

Surname											Other Names										
Centre Number							Candidate Number														
Candidate Signature																					

For Examiner's Use

General Certificate of Secondary Education
January 2009

APPLIED SCIENCE (DOUBLE AWARD)
Unit 2 Science for the Needs of Society
Foundation Tier

APSC/2F
F



Thursday 15 January 2009 1.30 pm to 3.00 pm

<p>For this paper you must have:</p> <ul style="list-style-type: none"> • a ruler • a calculator.
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Time allowed: 1 hour 30 minutes

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be 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.

Advice

- In all calculations, show clearly how you work out your answer.

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



J A N O 9 A P S C 2 F O 1

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

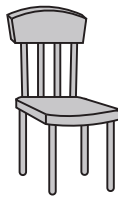
1 Useful products can be obtained from living things.

1 (a) Draw **one** line from each product to the living thing that produces it.

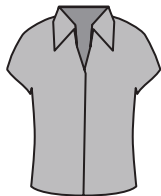
One has been done for you.

Product

Living thing



Wooden chair



Cotton shirt



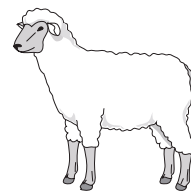
Woollen socks



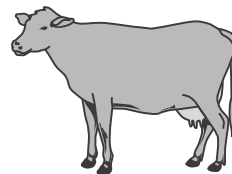
Leather shoes



Red food dye



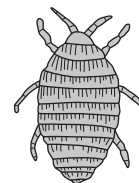
Sheep



Cow



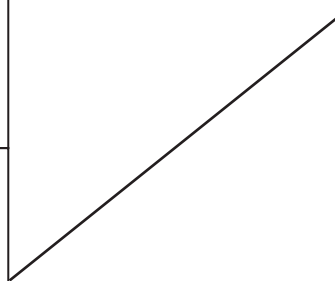
Tree



Insect



Plant



(3 marks)



- 1** (b) Some foods and medicines can be made using microorganisms.

Use words from the box to complete the following sentences.

bacteria

fungi

viruses

Yoghurt and cheese are made by growing in milk.

Penicillin is a drug that is produced using

(2 marks)

Question 1 continues on the next page

Turn over ►



- 1 (c) Beer is made by growing a microorganism in a solution containing sugar.

Read the recipe for making beer and then answer the questions that follow.

Making Beer

- 1 Carefully clean all the items that will come into contact with the brewing mixture.
- 2 Pour 10 litres of clean water into a large pan and bring to the boil.
- 3 Add malted barley and hops to the pan and continue to boil.
- 4 Allow to cool then pour the liquid from the mixture into a fermenting bucket.
- 5 Add yeast to the liquid.
- 6 Place a lid on the fermenting bucket and store at room temperature.
- 7 When fermentation is complete, the beer can be bottled.

- 1 (c) (i) Name the microorganism that is used to make beer.

.....
(1 mark)

- 1 (c) (ii) Name **one** other useful product that can be made using this microorganism.

.....
(1 mark)

- 1 (c) (iii) Bacteria will spoil the beer if they grow in the brewing mixture.

Give **two** methods in the recipe that are used to stop bacteria from growing in the brewing mixture.

1

.....

