheet (enclosed); • a ruler. <p>You may use a calculator.</p>

For Examiner's Use			
Number	Mark	Number	Mark
1		9	
2		10	
3		11	
4		12	
5		13	
6		14	
7		15	
8		16	
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 90.
- Mark allocations are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

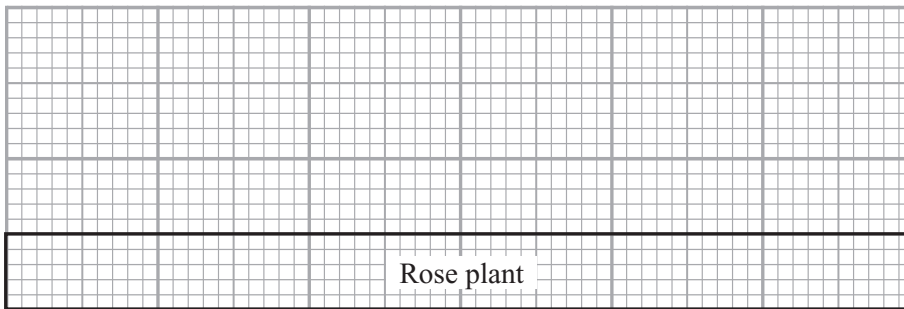
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ENVIRONMENT

1 Energy is stored in the materials that make up organisms. These materials are called biomass.

Organisms in food chain	Rose plant → Greenfly → Ladybird → Blackbird
Biomass in g/m²	600 50 10 1

(a) Complete the pyramid of biomass for this food chain. The rose plant has been done for you. You should draw the rest of the pyramid to the same scale. (5 small squares = 50 g/m².)



Biomass in g/m²

(3 marks)

(b) What proportion of the energy in a rose plant is transferred to greenfly?

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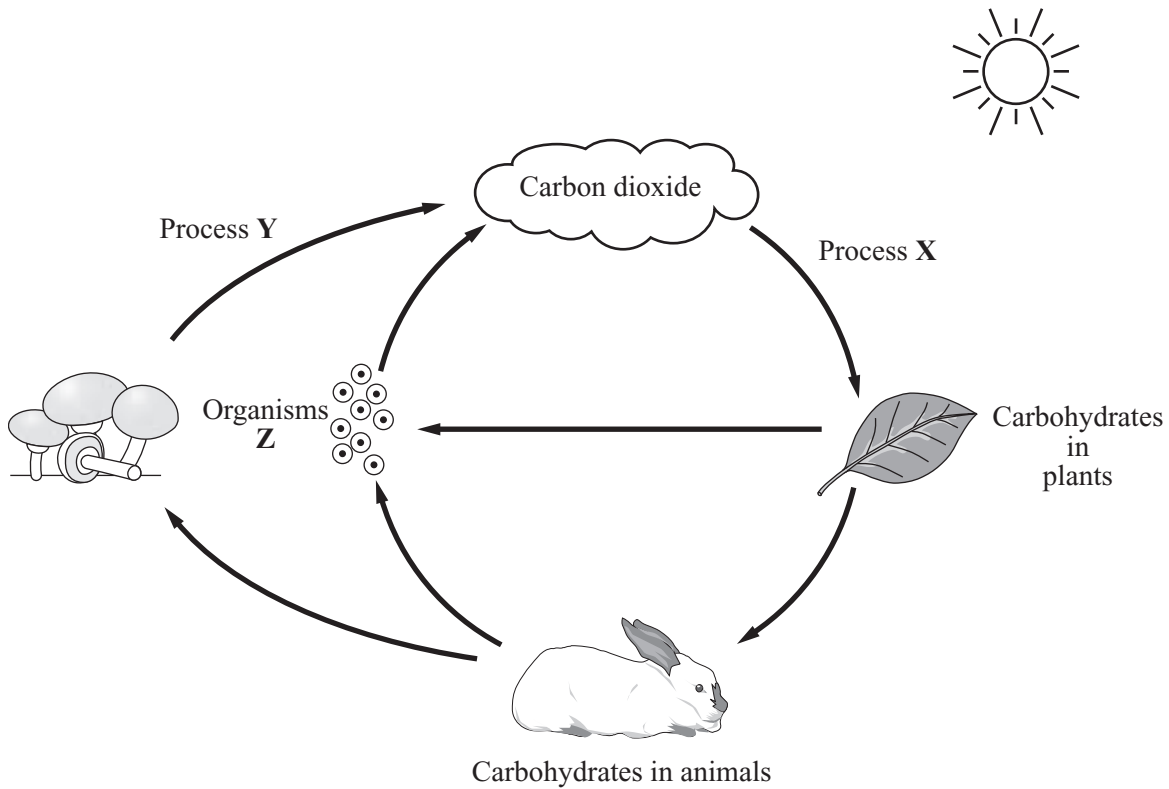
Proportion =

