

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education
January 2006

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

3860/2F

F



Wednesday 18 January 2006 9.00 am to 10.30 am

<p>For this paper you must have:</p> <ul style="list-style-type: none"> • a ruler <p>You may use a calculator.</p>
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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 80.
- The marks for questions are shown in brackets.

For Examiner's Use			
Number	Mark	Number	Mark
1		9	
2			
3			
4			
5			
6			
7			
8			
Total (Column 1)		→	
Total (Column 2)		→	
TOTAL			
Examiner's Initials			

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

1 The diagrams show some living organisms that provide us with useful products.

Choose a product from the list to match each living organism.

Write your answer under each diagram.

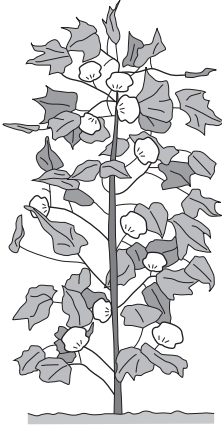
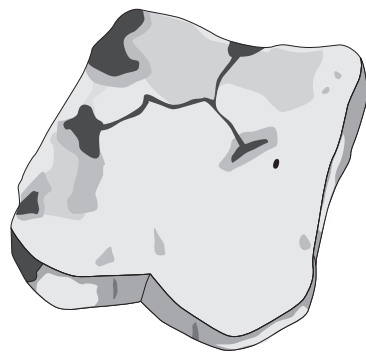
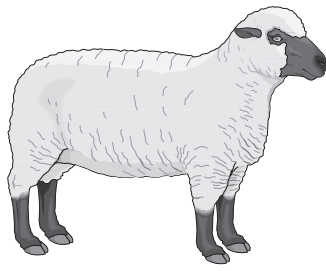
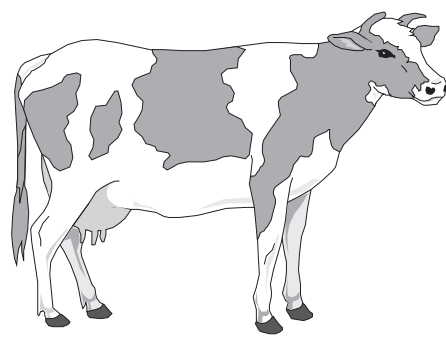
cotton

leather

penicillin

silk

wool

<p>Plant</p>  <p>(a)</p>	<p>Mould</p>  <p>(b)</p>
<p>Sheep</p>  <p>(c)</p>	<p>Cow</p>  <p>(d)</p>

(4 marks)

4

2 Fossil fuels and renewable energy resources are both used to generate electricity.

(a) Use names from the list of energy resources to complete the table below.

Put **one** answer in **each** box.

coal hydroelectric power natural gas oil solar cells wind

	Fossil fuel	Renewable energy resource
Name of energy resource		

(2 marks)

(b) Give **two** disadvantages of using the energy resources that you have named.

	Fossil fuel	Renewable energy resource
Disadvantage		
Disadvantage		

(4 marks)