2

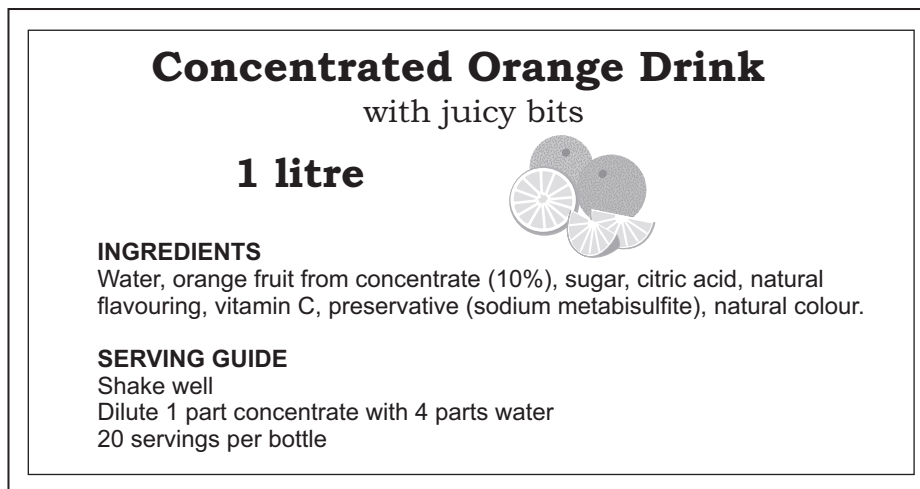
.....

(2 marks)



- 2 The label is from a bottle of drink manufactured in the UK.

Use the information on the label to help you to answer the questions.



- 2 (a) The bottle contains 1000 cm^3 of concentrated drink.

How much concentrated drink is used to make one serving?

.....
.....

..... cm^3
(2 marks)

- 2 (b) Name the chemical that is used to stop bacteria from growing in the drink.

.....
(1 mark)

- 2 (c) Concentrated Orange Drink contains both soluble and insoluble substances.

- 2 (c) (i) The soluble substances are dissolved in water.

Draw a ring around the name for this type of mixture.

emulsion foam gel solution suspension

(1 mark)

- 2 (c) (ii) The insoluble substances are mixed with the water but not dissolved.

Draw a ring around the name for this type of mixture.

emulsion foam gel solution suspension

(1 mark)

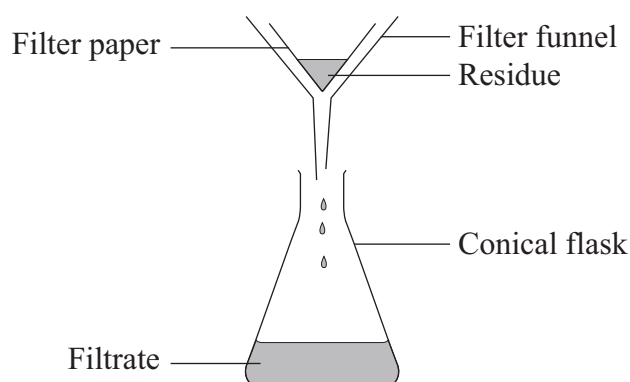
Turn over ►



- 2 (d) The manufacturer claims that 1000 cm^3 of Concentrated Orange Drink contains at least 1.5 g of insoluble solid.

A quality control technician carried out an experiment to prove that this is true. He used 100 cm^3 of Concentrated Orange Drink.

One of the steps that the technician took was to filter the drink to separate the insoluble solid.



- 2 (d) (i) The five steps of the method that the technician used are written in the table.

Complete the table by writing the numbers **2–5** to show the correct order for the steps in the method.

The first step has been done for you.

	Filter the drink using filter paper and a funnel.
	Weigh the dried filter paper and residue.
	Measure out 100 cm^3 of Concentrated Orange Drink using a measuring cylinder.
	Allow the filter paper and residue to dry.
1	Weigh a piece of clean filter paper.

(1 mark)



- 2 (d) (ii) The technician's results are shown below.

Mass of dried filter paper and residue = 1.57 g

Mass of clean filter paper = 1.38 g

Calculate the mass of insoluble solid in 1000 cm³ of Concentrated Orange Drink.

.....

.....

.....

.....

.....

..... g
(3 marks)

9

Turn over for the next question

Turn over ►



3 Gas and electricity are used to provide energy for devices around the home.

3 (a) Choose words from the box to name the most suitable source of energy for each of the devices listed.

batteries	mains electricity	bottled gas	mains gas
------------------	--------------------------	--------------------	------------------

3 (a) (i) A portable barbecue
(1 mark)

3 (a) (ii) A portable MP3 player
(1 mark)

3 (a) (iii) Central heating
(1 mark)

3 (b) Different types of energy resource are used to generate mains electricity.