(2 marks)

5

Turn over ►

- 2 In a stable community, the processes which remove materials are balanced by processes which return materials. These materials are constantly cycled within the community.



(a) Name:

(i) process **X** (1 mark)

(ii) process **Y** (1 mark)

(iii) the group of organisms **Z** which bring about decay.

..... (1 mark)

(b) Many of the plants that we eat as fruits and vegetables in the UK are imported. The transport used to import foods accounts for about 2.5% of the UK's carbon dioxide emissions. During winter, it is necessary to import foods because most of the UK's fresh vegetables have to be grown in greenhouses. Energy is needed to heat and light these greenhouses.

Give **one** argument for and **one** against growing all of our vegetables in the UK. These arguments should consider the environmental effect of carbon dioxide emissions.

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(3 marks)

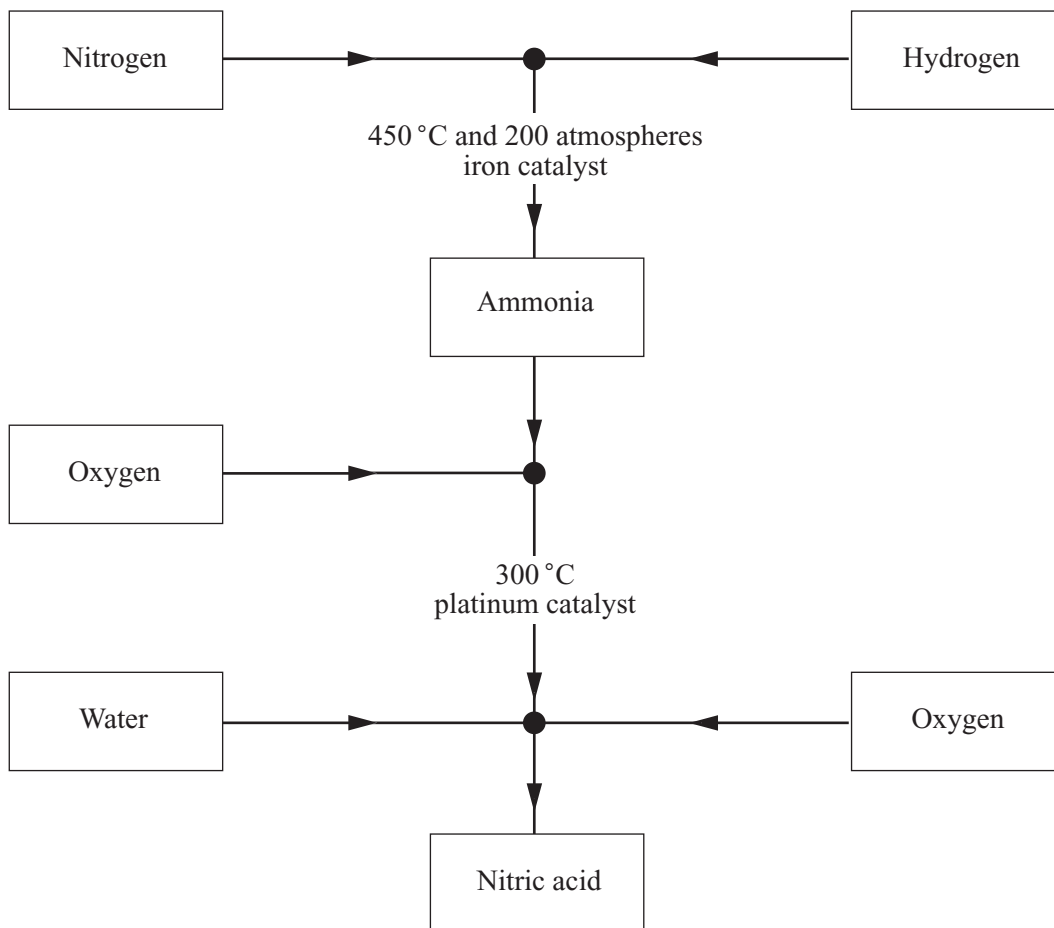
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TURN OVER FOR THE NEXT QUESTION

Turn over ►

PATTERNS OF CHEMICAL CHANGE

3 The flow diagram shows how to make ammonia and nitric acid from the nitrogen in the air.



(a) A fertiliser is made by neutralising ammonia with nitric acid. What is the name of this fertiliser?

