Cambridge Assessment

GCSE

Chemistry A

Session: 2010 June
Type: Question paper
Code: J634
Units: A321; A322; A323

OCR
RECOGNISING ACHIEVEMENT

F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE CHEMISTRY A

A321/01

Unit 1: Modules C1 C2 C3 (Foundation Tier)

OCE/16246

Candidates answer on the Question Paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:
- Pencil
- Ruler (cm/mm)

Friday 18 June 2010
Afternoon

Duration: 40 minutes

A321 01

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **42**.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

1 **(a)** The acidification of rivers, lakes and soil takes place when acid rain falls on them.

(i) Sulfur dioxide is one cause of acid rain.

Which of these processes is the main source of sulfur dioxide in the air?

Put a tick (✓) in the box next to the correct answer.

gases breathed out by animals ☐

the burning of fuels containing sulfur compounds ☐

the spreading of fertiliser on fields ☐ **[1]**

(ii) Sulfur dioxide reacts with two chemicals in the air to form acid rain.

Which chemicals in the air does it react with?

Put a (ring) around each of the **two** correct answers.

argon **carbon dioxide** **nitrogen** **oxygen** **water** **[2]**

(iii) The lists show some names of gases and their formulae.

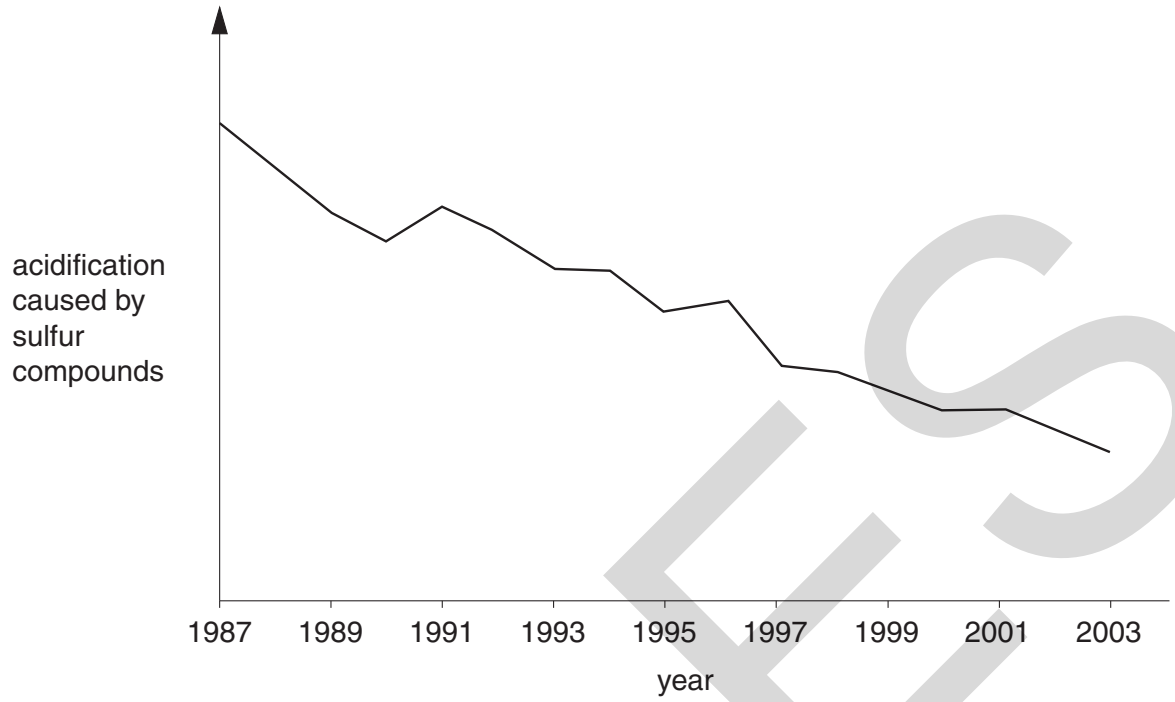
Only one of these gases causes acid rain.

Put a (ring) around the **name** and a (ring) around the **formula** of the gas that causes acid rain.

nitrogen	**nitrogen dioxide**	**oxygen**	**water vapour**
H_2O	**N_2**	**NO_2**	**O_2**

[2]

(b) The graph shows how the acidification of rivers and lakes caused by sulfur compounds changed between 1987 and 2003 in the United Kingdom.



The graph shows that acidification caused by sulfur compounds fell from 1987 to 2003.

Which of these statements are reasons for this fall?

Put ticks (✓) in the boxes next to the **two** best reasons.

There was a decrease in the number of cars sold. ☐

More cars and power stations changed to using low sulfur fuels. ☐

There was an increase in the number of electrical appliances in people's homes. ☐

More cars were fitted with catalytic converters. ☐

More power stations were fitted with devices to remove sulfur compounds from flue gases. ☐

More people changed from driving cars to using public transport. ☐ **[2]**

(c) There is a set limit to the amount of each pollutant gas a power station is allowed to release.

Who decides this limit?

Put a tick (✓) in the box next to the correct answer.

people living near the power station	☐
people working in the power station	☐
the Government	☐
the companies supplying fuel to the power station	☐

[1]

[Total: 8]

2 Petrol is a mixture of hydrocarbons.

When hydrocarbons burn completely in air the products are carbon dioxide and water.

In a car engine they burn incompletely, also producing carbon monoxide.

Modern cars are fitted with catalytic converters, which decrease the amount of carbon monoxide that is released into the air.

(a) Scientists test two types of catalytic converter: an old model and a new model.

For each catalytic converter, fitted to the same engine, the scientists took several measurements of the percentage of carbon monoxide in the exhaust gas.

They used their results to get a best estimate of the percentage of carbon monoxide released from each catalytic converter.

	percentage of carbon monoxide					
	sample 1	**sample 2**	**sample 3**	**sample 4**	**sample 5**	**best estimate**
old catalytic converter	0.243	0.246	0.243	0.245	0.243	0.244
new catalytic converter	0.168	0.170	0.168	0.167	0.167	

(i) Taking several measurements gives a better estimate of the percentage of carbon monoxide released than taking just one measurement.