The UK Government would like to increase the proportion of electricity generated, using renewable energy resources, to 20% by the year 2020.

3 (b) (i) Draw a ring around a renewable energy resource.

coal gas nuclear wind

(1 mark)

3 (b) (ii) Give **one** advantage of using a renewable energy resource to generate electricity.

.....

.....

(1 mark)



- 3 (c) (i) Bottled gas contains propane, C_3H_8 .

Complete the sentence about propane.

Propane is a compound containing the elements
and

(2 marks)

- 3 (c) (ii) Propane can be separated from crude oil by fractional distillation.

Name **two** other fuels that can be separated from crude oil by fractional distillation.

1

2
(2 marks)

- 3 (d) Mains gas contains methane.

Methane undergoes complete combustion when it burns in a good supply of air.

methane + oxygen \rightarrow carbon dioxide + water

Carbon monoxide is formed when methane burns in a poor supply of air.

- 3 (d) (i) Draw a ring around the chemical formula of methane.



(1 mark)

- 3 (d) (ii) Complete the sentence to explain why carbon monoxide is poisonous.

If we breathe air containing carbon monoxide, the carbon monoxide combines
with a chemical in the and it cannot carry
as much from the lungs.

(2 marks)

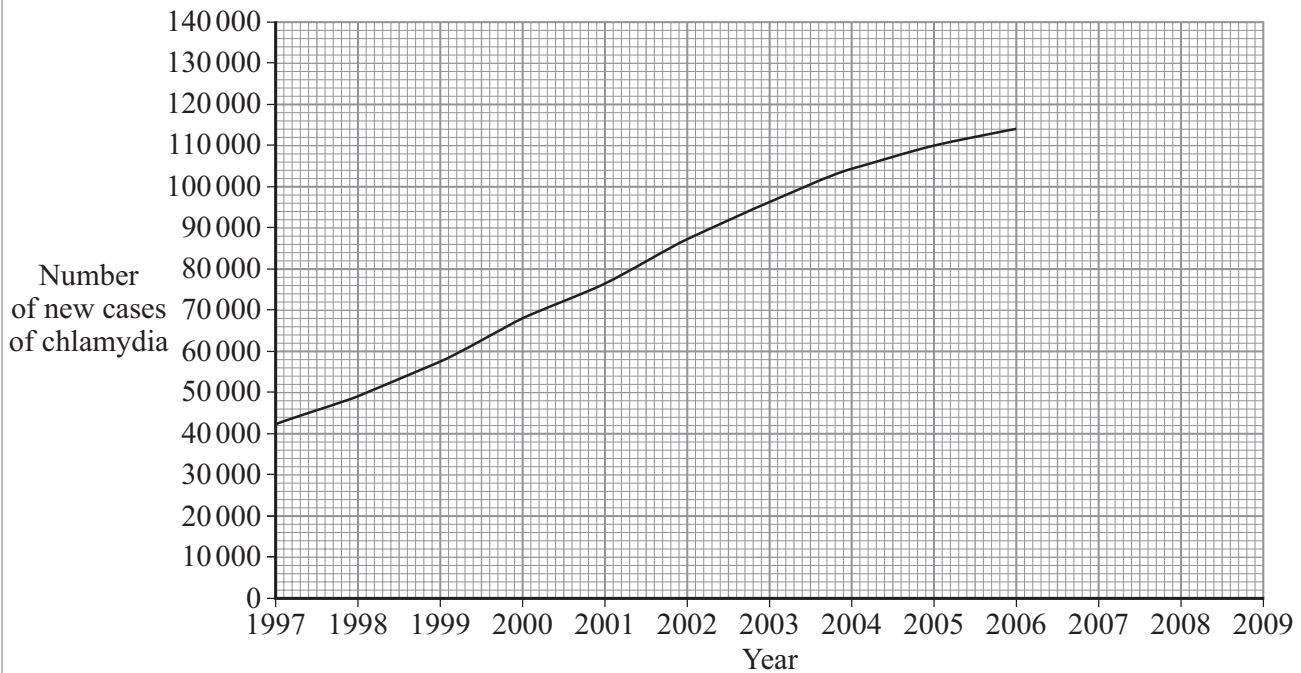


- 4 The number of sexually transmitted infections in the UK is increasing.