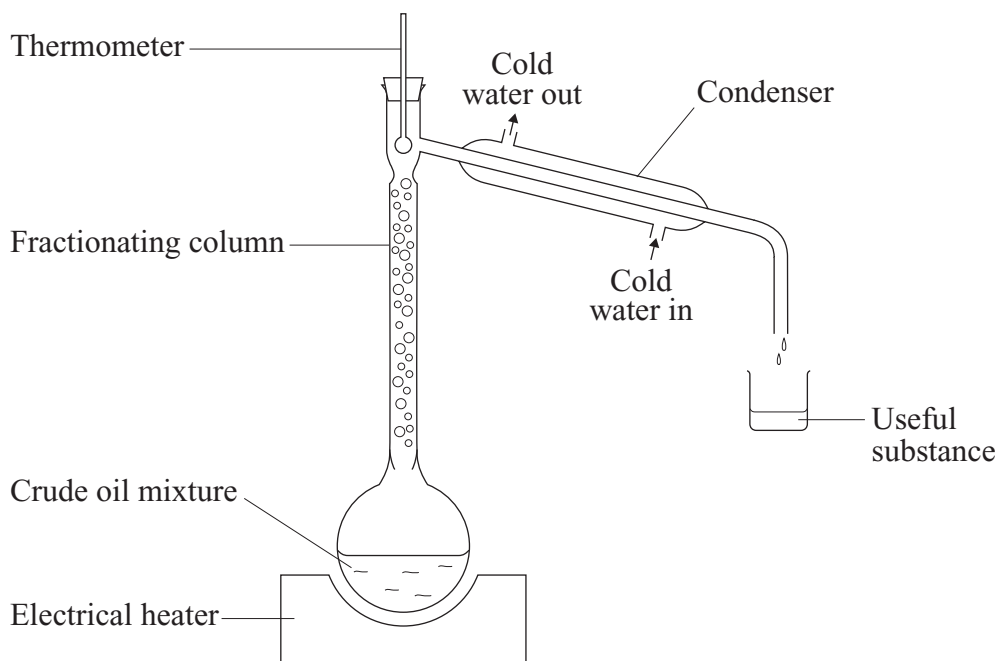
6

Turn over for the next question

Turn over ►

3 Crude oil can be separated into useful substances by fractional distillation.

The diagram shows the apparatus for doing this in the laboratory.



- (a) Complete the sentences about fractional distillation, using the correct words from the box.

cooler	gas	highest	hotter
liquid	lowest	solid	

When the crude oil mixture is heated, the liquid with the
boiling point evaporates. The column gets near the top. The
vapour condenses at the top of the column and is collected as a
..... .

(3 marks)

- (b) Why is a Bunsen burner **not** used to heat the crude oil mixture?

.....
.....

(1 mark)

(c) Polymers are made from crude oil.

(i) Name **one** polymer made from crude oil.

.....
(1 mark)

(ii) Give **one** use for this polymer.

.....
(1 mark)

6

Turn over for the next question

Turn over ►

4 Plants need minerals to help their growth.

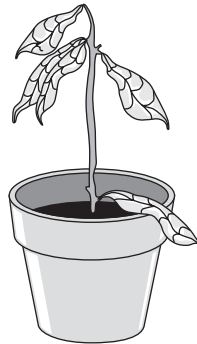
A student did an experiment to test the effect of leaving out one of the minerals from the soil.

The results are shown in the diagrams.



Healthy plant
Strong growth

Plant A



Unhealthy plant
Yellow leaves

Plant B



Small plant
Poor growth

Plant C

- (a) (i) Which plant has no nitrates?

.....
(1 mark)

- (ii) Explain your answer.

.....
(1 mark)

- (b) (i) Which plant has no magnesium?

.....
(1 mark)

- (ii) Explain your answer.

.....
(1 mark)

- (c) Name **two** other minerals needed by plants.

..... and
(2 marks)

(d) What could a farmer add to his soil to increase the amounts of these minerals?

.....
(1 mark)

(e) A farmer can use other methods to improve plant growth.

(i) Give **one** other method a farmer can use to improve the growth of plants.

.....
(1 mark)

(ii) How does this method improve plant growth?

.....
(1 mark)

9

Turn over for the next question

Turn over ►

5 How an element is used often depends on its density.

The densities of some elements are given in the table, together with the number of protons in each atom of the element.

Element	Symbol	Number of protons	Density in g/cm ³
Aluminium	Al	13	2.7
Calcium		20	1.5
Zinc		30	7.1
Silver	Ag	47	10.5
Lead	Pb	82	11.3

(a) Name **two** other particles, apart from protons, found in the atoms of an element.