Explain why.

.....

.....

.....

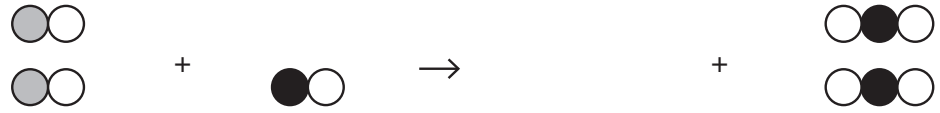
..... **[2]**

(ii) Calculate the best estimate for the **new** catalytic converter.

best estimate = ... % **[2]**

(b) A reaction taking place in each catalytic converter decreases the amount of carbon monoxide released.

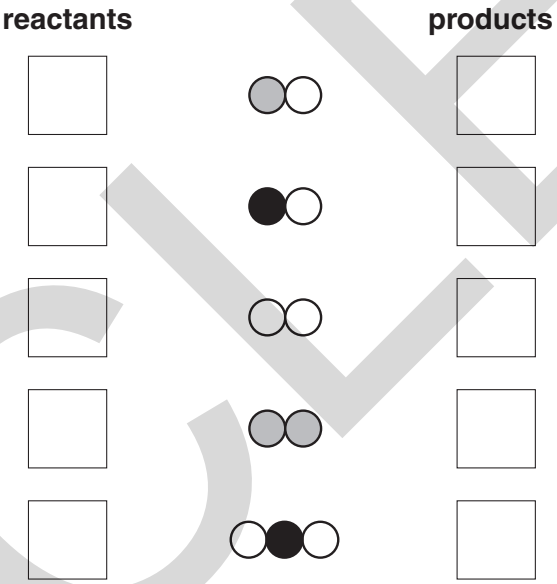
The diagram shows the reactants and products for this reaction.



nitrogen monoxide + carbon monoxide → nitrogen + carbon dioxide

Two molecules are missing from the diagram, **one** from the reactants and **one** from the products.

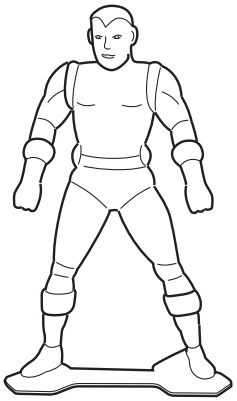
Put ticks (✓) in the boxes to show which molecule should be added to the **reactants** and which molecule should be added to the **products**.



[2]

[Total: 6]

3 A toy company wants to make plastic models using a polymer.



Scientists working for the company test two different polymers to find the temperature at which each polymer melts.

	melting temperature in °C					
	sample 1	**sample 2**	**sample 3**	**sample 4**	**sample 5**	**mean**
polymer **A**	135	137	135	134	134	135
polymer **B**	265	265	264	262	264	264

(a) (i) What is the best estimate for the true value of the melting temperature for polymer **A**?

best estimate = ... °C **[1]**

(ii) What is the range of the data for polymer **A**?

range = ... °C to ..... °C **[1]**

(iii) The scientists consider that the data for both polymers are reliable.

What information in the table suggests that this is true?

Put a tick (✓) in the box next to the correct answer.

The results for polymer **B** are much higher than those for polymer **A**. ☐

For each set of results two of the samples have the same value as the mean. ☐

The mean for each set of results is near to the middle of the range. ☐

Each set of results has a narrow range. ☐ **[1]**

(iv) The results for polymer **A** are not all identical.

Which of these statements gives a reason for the differences?

Put a tick (✓) in the box next to the **best** answer.

The scientists made many errors in their measurements.	☐
Samples of the same polymer show small variations in structure.	☐
Each polymer can have several different melting points.	☐

[1]

(b) One of these polymers will be chosen to make the models.

It will be melted and forced into moulds to make the shapes.

(i) After looking at the melting temperature data, the scientists suggest that the company uses polymer **A** to make their models.

Suggest why and explain your answer.

.....

.....

.....

..... **[2]**

(ii) The company considers other properties before choosing the best polymer to make the models.

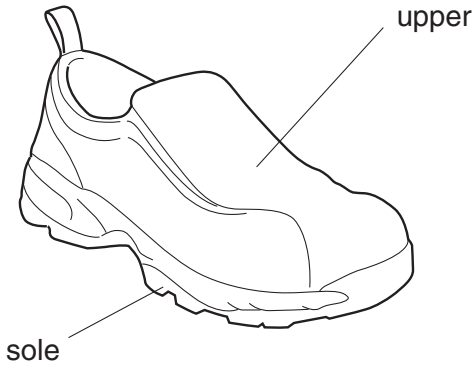
From each **property** draw a line to the **reason** why this property is important.

property	reason
strength	so that the models do not bend too easily
durability	so that the models last a long time
stiffness	so that the models are not easy to break

[2]

[Total: 8]

4 For many products, new materials have replaced the materials that were used in the past. These new materials often have better properties than the old ones.



Soles of shoes used to be made of leather.

Soles of shoes are now usually made from polyurethane.

The change of material for shoe soles is shown in the **first example** in the table.

	first example	**second example**
product	shoe sole	
old material	leather	
new material	polyurethane	
advantage of new material	more durable	

(a) Complete the table by filling in the details of a **second example** that does not involve shoes. **[3]**

(b) The Life Cycle Assessment (LCA) of a shoe with a polyurethane sole is different to that of a shoe with a leather sole.

Which of these reasons explain this difference?

Put ticks (✓) in the boxes next to the **three** best reasons.