Health workers are worried about the increase.

One of these infections is called chlamydia.

- 4 (a) The graph shows the number of new cases of chlamydia each year in the UK from 1997 to 2006.



- 4 (a) (i) Continue the line on the graph to predict the change in the numbers of new cases from 2006 to 2009. *(1 mark)*

- 4 (a) (ii) Use the graph to estimate how many new cases of chlamydia there will be in 2009.

.....
(1 mark)

- 4 (a) (iii) Give **two** ways in which sexually transmitted infections and other diseases can be spread.

1

.....

2

.....

(2 marks)



- 4 (b) Sexually transmitted infections are caused by microorganisms.

Complete the sentences about the body's defence against microorganisms.

When microorganisms get into the body they multiply and cause damage
to The microorganisms are attacked
by blood cells. These cells also produce
..... , which help to destroy the microorganisms.

(3 marks)

- 4 (c) Medicines can be used to treat and prevent sexually transmitted infections.

- 4 (c) (i) Draw a ring around the type of medicine that can be used to treat some sexually transmitted infections.

antibiotic

anti-depressant

painkiller

vaccine

(1 mark)

- 4 (c) (ii) Draw a ring around the type of medicine that can be used to prevent some sexually transmitted infections.

antibiotic

anti-depressant

painkiller

vaccine

(1 mark)

9

Turn over for the next question

Turn over ►



- 5 Environmental scientists test samples of sea water to check the levels of pollution.

They do this by measuring the masses of chemicals in the water.

The table lists the masses of the positive and negative ions dissolved in a sample of sea water.

Use the data in the table to answer the questions.

Positive ions		Mass (in grams) in 1000 grams of sea water	Negative ions		Mass (in grams) in 1000 grams of sea water
Calcium	Ca^{2+}	0.4	Bromide	Br^-	0.07
Potassium	K^+	0.4	Chloride	Cl^-	19.0
Magnesium	Mg^{2+}	1.3	Hydrogencarbonate	HCO_3^-	0.1
Sodium	Na^+	11.0	Sulfate	SO_4^{2-}	2.5

- 5 (a) Sodium chloride is the most common ionic compound in sea water.

Write the chemical formula of sodium chloride.
(1 mark)

- 5 (b) MgSO_4 can be separated from sea water.

Name this ionic compound.
.....
(1 mark)

- 5 (c) Use words from the box to complete the following sentences.

evaporates	condenses	high	low	strong	weak
------------	-----------	------	-----	--------	------

When sea water is heated the water because it has
aboiling point. The ionic compounds are left behind,
because they have very forces between the particles.
(3 marks)



- 5 (d) Describe an experiment that you could do in the laboratory to measure the total mass of ionic compounds dissolved in 1000 g of sea water.

.....

.....

.....

.....

.....

.....

.....

(3 marks)

- 5 (e) Sea water is polluted by the chemicals used in intensive farming.

- 5 (e) (i) Give **two** reasons why farmers use chemicals in intensive farming.

1

.....

2

.....

(2 marks)

- 5 (e) (ii) Explain how the chemicals used in intensive farming get into sea water.

.....