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(1 mark)

(b) In the flow diagram, why are two different catalysts used?

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(1 mark)

(c) What happens to catalysts at the end of a reaction?

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(1 mark)

(d) Explain why catalysts are used in many industrial chemical reactions.

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(2 marks)

(e) Explain, in terms of collisions between molecules, why a high pressure is used in the reaction between nitrogen and hydrogen.

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(2 marks)



TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 4 Nitrate fertilisers are important in agriculture. They help to increase crop yields and so make food cheaper to buy. Some of the nitrate fertilisers run off into rivers and get into drinking water. The problem is that the nitrates can react with iron in our blood. This reduces the blood's ability to carry oxygen. If the amount of nitrate in drinking water is too high, it can cause 'blue baby syndrome', in which babies look blue due to lack of oxygen.

The table shows the amount of nitrate fertilisers used and the crop yield.

Nitrate fertilisers in kilograms per hectare of land	0	150	250
Crop yield in tonnes per hectare of land	5	8	7

Use the information above to suggest what should be done, by farmers and government, to prevent 'blue baby syndrome'. Explain the reasons for your suggestions.

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(3 marks)

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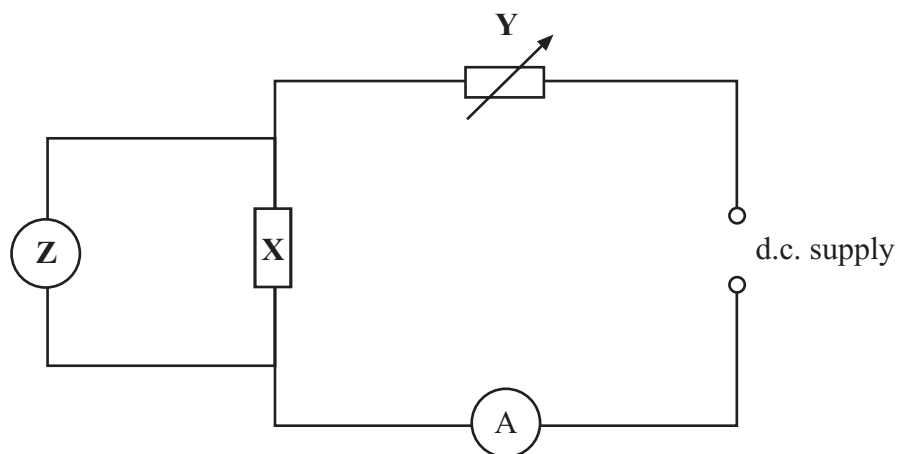
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TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTIONS RELATING TO PREVIOUSLY TESTED MODULES

- 7 The current through component **X** is measured when different voltages are applied across it.



- (a) Name the component labelled **Y** in the circuit.

..... (1 mark)

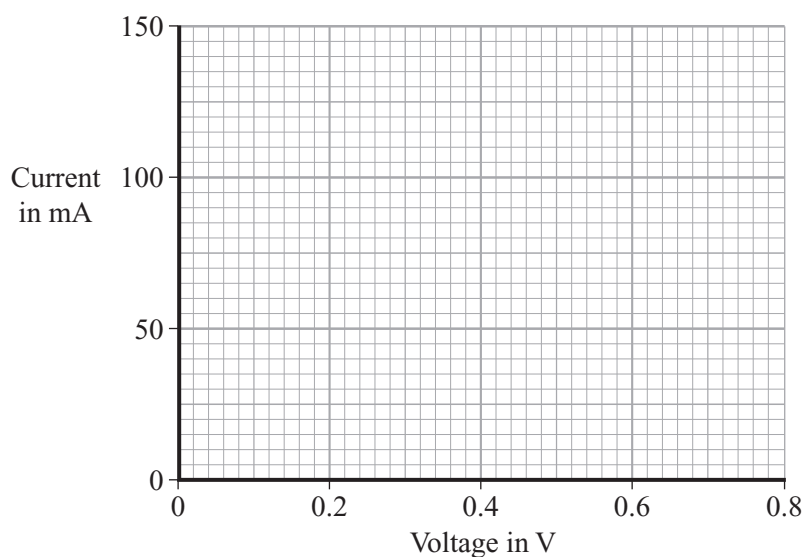
- (b) What type of meter is **Z**?