Leather is renewable but polyurethane is not.	☐
Leather has a more attractive appearance than polyurethane.	☐
Leather is more expensive to buy than polyurethane.	☐
Leather will rot when disposed of in landfill but polyurethane will not.	☐
The manufacture of polyurethane uses more energy than the manufacture of leather.	☐
Leather has been used for a longer period of time than polyurethane.	☐ **[2]**

(c) The use of leather to make shoes is more sustainable than the use of plastics such as polyurethane.

Which statement explains this?

Put a tick (✓) in the box next to the **best** answer.

Plastics are made using chemicals from crude oil.	☐
Leather is made from animal skins.	☐
Leather can be obtained without spoiling the environment for the future.	☐
Leather is hard wearing so the product will last a long time.	☐ **[1]**

[Total: 6]

5 Diabetes is a disorder that affects the way the body processes sugar.

In a person with diabetes, less sugar is removed from the blood for storage in the liver.

The resulting high blood sugar level causes symptoms such as excessive thirst, weight loss and poor vision. When untreated, it can lead to coma and death.

There are two types of diabetes: type 1 and type 2.

(a) Decide whether each **statement** best applies to **type 1 diabetes** or **type 2 diabetes**.

Put a tick (✓) in the correct box in each row.

statement	type 1 diabetes	type 2 diabetes
cannot be controlled by diet and exercise		
is less likely to occur in young people		
is caused when the body no longer responds to its own insulin		

[2]

(b) (i) When a person eats a chocolate bar their blood sugar level rises quickly.

Which statements explain how this happens?

Put ticks (✓) in the boxes next to the **two** best answers.

The chocolate bar contains a lot of sugar. ☐

The chocolate bar contains a lot of fat. ☐

Fat is quickly digested into sugar. ☐

Sugar is quickly absorbed into the blood stream. ☐ **[2]**

(ii) People who are obese are more likely to develop type 2 diabetes. Despite the higher risk, many people eat a poor diet and become obese.

Suggest why a person may eat a poor diet despite the higher risk of developing type 2 diabetes.

.....

.....

.....

..... **[2]**

[Total: 6]

6 Plants obtain nitrogen by absorbing nitrogen compounds from the soil. When crops are harvested this nitrogen is not returned to the soil.

(a) Complete this sentence to describe how plants use this nitrogen.

Use words from the list.

amino acids **carbohydrates** **proteins** **starch** **sugars**

Plants use nitrogen to make small molecules called ..... which are then used to make natural polymers called ..... . **[2]**

(b) Synthetic fertilisers are not used in organic farming. Instead nitrogen compounds are added to the soil in other ways.

One way is to add manure.

Describe and explain one **other** organic farming method that adds nitrogen compounds to the soil.

.....

.....

.....

..... **[2]**

(c) Farmers protect their crops from attack by pests and competition from weeds.

(i) Describe the methods used to do this in **organic** farming.

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.....

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..... **[3]**

(ii) The methods used in **organic** farming have less impact on the environment than those used in **intensive** farming.

Explain why.

.....

.....

..... **[1]**

[Total: 8]

END OF QUESTION PAPER

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GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE CHEMISTRY A

A321/02

Unit 1: Modules C1 C2 C3 (Higher Tier)

OCE/16247

Candidates answer on the Question Paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:
- Pencil
- Ruler (cm/mm)

Friday 18 June 2010
Afternoon

Duration: 40 minutes

A321 02

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

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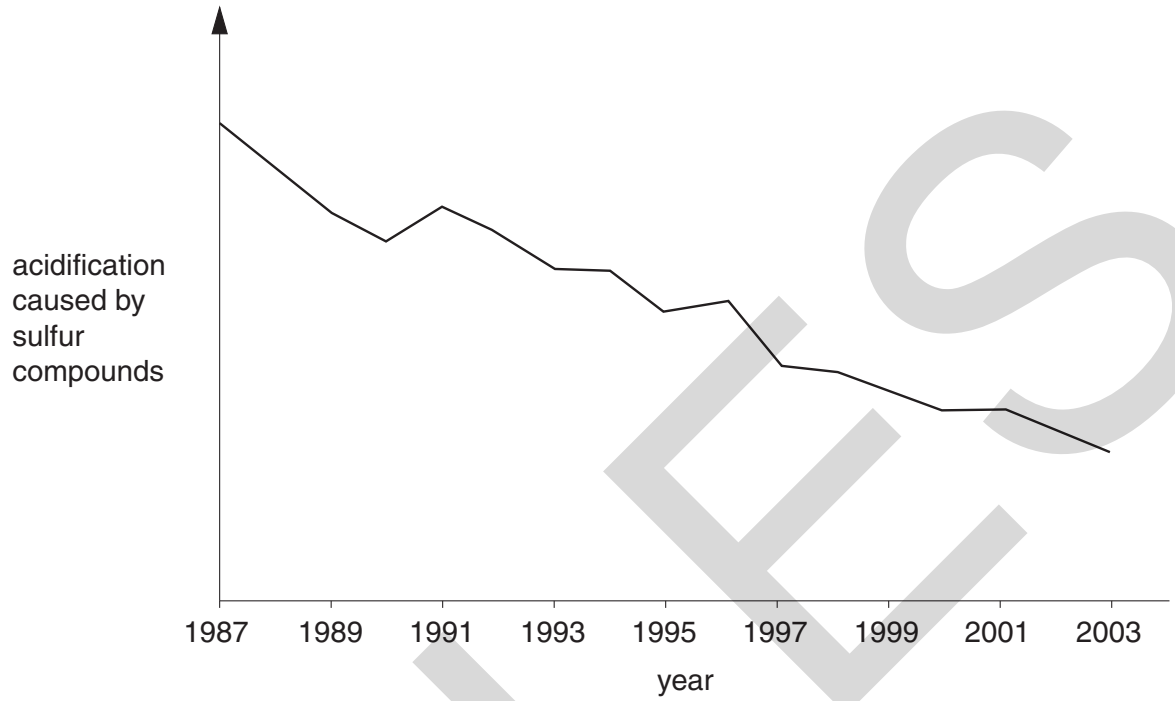
Answer **all** the questions.