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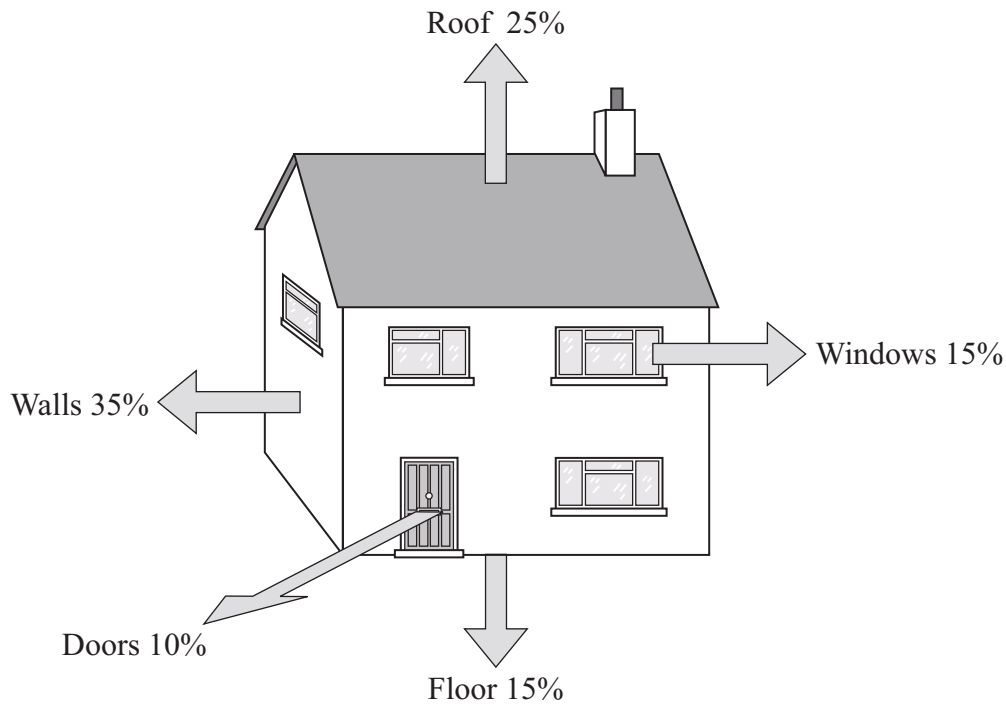
.....

.....

(3 marks)



6 The diagram shows how much heat energy is lost from different parts of a house.



6 (a) Complete the sentences about how heat energy is lost by drawing a ring around the correct word in each box.

6 (a) (i) The movement of hot air leads to heat loss by

conduction
convection
radiation

(1 mark)

6 (a) (ii) Good insulation can prevent heat loss by

conduction
convection
radiation

(1 mark)

6 (a) (iii) Heat will be lost from a dark-coloured roof by

conduction
convection
radiation

(1 mark)



6 (b) A homeowner would like to reduce the amount of heat energy lost from her home.

6 (b) (i) Describe how the homeowner could reduce the heat lost through the windows.

.....

.....
(1 mark)

6 (b) (ii) Describe how the homeowner could reduce the heat lost through the floors.

.....

.....
(1 mark)

6 (b) (iii) Describe how the homeowner could reduce the heat lost through the walls.

.....

.....
(1 mark)

Question 6 continues on the next page

Turn over ►



- 6 (c) The homeowner can save energy by using more efficient electrical devices in her home.

- 6 (c) (i) A 0.5 kW electric motor is used to circulate air in the kitchen.

Calculate the energy supplied to the motor when it is switched on for 3 hours.

$$\text{Energy supplied (kilowatt-hours)} = \text{power (kilowatts)} \times \text{time (hours)}$$

.....
.....

Energy supplied = kilowatt-hours
(2 marks)

- 6 (c) (ii) Calculate the percentage efficiency of the motor if it transfers 1.1 kilowatt-hours of useful energy.

Percentage efficiency can be calculated using the following formula.

$$\% \text{ efficiency} = \frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}} \times 100$$

.....
.....

Percentage efficiency = %
(2 marks)

- 6 (c) (iii) What happens to the energy that is **not** transferred by the device?

.....
.....

(1 mark)



Turn over for the next question

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7 Agricultural scientists use genetic engineering to improve food production.