..... and
(2 marks)

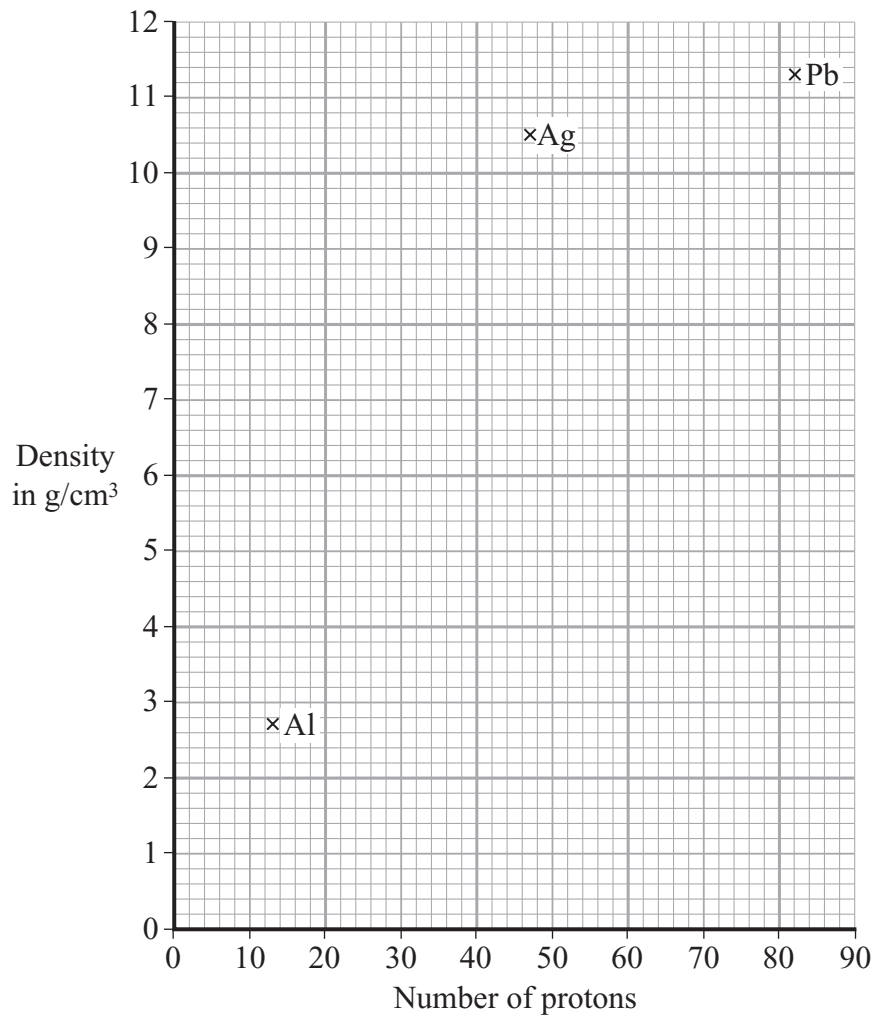
(b) Write the symbols for calcium and zinc in the table. (2 marks)

(c) Give a use for **one** metal listed in the table.

Name of metal

Use
(1 mark)

(d) A student plotted the data for three of the elements from the table on a graph.



Plot the data for calcium and zinc on the graph.

(2 marks)

(e) The student concluded that elements with more protons have a higher density.

Do you think the student's conclusion is correct?

Explain your answer.

.....

.....