1 The graph shows how the acidification of rivers and lakes caused by sulfur compounds changed between 1987 and 2003 in the United Kingdom.



(a) The graph shows that acidification caused by sulfur compounds fell from 1987 to 2003.

Which of these statements are reasons for this fall?

Put ticks (✓) in the boxes next to the **two** best reasons.

There was a decrease in the number of cars sold. ☐

More cars and power stations changed to using low sulfur fuels. ☐

There was an increase in the number of electrical appliances in people's homes. ☐

More cars were fitted with catalytic converters. ☐

More power stations were fitted with devices to remove sulfur compounds from flue gases. ☐

More people changed from driving cars to using public transport. ☐ **[2]**

(b) Much of the acidification shown in the graph is caused by acid rain.

Describe how the burning of fuel in a power station leads to the formation of acid rain.

.....

.....

.....

.....

..... **[3]**

(c) Acid rain is also formed from nitrogen dioxide.

Look at these statements.

A Air and petrol vapour enter the car engine.

B Nitrogen in petrol reacts with oxygen from air to form nitrogen monoxide.

C Nitrogen monoxide is released into the air from the car exhaust.

D Nitrogen dioxide is released into the air from the car exhaust.

E Nitrogen monoxide reacts with oxygen in the air to make nitrogen dioxide.

F Fuel burns in the car engine releasing heat to produce a very high temperature.

G Nitrogen and oxygen from air react to form nitrogen monoxide.

Choose the **five** statements which correctly describe how the burning of fuel in car engines results in the formation of nitrogen dioxide.

Then put the statements in the correct order in the boxes. The first one has been done for you.

A				

[3]

[Total: 8]

2 Petrol is a mixture of hydrocarbons.

When hydrocarbons burn completely in air the products are carbon dioxide and water.

In a car engine they burn incompletely, also producing carbon monoxide.

Modern cars are fitted with catalytic converters, which decrease the amount of carbon monoxide that is released into the air.

(a) Scientists test two types of catalytic converter: an old model and a new model.

For each catalytic converter, fitted to the same engine, the scientists took several measurements of the percentage of carbon monoxide in the exhaust gas.

They used their results to get a best estimate of the percentage of carbon monoxide released from each catalytic converter.

	percentage of carbon monoxide					
	sample 1	**sample 2**	**sample 3**	**sample 4**	**sample 5**	**best estimate**
old catalytic converter	0.243	0.246	0.243	0.245	0.243	0.244
new catalytic converter	0.168	0.170	0.198	0.167	0.167	

(i) Taking several measurements gives a better estimate of the percentage of carbon monoxide released than taking just one measurement.

Explain why.

.....

.....

.....

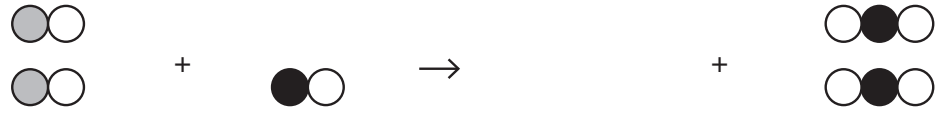
..... **[2]**

(ii) Calculate the best estimate for the **new** catalytic converter.

best estimate = ... % **[2]**

(b) A reaction taking place in each catalytic converter decreases the amount of carbon monoxide released.

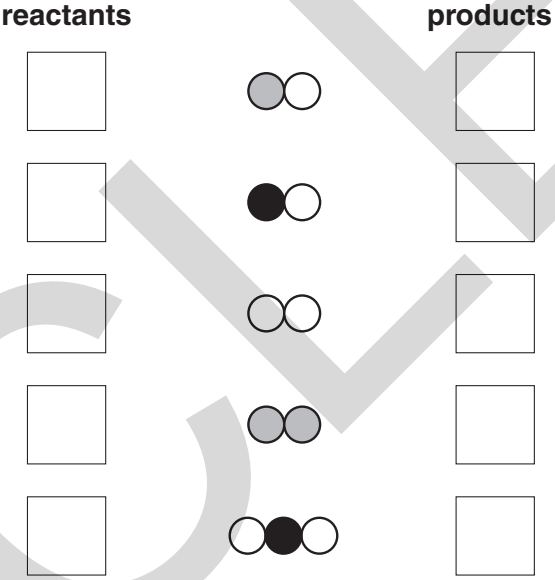
The diagram shows the reactants and products for this reaction.



nitrogen monoxide + carbon monoxide → nitrogen + carbon dioxide

Two molecules are missing from the diagram, **one** from the reactants and **one** from the products.

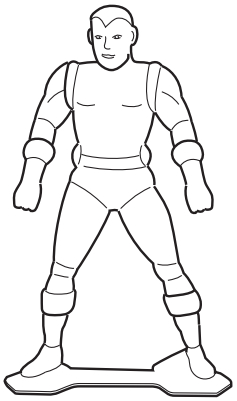
Put ticks (✓) in the boxes to show which molecule should be added to the **reactants** and which molecule should be added to the **products**.



[2]

[Total: 6]

3 A toy company wants to make plastic models using a polymer.



Scientists working for the company test two different polymers to find the temperature at which each polymer melts.

	melting temperature in °C					
	sample 1	**sample 2**	**sample 3**	**sample 4**	**sample 5**	**mean**
polymer **A**	135	137	135	134	134	135
polymer **B**	265	265	264	262	264	264

(a) The scientists tested polymer samples of the same size.

They used the same equipment, in the same way, each time.

Explain why it is necessary to control factors in this way.

.....

.....

.....

..... **[2]**

(b) Polymer **A** and polymer **B** are both made from the same small molecules.

(i) Which statements explain why polymer **A** has a lower melting temperature than polymer **B**?

Put ticks (✓) in the boxes next to the **two** best answers.