7 (a) Give **one** advantage of using genetically modified (GM) plants for farming.

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

(1 mark)

7 (b) Give **one** reason why some shoppers prefer to buy non-GM foods.

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

(1 mark)

7 (c) Plants produce food by photosynthesis.

7 (c) (i) Complete the word equation for photosynthesis.

..... + water → glucose +
(2 marks)

7 (c) (ii) Photosynthesis is an *endothermic* reaction.

What is an *endothermic* reaction?

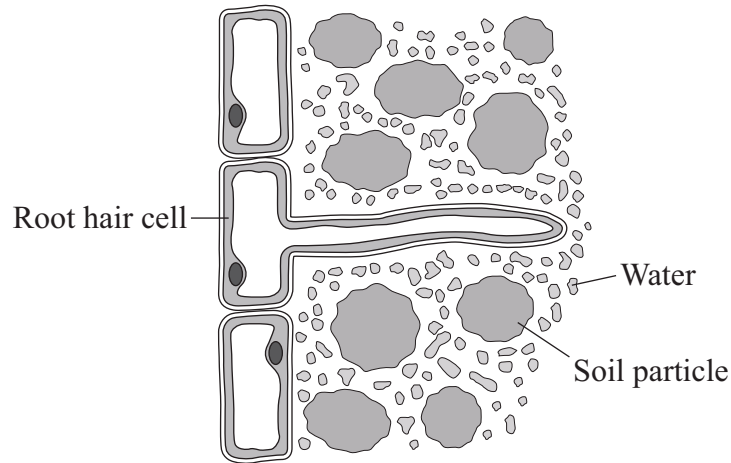
.....
.....
.....

(1 mark)



- 7 (d) Plants obtain water for photosynthesis from the soil.

The structure of a root hair cell enables the plant to absorb water from the soil.



- 7 (d) (i) Name **two** parts of a plant cell that are **not** found in animal cells.

1

2 (2 marks)

- 7 (d) (ii) Describe **one** feature of the structure of the root hair cell that helps it to absorb water from the soil.

.....

..... (1 mark)

- 7 (d) (iii) Name the process for the movement of water from the soil into the root hair cell.

.....

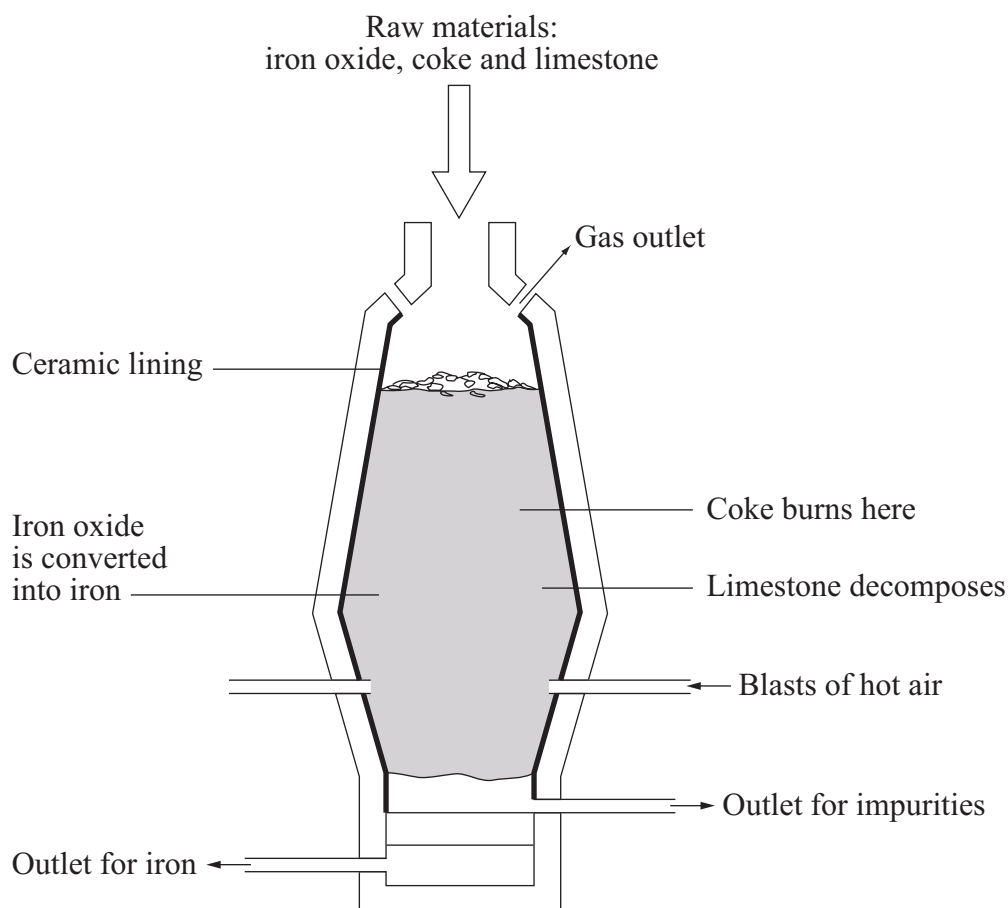
(1 mark)