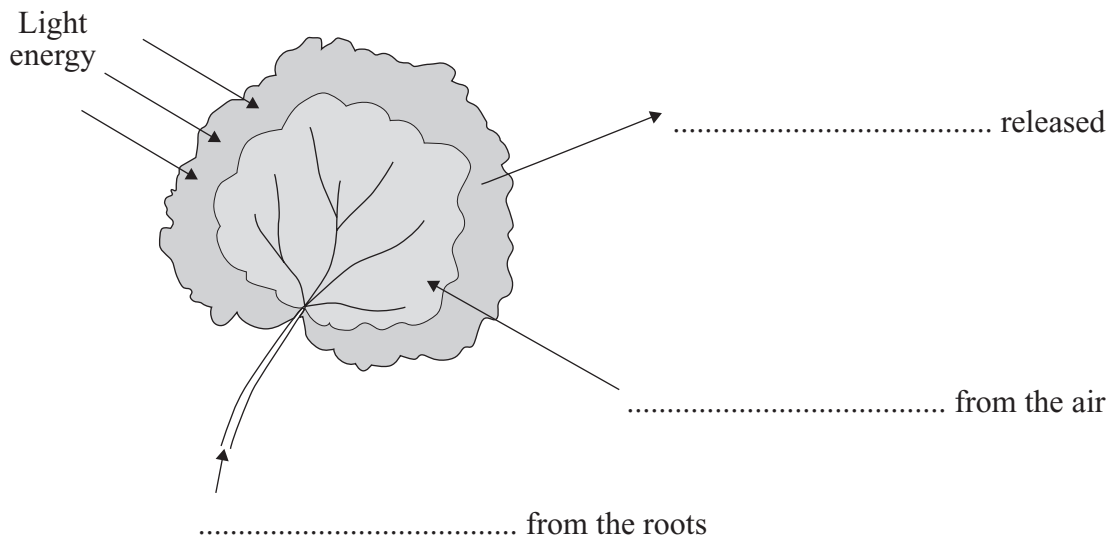
(1 mark)

6 Plants carry out photosynthesis in order to produce food.

(a) The diagram shows photosynthesis occurring in a leaf.

Choose words from the list to complete the labels on the diagram.

carbon dioxide glucose nitrogen oxygen water



(3 marks)

(b) Name the green substance that allows plants to carry out photosynthesis.

.....
(1 mark)

(c) What chemical is made during photosynthesis and stored in the leaf?

.....
(1 mark)

(d) Describe an experiment that you could use to investigate how the amount of light affects photosynthesis.

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

9

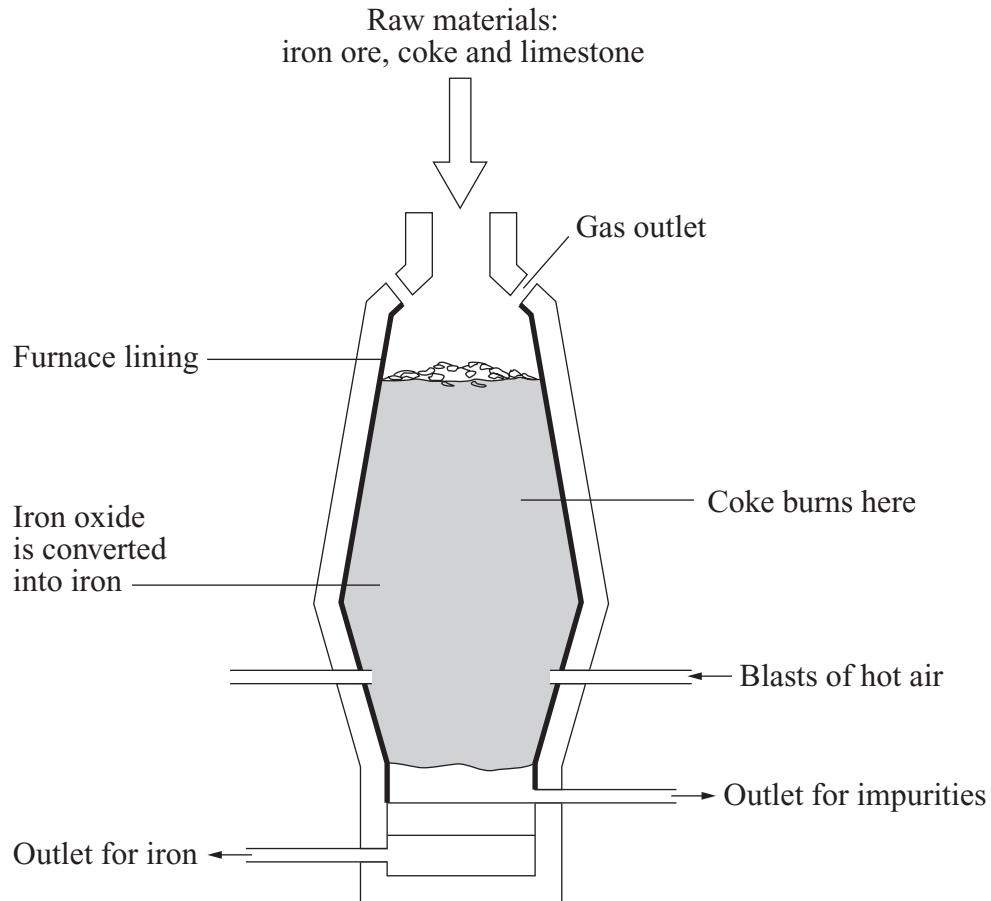
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7 Iron is a very important element with many industrial uses.