The forces of attraction between the atoms in each molecule of polymer **A** are weaker.	☐
The forces of attraction between the molecules of polymer **A** are weaker.	☐
Different atoms in the two polymers are bonded together in different ways.	☐
Some atoms in the two polymers have stronger forces of attraction between them than others.	☐
The higher the force of attraction between molecules, the more energy is needed to separate them.	☐

[2]

(ii) Suggest two modifications that may have been made to polymer **B** to make it melt at a higher temperature than polymer **A**.

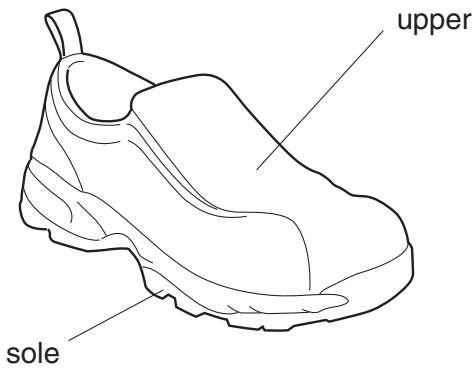
modification 1 .....

modification 2 .....

[2]

[Total: 6]

4 For many products, new materials have replaced the materials that were used in the past. These new materials often have better properties than the old ones.



Soles of shoes used to be made of leather.

Soles of shoes are now usually made from polyurethane.

(a) (i) The Life Cycle Assessment (LCA) of a shoe with a polyurethane sole is different to that of a shoe with a leather sole.

Which of these reasons explain this difference?

Put ticks (✓) in the boxes next to the **three** best reasons.

Leather is renewable but polyurethane is not.	☐
Leather has a more attractive appearance than polyurethane.	☐
Leather is more expensive to buy than polyurethane.	☐
Leather will rot when disposed of in landfill but polyurethane will not.	☐
The manufacture of polyurethane uses more energy than the manufacture of leather.	☐
Leather has been used for a longer period of time than polyurethane.	☐ **[2]**

(ii) A shoemaker in a developing country is more likely to use leather than plastics.

Which statements give the best explanation for this?

Put ticks (✓) in the boxes next to the **two** best answers.

Plastics have to be imported and so are more expensive than leather. ☐

It is easier to make shoes from leather than from plastics. ☐

Leather is more durable, so the shoes will last longer. ☐

Leather can be made locally from animals kept in the area. ☐

Plastic shoes are not suitable for wearing in a developing country. ☐ **[2]**

(b) The plastic polyurethane is used to make shoe soles and the foam filling for sofas.

The contribution made by polyurethane to the Life Cycle Assessment (LCA) of a shoe is different to that for a sofa.

Which of these statements explain this difference?

Put ticks (✓) in the boxes next to the **three** best answers.

A sofa is likely to last a lot longer before disposal than a pair of shoes. ☐

Manufacturing the two products from polyurethane uses different amounts of energy. ☐

The polyurethane used in foam is made from different small molecules to that used in shoe soles. ☐

Turning polyurethane into foam uses chemicals that are not used to make a shoe sole. ☐

Polyurethane foam will rot quickly in landfill but polyurethane shoe soles will not. ☐

Making the polyurethane used for foam takes more energy than making the polyurethane used for shoe soles. ☐ **[3]**

[Total: 7]

5 Diabetes is a disorder that affects the way the body processes sugar.

In a person with diabetes, less sugar is removed from the blood for storage in the liver.

The resulting high blood sugar level causes symptoms such as excessive thirst, weight loss and poor vision. When untreated, it can lead to coma and death.

There are two types of diabetes: type 1 and type 2.

(a) (i) Decide whether each **statement** best applies to **type 1 diabetes** or **type 2 diabetes**.

Put a tick (✓) in the correct box in each row.

statement	type 1 diabetes	type 2 diabetes
cannot be controlled by diet and exercise		
is less likely to occur in young people		
is caused when the body no longer responds to its own insulin		

[2]

(ii) People who have diabetes are told to avoid food that has a high sugar content.

Which of these statements, when taken together, use ideas of **risk and consequence** to suggest why they should avoid this food?

Put ticks (✓) in the boxes next to the **two** correct answers.

Only a few food items have a high sugar content. ☐

Eating food with a high sugar content will cause a person with diabetes to have a high blood sugar level. ☐

Avoiding food with a high sugar content helps a person to avoid getting overweight. ☐

Both types of diabetes involve the way the body processes sugar. ☐

A high blood sugar level may lead to serious symptoms. ☐

When the sugar level in the blood rises, the liver stores the excess sugar. ☐ **[2]**

(b) People who have diabetes may choose to eat foods that contain the sweetener sorbitol instead of glucose.

It has been suggested that eating high levels of sorbitol may cause digestive problems for some people.

Four friends talk about eating foods sweetened with sorbitol.

Which **two** people's views, when taken together, describe how to apply the **precautionary principle** to eating foods containing sorbitol?

Put ticks (✓) in the boxes next to the two **best** answers.

Jason ☐

Rosie ☐

Steve ☐

Emma ☐ **[2]**

[Total: 6]

6 Plants obtain nitrogen by absorbing nitrogen compounds from the soil. When crops are harvested this nitrogen is not returned to the soil.

(a) Complete this sentence to describe how plants use the nitrogen in nitrogen compounds that they absorb from the soil.

Plants use nitrogen to make small molecules called ..... which are then used to make natural polymers called ..... . **[2]**

(b) Some nitrogen is added to soil by natural processes that require no action from farmers.

Which two statements, when taken together, describe one of these natural processes?

Put ticks (✓) in the boxes next to the **two** correct statements.

Lightning makes oxygen and nitrogen react to form nitrogen oxides.	☐
Plants absorb nitrogen gas from the air.	☐
Ammonia is made from nitrogen and hydrogen.	☐
Nitrogen oxides dissolve in rain which falls on the soil.	☐
Ammonia is used to make nitrates to use as fertiliser.	☐
Plants use nitrogen gas to make nitrates.	☐ **[2]**

(c) Synthetic fertilisers are not used in organic farming. Instead nitrogen compounds are added to the soil in other ways.