8 Iron is extracted from iron oxide on a large scale in a blast furnace.

A mixture of iron oxide, coke and limestone is fed into the top of the furnace.

Blasts of hot air are blown into the bottom of the furnace.



8 (a) The furnace lining is made from a ceramic material.

Give **one** property of a ceramic that makes it a good choice for lining a furnace.

.....
(1 mark)

8 (b) Limestone (calcium carbonate) decomposes in the heat of the furnace.

Complete the word equation for the decomposition of limestone.

calcium carbonate → +
(2 marks)



- 8 (c) Coke (carbon) is a reducing agent.

Describe how a reducing agent converts iron oxide, Fe_2O_3 , into iron, Fe.

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.....

.....

.....

(2 marks)

- 8 (d) The iron produced in the blast furnace is converted into steel.

Explain the difference between iron and steel.

.....

.....

.....

.....

.....

(2 marks)

- 8 (e) The production of iron and steel results in the release of large quantities of carbon dioxide, which causes environmental pollution.

- 8 (e) (i) Write a chemical equation to show the formation of carbon dioxide in the blast furnace.

.....

(1 mark)


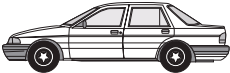


- 8 (e) (ii) Give **one** other example of environmental pollution caused by the production of iron and steel.

.....

(1 mark)



9 Transport engineers compare the performance of different types of vehicle.

			
Small car	Saloon car	Multi-purpose vehicle (MPV)	4 × 4

Use data from the table to help you to answer the questions.

Type of car	Miles per gallon	Acceleration time in seconds 0–100 km/h	Top speed in km/h	CO ₂ emissions in g/km
Small car	63	9.3	193	119
Saloon car	51	8.6	221	146
Multi-purpose vehicle	45	8.8	206	167
4 × 4	32	9.1	180	242

9 (a) Explain why driving a small car is better for the environment than driving a 4 × 4.

.....

.....

.....

.....

(2 marks)

9 (b) Use the formula to calculate the distance travelled by the saloon car if it is driven at top speed for one minute.

Distance travelled (km) = speed (km/h) × time (h)

.....

.....

.....

.....

Distance = km
(2 marks)



9 (c) The multi-purpose vehicle takes 8.8 seconds to accelerate from 0 to 100 000 metres per hour.

9 (c) (i) Show that a speed of 100 000 metres per hour is the same as 27.78 metres per second.

.....

.....

.....

.....

.....

(2 marks)

9 (c) (ii) Calculate the acceleration of the multi-purpose vehicle in m/s^2 .

.....

.....

.....

.....

Acceleration = m/s^2
(3 marks)

9

END OF QUESTIONS



There are no questions printed on this page

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