..... (1 mark)

- (c) The table shows the measurements obtained in this experiment.

Voltage in V	0	0.2	0.4	0.6	0.8
Current in mA	0	0	50	100	150

Draw a graph of the measurements.



(2 marks)

- (d) Use the shape of the graph to name component X.

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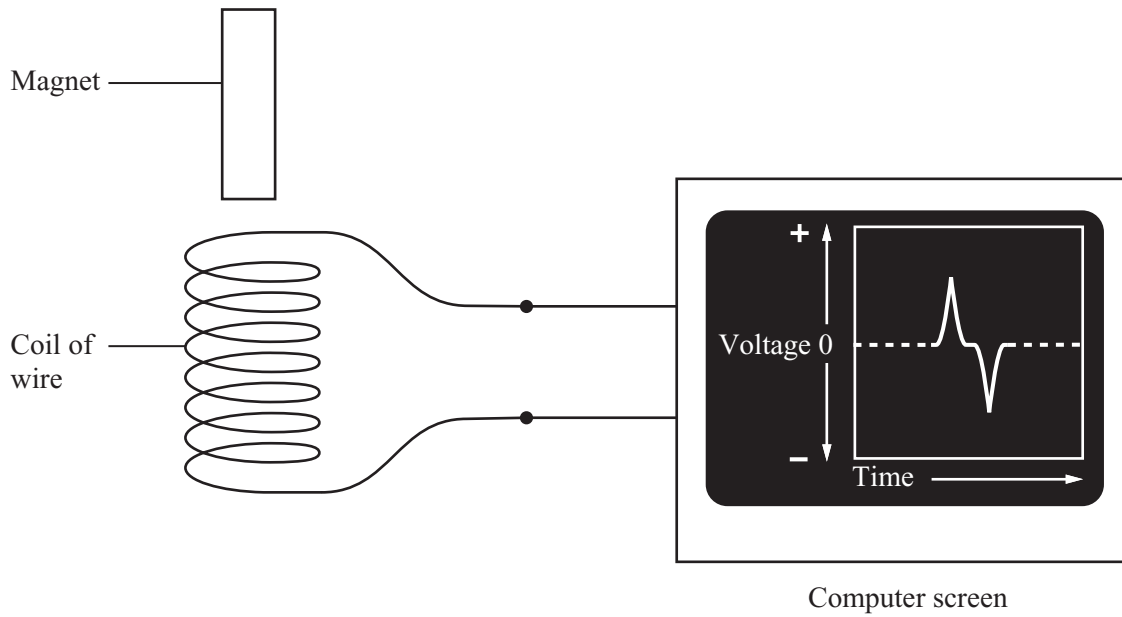
(1 mark)

5

TURN OVER FOR THE NEXT QUESTION

Turn over ►

8 The equipment shown was used to produce the trace on the computer screen.



Describe and explain what was done with the equipment to produce this trace.

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.

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(4 marks)

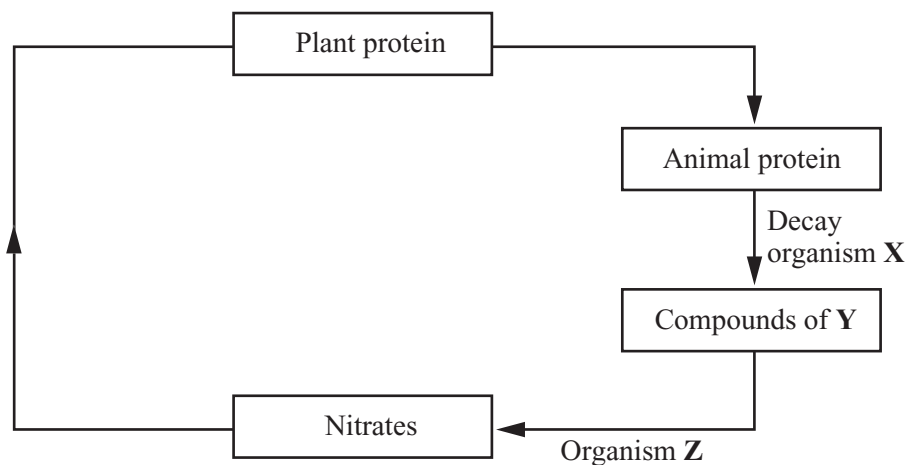
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TURN OVER FOR THE NEXT QUESTION