One way is to add manure.

Describe and explain one **other** organic farming method that adds nitrogen compounds to the soil.

.....

.....

.....

..... **[2]**

(d) Most farmers in the United Kingdom add synthetic fertilisers to their soil. Most farmers in developing countries add manure instead.

Suggest reasons for this difference.

.....

.....

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.....

.....

..... **[3]**

[Total: 9]

END OF QUESTION PAPER

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RECOGNISING ACHIEVEMENT

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GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE CHEMISTRY A

A322/01

Unit 2: Modules C4 C5 C6 (Foundation Tier)

OCE/17076

Candidates answer on the Question Paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:
- Pencil
- Ruler (cm/mm)

Monday 28 June 2010
Morning

Duration: 40 minutes

A322201

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

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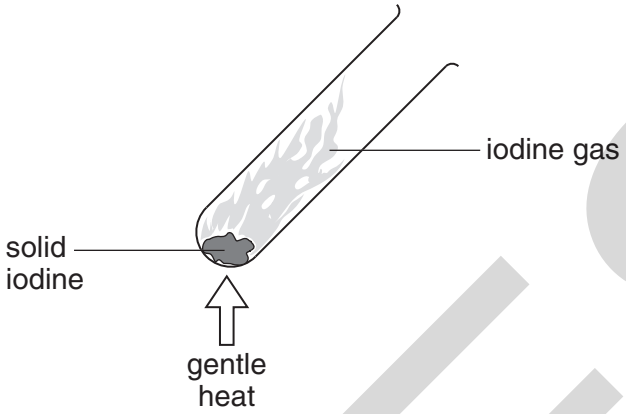
- The total number of marks for this paper is **42**.
- This document consists of **16** pages. Any blank pages are indicated.
- The Periodic Table is printed on the back page.

Answer **all** the questions.

1 Iodine is a halogen in Group 7 of the Periodic Table.

Marty warms a small crystal of iodine in a test tube.



(a) What colour change will Marty see when solid iodine changes into iodine gas?

Put a tick (✓) in the box next to the correct answer.

dark grey to orange ☐

orange to yellow ☐

dark grey to purple ☐

green to brown ☐ **[1]**

(b) The equation shows what happens when iodine changes from a solid to a gas.

Complete the symbol equation by filling in the missing formula and state symbols.

iodine solid → iodine gas

I_2 (s) → ..... (.....)

[2]

(c) Marty finds some information about other halogens in Group 7.

name of halogen	melting point in °C	boiling point in °C	reactivity	formula of potassium salt
fluorine	–220	–188	most reactive halogen	.....
chlorine	–101	–35	less reactive than fluorine more reactive than bromine	KCl
bromine	–7	59	less reactive than chlorine more reactive than iodine	KBr

(i) Fill in the missing formula for potassium fluoride. **[1]**

(ii) Use information from the table to describe the trends in properties of the elements down Group 7.

.....

.....

.....

.....

..... **[3]**

(d) Astatine is another halogen. It is below iodine in Group 7.

Complete the sentences about astatine by putting a (ring) around the correct word in each sentence.

Astatine is a **metal / non-metal**.

The atomic mass of astatine is **bigger / smaller** than the atomic mass of iodine.

Astatine is **more / less** reactive than iodine. **[2]**

[Total: 9]

2 Lithium is in Group 1.

Alex watches a video about lithium.

The video shows a piece of lithium being cut with a knife.

(a) What does Alex see when the freshly cut surface of lithium comes in contact with air?

Put a tick (✓) in the box next to the correct answer.

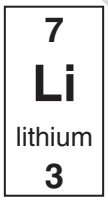
It starts to fizz. ☐

It expands. ☐

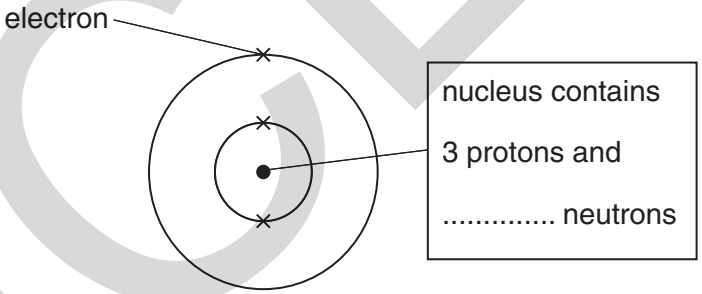
It catches fire. ☐

It goes from shiny to dull. ☐ **[1]**

(b) The Periodic Table shows this information for lithium.



The diagram shows an atom of lithium.

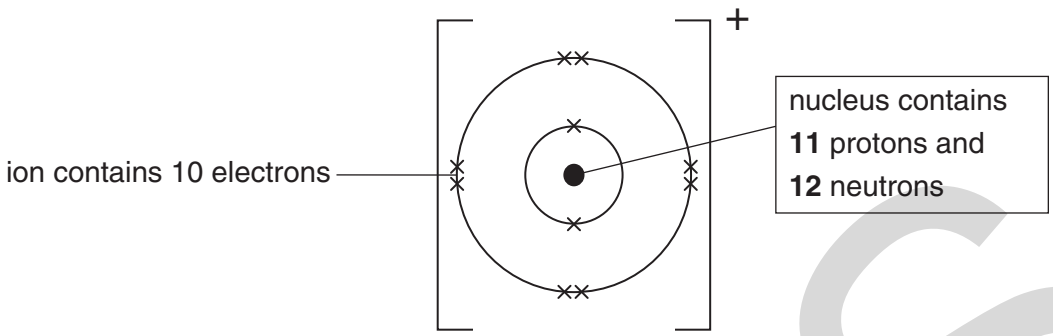


[1]

Complete the label on the diagram to show the number of neutrons in the nucleus of a lithium atom.

(c) Sodium is another element in Group 1.

The diagram shows a sodium **ion**.



Which one of the following statements about a sodium **ion** is correct?