It is obtained from iron ore (iron oxide) by heating with coke and limestone in a blast furnace.

A labelled diagram of a blast furnace is shown below.



(a) Give **one** large-scale use of iron.

.....
(1 mark)

- (b) Select the best **two** properties from the table that explain why a ceramic material is a good choice for making the lining of the blast furnace.

Tick **two** boxes.

Brittle	
Poor conductor of heat	
Poor tensile strength	
Poor conductor of electricity	
High melting point	

(2 marks)

- (c) Three raw materials are fed into the top of the blast furnace.

Complete the table below with information about the raw materials.

Raw material	Chemical name	Chemical symbol or formula	Type of chemical
Iron ore	Iron oxide		Compound
Coke		C	Non-metal element
Limestone		CaCO ₃	

(4 marks)

- (d) When coke burns in the furnace, this is an *exothermic* reaction.

- (i) What is an *exothermic* reaction?

.....

(1 mark)

- (ii) Why is this reaction important in the making of iron?

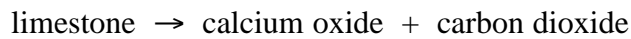
.....

(1 mark)

Turn over ►

- (e) Limestone is added to remove impurities.

Limestone breaks down in the hot furnace, forming calcium oxide and carbon dioxide.



- (i) How is limestone obtained for use in the blast furnace?

.....
.....

(1 mark)

- (ii) Write a symbol equation for the breakdown of limestone into calcium oxide and carbon dioxide.



(3 marks)

- (f) Describe the chemical changes that occur when iron oxide is changed into iron.

You may use a word equation or a symbol equation as part of your answer.

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

(3 marks)

- (g) Some elements are easier to obtain than iron because they can be extracted straight from the ground.

- (i) Name **one** element that can be extracted straight from the ground.

.....

(1 mark)

- (ii) Name **one** other element that is extracted from its oxide by heating with coke.

.....

(1 mark)

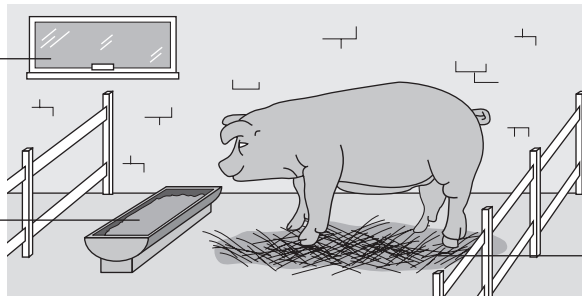
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8 The following diagram shows some of the features you would find in a commercial pig house.

Feature A

Plenty of ventilation



Feature B

Access to food

Feature C

A means of keeping warm

(a) (i) For each feature, describe how it could increase the amount of meat obtained from the pigs.

Feature A

.....

Feature B

.....

Feature C

.....

(3 marks)

(ii) Is this method of meat production intensive or organic? Explain your answer.

.....

.....

(1 mark)

(b) Give **two** advantages of using this type of farming.

1

2

(2 marks)

(c) The following label is found on meat that is grown organically.