Turn over ►

ENVIRONMENT

9 The diagram shows the nitrogen cycle.



(a) Name:

(i) organism X (1 mark)

(ii) compounds of Y (1 mark)

(iii) organism Z (1 mark)

(b) Farmers may add ammonium nitrate to the soil to replace the nitrogen-containing compounds that plants need for growth. Describe, in as much detail as you can, how the pollution of water by ammonium nitrate may cause eutrophication.

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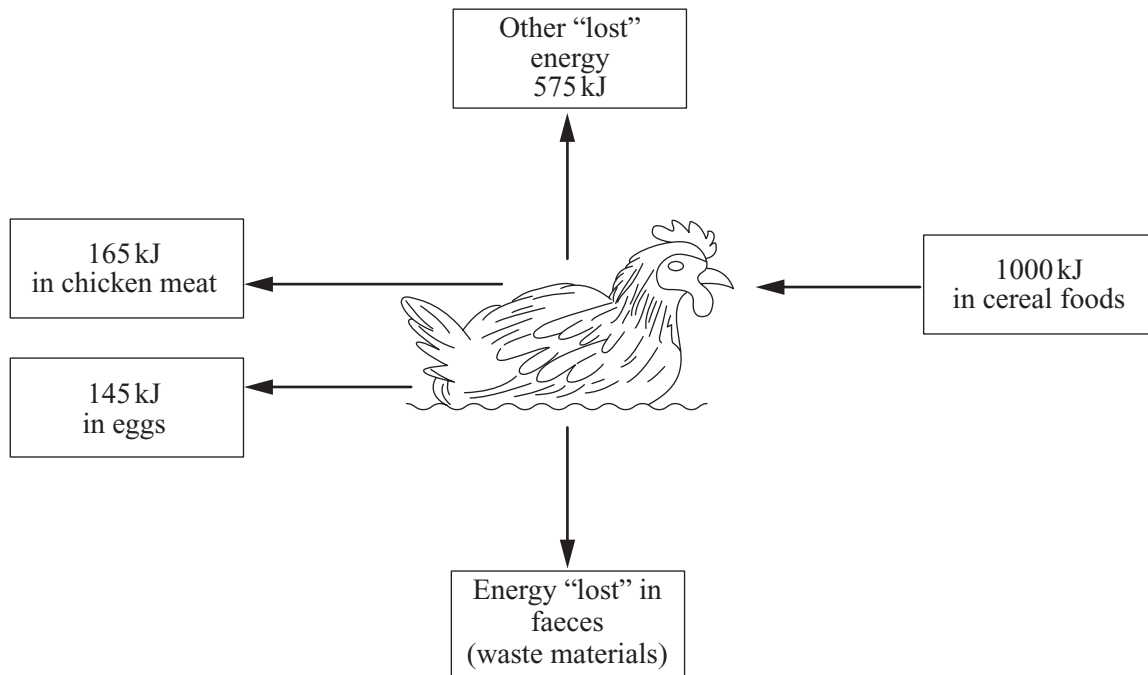
(5 marks)



TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 10 Chickens are kept as farm animals to produce food. Free-range chickens are allowed to feed in a large space outside. The diagram shows how energy supplied in food to a free-range chicken is transferred.



- (a) Calculate the amount of energy “lost” in faeces.

.....

Energy “lost” = kJ
 (1 mark)

- (b) Some farmers use the battery method. They keep large numbers of chickens in a small indoor space. The food yield from these chickens is higher than that from free-range chickens. Explain why, as fully as you can.