Put a tick (✓) in the box next to the correct answer.

A sodium ion has more electrons than protons. ☐

A sodium ion has a lower mass than a lithium atom. ☐

A sodium ion has more protons than neutrons. ☐

A sodium atom forms a sodium ion by losing one electron. ☐ **[1]**

(d) Alex looks at lines in the spectra of lithium, sodium and potassium.

lithium

sodium

potassium

(i) How can you tell by looking at the spectra that these are three different elements?

..... **[1]**

(ii) 'Healthy Salt' is a type of table salt that contains compounds of more than one Group 1 element.

This is the line spectrum for 'Healthy Salt'.

Which two Group 1 elements does 'Healthy Salt' contain?

answer ..... and .....**[1]**

[Total: 5]

3 Bauxite is an ore of aluminium.

Bauxite contains the ionic compound, aluminium oxide.

Aluminium is extracted from aluminium oxide by electrolysis.

(a) The first stage of the process involves heating solid aluminium oxide until it melts.

What happens to the ions in aluminium oxide when it melts?

Put ticks (✓) in the boxes next to the **two** correct answers.

The ions become free to move. ☐

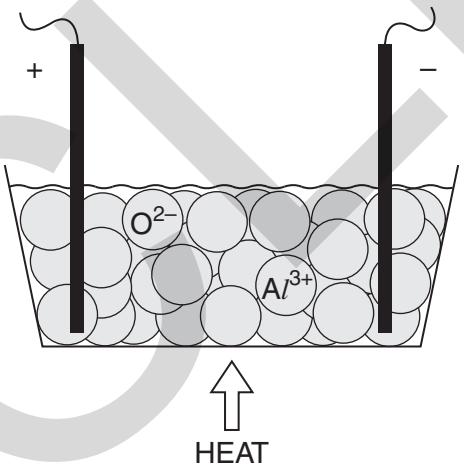
The ions spread very far apart. ☐

New bonds form between the ions. ☐

The arrangement of ions becomes more random. ☐

The ions move into a regular arrangement. ☐ **[2]**

(b) The diagram shows how the electrolysis of aluminium oxide can be set up.



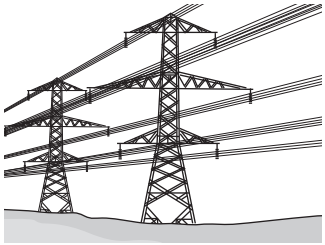
(i) Draw an arrow on the diagram to show which way the aluminium ions, Al^{3+}, move when the electrical current is switched on. **[1]**

(ii) Aluminium is one product of the electrolysis.

What is the name of the **other** product?

..... **[1]**

(c) One use of aluminium is to make overhead power cables.



Why is aluminium a good material to use to make overhead power cables?

Put ticks (✓) in the boxes next to the **two** best reasons.

Aluminium is a good conductor of heat. ☐

Aluminium is less dense than other metals. ☐

Aluminium has a lower melting point than some other metals. ☐

Aluminium is a good electrical conductor. ☐

Aluminium is softer than most other metals. ☐ **[2]**

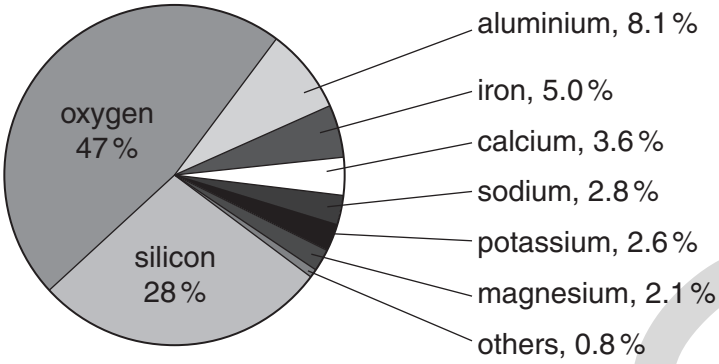
(d) What type of bonding holds aluminium atoms together?

Put a (ring) around the correct answer.

atomic **covalent** **ionic** **metallic** **[1]**

[Total: 7]

4 The pie chart shows the percentages of common elements found in the Earth's crust.



(a) Three elements make up most of the Earth's crust.

The list below shows compounds found in the Earth's crust.

Which two compounds, when taken together, contain **all three** of these most common elements?

Put a (ring) around the **two** correct answers.

NaCl **SiO_2** **$CaCO_3$** **Al_2O_3** **Fe_2O_3** **[2]**

(b) Sodium chloride, NaCl, is found in some parts of the Earth's crust. It is left behind when sea water evaporates.

Sodium appears in the pie chart of common elements in the Earth's crust but chlorine does not.

Which of the following statements explain why?

Put ticks (✓) in the boxes next to the **two** best answers.

There is much less chlorine than sodium in the Earth's crust. ☐

Chlorine is a gas. ☐

Sodium occurs in other compounds, not only sodium chloride. ☐

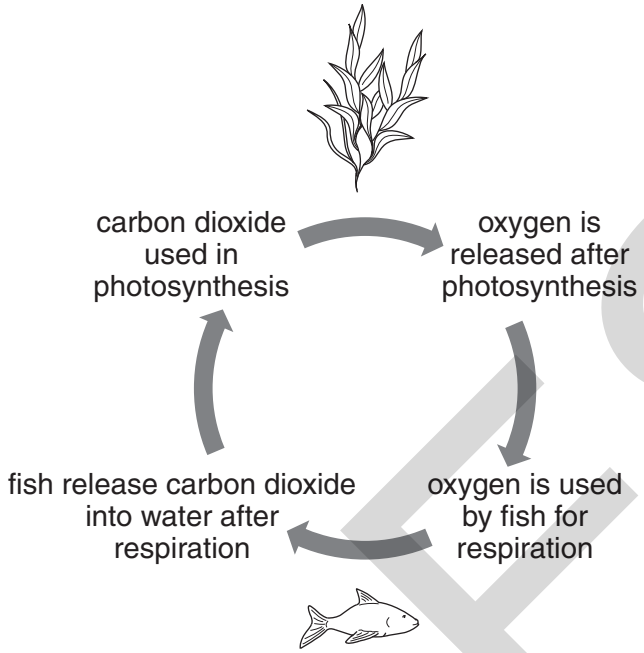
The pie chart only shows metals. ☐

There is only a very small amount of chlorine in the sea. ☐ **[2]**

[Total: 4]

5 A fish pond contains plants and fish.

The diagram shows how carbon dioxide and oxygen are involved in a cycle of changes in the fish pond.