SOIL ASSOCIATION
ORGANIC STANDARD

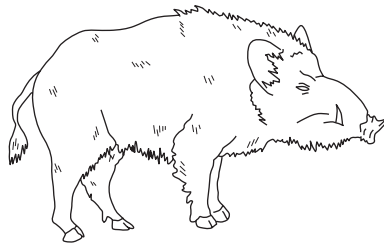
Suggest how the pigs might be reared for the meat to be given this label.

.....
.....

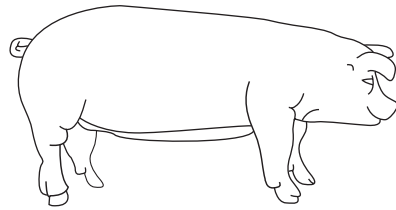
(1 mark)

(d) Over hundreds of years, pigs have been bred from wild boars.

The diagrams show a wild boar and a modern day pig.



Wild boar



Modern day pig

Look at the diagrams.

Give **two** characteristics that have been selected when breeding modern pigs.

A

B

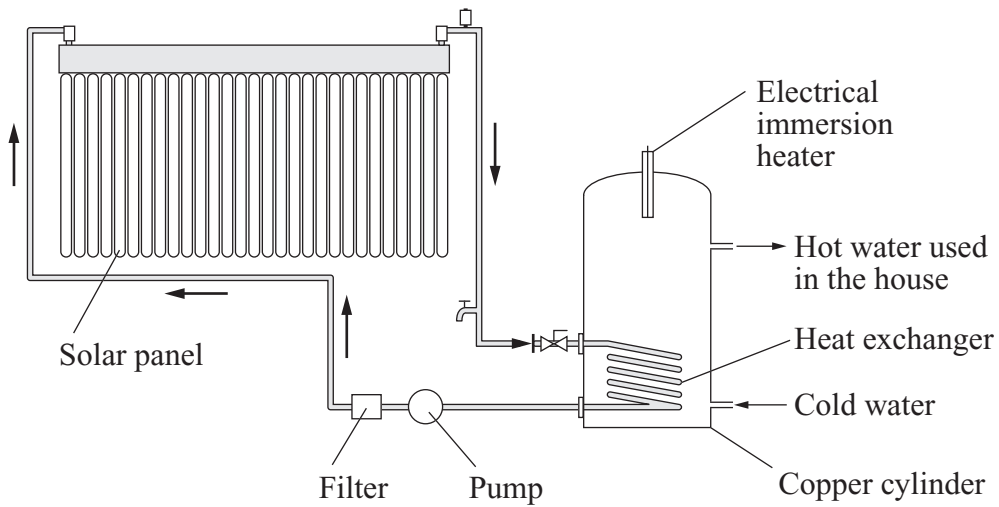
(2 marks)

9

Turn over for the next question

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9 A solar panel water heater was installed on the roof of a house to reduce electrical heating costs.



(a) The solar panel is mounted on the part of the roof that faces south.

Many small black plastic tubes carry water through the solar panel.

(i) Why is the solar panel mounted on the part of the roof that faces south?

.....

 (1 mark)

(ii) Why are many small tubes used instead of one large tube?

.....

 (1 mark)

(iii) Explain why the tubes are coloured black.

.....

 (2 marks)

(b) Water heated in the solar panel passes into a copper heat exchanger inside a copper cylinder, where it heats water for use in the house.

(i) Why is the heat exchanger made out of copper?

.....
(1 mark)

(ii) How is heat energy transferred from the heat exchanger to the water in the copper cylinder?

.....
(1 mark)

(iii) How is heat loss prevented from the copper cylinder?

.....
(1 mark)

(c) Before the solar panel was installed, a 3 kW immersion heater was used to heat the water.

The immersion heater was switched on for 4 hours each day.

(i) Use the equation to calculate the number of Units used by the 3 kW immersion heater in 4 hours.

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

.....
.....

Number of Units = kWh
(2 marks)

(ii) One unit of electricity costs 7p.

Calculate the cost of using the immersion heater for 4 hours.

.....
.....

Cost = p
(2 marks)

END OF QUESTIONS

There are no questions printed on this page