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(4 marks)

PATTERNS OF CHEMICAL CHANGE

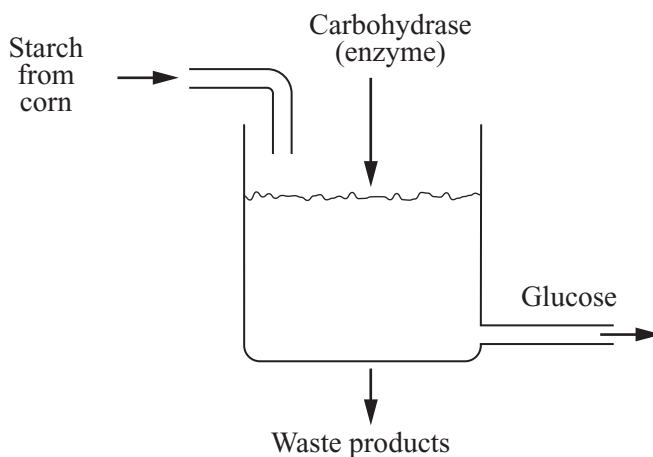
11 Enzymes are used to make chemical reactions work at normal temperatures and pressures.

(a) Explain why enzymes cannot be used at high temperatures.

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(2 marks)

(b) The diagram below shows a batch method of producing glucose from starch.



Describe and explain how this batch process could be changed to a continuous process.

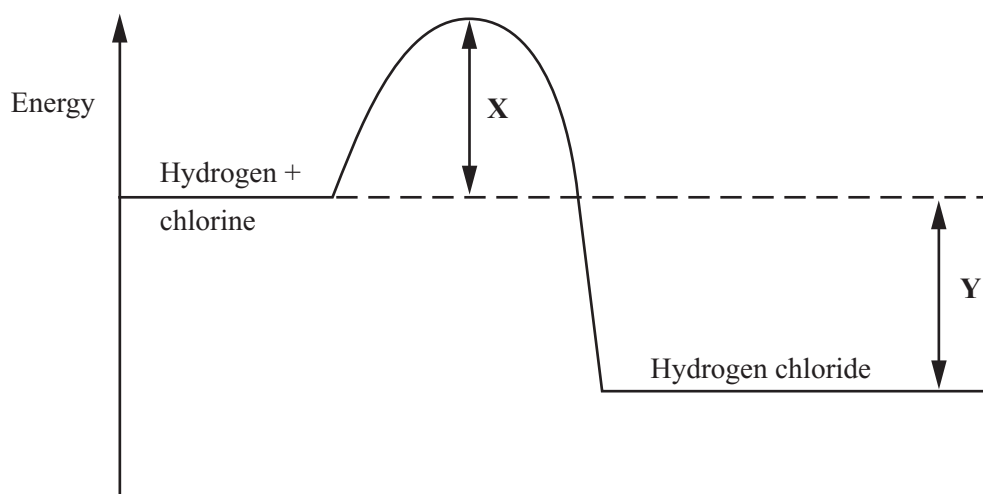
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(3 marks)

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Turn over ►

12 Hydrogen chloride gas is produced by reacting the gases hydrogen and chlorine.



- (a) The energy level diagram above represents this reaction.
Explain, as fully as you can, what is represented on the energy level diagram by:

(i) **X**

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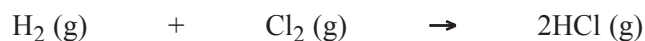
(2 marks)

(ii) **Y**

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(2 marks)

(b) The balanced symbol equation for the reaction is



- (i) In this reaction, what volume of hydrogen chloride would be produced from 1 litre of hydrogen (measured at room temperature and pressure)?
(The volume of one formula mass (mole) of any gas is 24 litres at room temperature and pressure.)

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Volume of hydrogen chloride = litres
(1 mark)

- (ii) Starting with 2 g of hydrogen, what mass of hydrogen chloride would be produced?
(Relative atomic masses: H = 1; Cl = 35.5)

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Mass of hydrogen chloride = g
(3 marks)

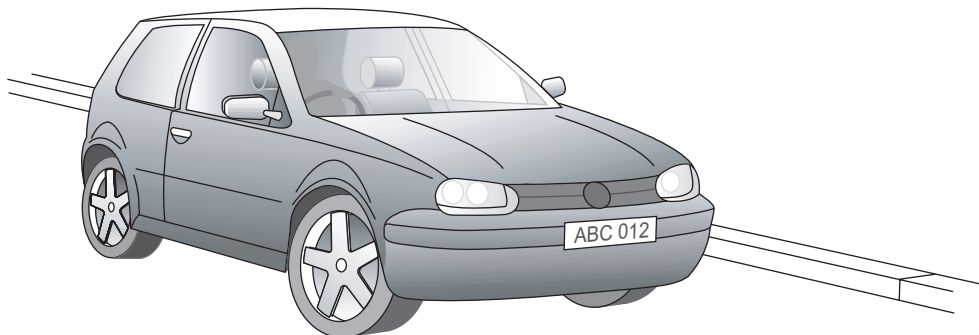
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TURN OVER FOR THE NEXT QUESTION

Turn over ►

FORCES

- 13 A car which is moving has kinetic energy.



The faster a car goes, the more kinetic energy it has. The kinetic energy of this car was 472 500 J when travelling at 30 m/s.

Calculate the total mass of the car.

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

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Mass of the car =
(5 marks)

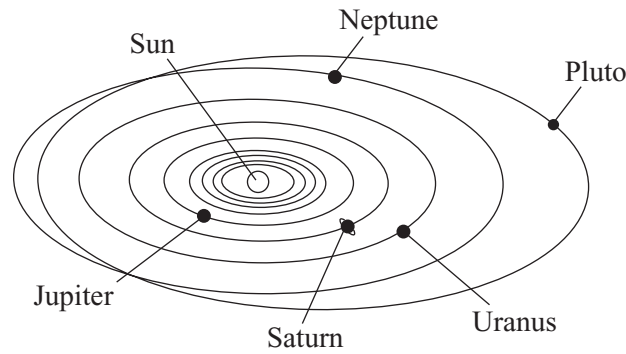
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TURN OVER FOR THE NEXT QUESTION

Turn over ►

14 The Sun at the centre of our solar system is a star.



(a) (i) Complete the sentence by writing in the correct words.

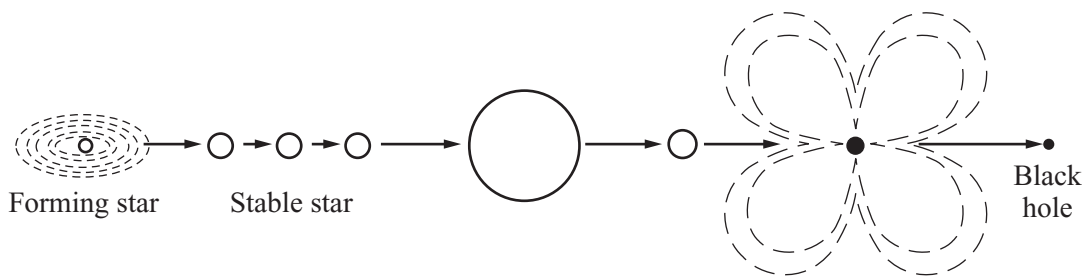
The Sun is just one of millions of stars in our At least one billion of these make up the (1 mark)

(ii) The Sun contains nuclei of the heaviest elements. Atoms of these heaviest elements are also present in the planets of the solar system. What does this suggest about the material from which the solar system is formed?

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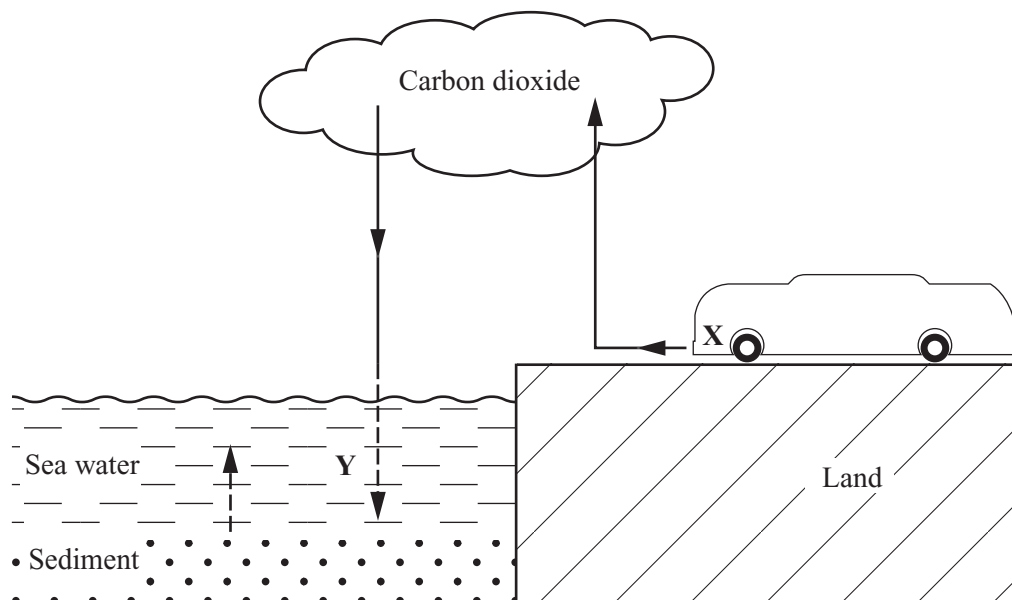
(1 mark)

(b) Stars form from gas (mostly hydrogen) and dust.



QUESTIONS RELATING TO PREVIOUSLY TESTED MODULES

- 15** The amount of carbon dioxide in the atmosphere is increased by reactions that occur in internal combustion engines (**X**) and is decreased by reactions in sea water (**Y**).

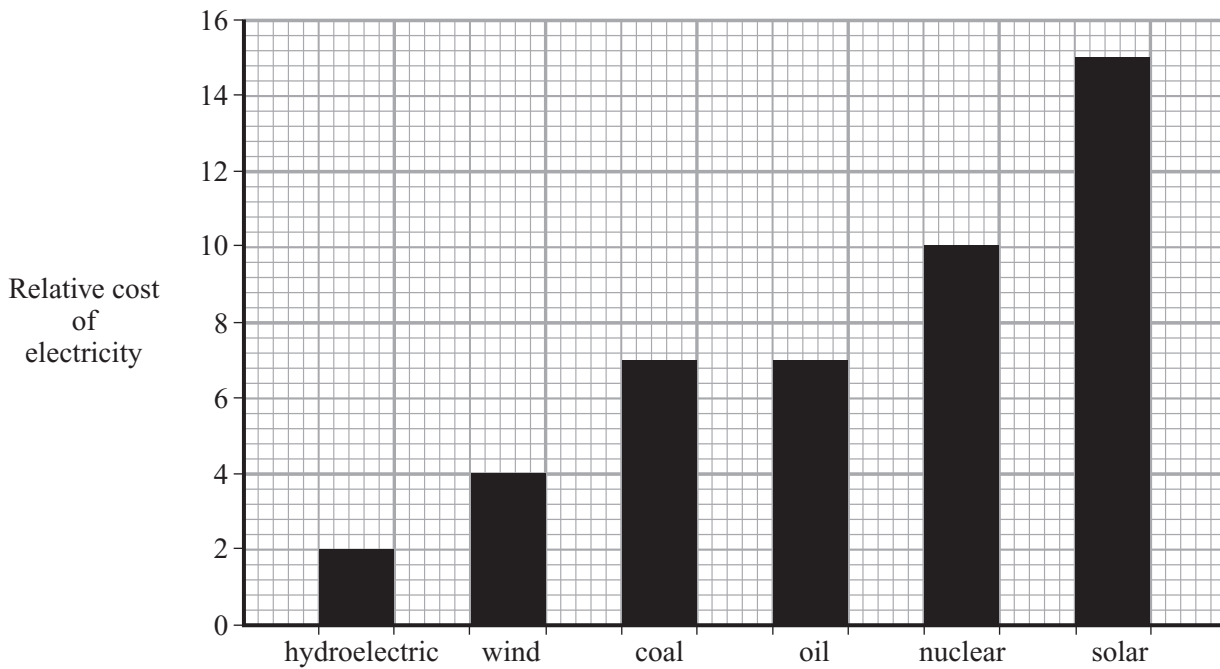


Describe, in as much detail as you can, the reactions which take place at **X** and **Y**.

- (a) **X**
-
-
-
- (2 marks)

- (b) **Y**
-
-
-
- (3 marks)

16 The bar chart shows the relative costs of some different energy sources that are used to generate electricity.



(a) Apart from cost, give **two** advantages that a hydroelectric power station has compared with a wind farm.

1

.....

2

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(2 marks)

(b) Apart from cost, give **one** advantage and **one** disadvantage that a nuclear power station has compared with a coal-fired power station.

Advantage.....

.....

Disadvantage

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(2 marks)

QUESTION 16 CONTINUES ON THE NEXT PAGE

Turn over ►

- (c) State and explain **one** situation where it is better to use solar energy, rather than any of the other energy sources, to generate electricity.

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(2 marks)

END OF QUESTIONS

6