(a) What effect do the **fish** have on the amount of carbon dioxide and oxygen in the fish pond?

Put a tick (✓) in the correct box in each row.

	increases	**stays the same**	**decreases**
amount of carbon dioxide in the water			
amount of oxygen in the water			

[1]

(b) The diagram below shows the structure of a carbon dioxide molecule and an oxygen molecule.

carbon dioxide oxygen

Explain why carbon dioxide is a **compound** but oxygen is an **element**.

.....

..... **[2]**

[Total: 3]

6 Vehicles produce pollutant gases.

(a) One of the pollutant gases is nitrogen dioxide.

Nitrogen dioxide makes nitric acid when it dissolves in water. Nitric acid is very acidic.

How does the pH of the water change if a large volume of nitrogen dioxide is bubbled through it?

Put a (ring) around the correct answer in **each row**.

Pure water has a pH of	**1**	**5**	**7**	**9**	**14**
When a large volume of nitrogen dioxide is bubbled through water the pH changes to	**1**	**5**	**7**	**9**	**14**

[1]

(b) Concrete contains calcium carbonate.

Nitric acid in rain water damages concrete because it reacts with calcium carbonate.

Complete the **word** and **symbol** equations for this reaction by filling in the empty boxes.

nitric acid + calcium carbonate → [ ] + [ ] + [ ]

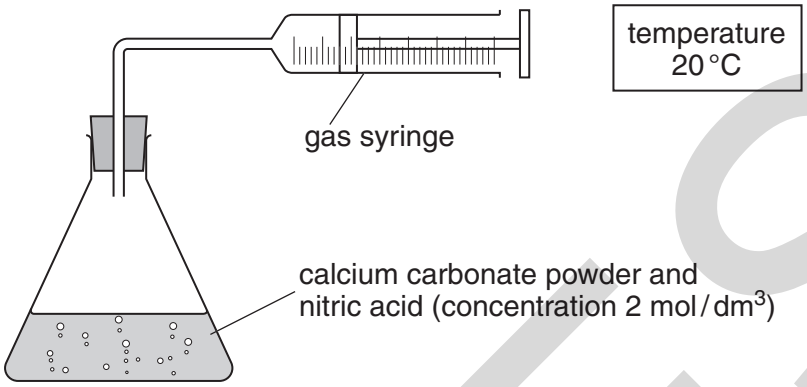
$2HNO_3 + CaCO_3 \rightarrow Ca(NO_3)_2 +$ [ ] + [ ]

[3]

(c) Joe carries out an experiment to find out how quickly nitric acid reacts with calcium carbonate.

He follows the rate of reaction by measuring the amount of gas given off every 30 s.

This is how he sets his experiment up.



(i) The reaction happens too quickly for Joe to measure the volume of gas accurately.

Suggest **three** changes that Joe could make to his experiment so that the reaction happens more slowly.

1 .....

2 .....

3 ..... **[3]**

(ii) Joe decides to use another method of following the rate of reaction.

He puts the flask on a balance and measures the change in mass during the reaction.

The mass decreases.

Explain why.

..... **[1]**

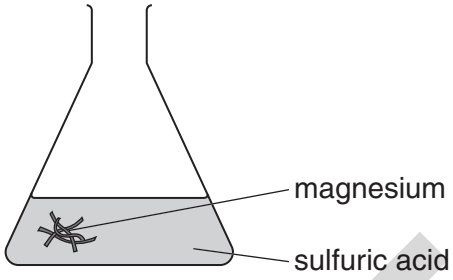
[Total: 8]

7 Jack works for a company that makes chemicals to make soil more fertile.

The company sells magnesium sulfate to treat soil that does not have enough magnesium.

Jack makes a small amount of magnesium sulfate to test.

He makes the magnesium sulfate by reacting magnesium metal with dilute sulfuric acid.



These are the word and symbol equations for the reaction.

magnesium + sulfuric acid → magnesium sulfate + hydrogen

$Mg(s) + H_2SO_4(aq) \rightarrow MgSO_4(aq) + H_2(g)$

(a) What will Jack **see** during the reaction?

.....

.....

..... **[2]**

(b) Jack keeps adding magnesium until the reaction finishes.

The sentences below show some steps he might carry out to make magnesium sulfate crystals.

They are in the wrong order.

A pat dry with filter paper
B leave to crystallise
C filter off unreacted magnesium
D evaporate some liquid by heating

Write the letters in the boxes to show the correct order of steps Jack needs to carry out.

The first one has been done for you.

correct order	**C**			

[1]

(c) Jack works out the theoretical yield of magnesium sulfate for this reaction.

He measures the actual yield he has made.

The box shows his results.

theoretical yield:	2.5 g
actual yield:	2.0 g

What is Jack's **percentage yield**?

Put a (ring) around the correct answer.

0.5% **5%** **20%** **25%** **80%** **[1]**

(d) Jack wants to make a **larger** amount of magnesium sulfate.

What **two** changes does he need to make to his experiment to make more magnesium sulfate?

Put ticks (✓) in the boxes next to the **two** correct answers.

use more acid ☐

heat the reaction mixture to a higher temperature ☐

use smaller pieces of magnesium ☐

use a catalyst ☐

use more magnesium ☐

leave the reaction for a longer time ☐ **[2]**

[Total: 6]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE CHEMISTRY A

A322/02

Unit 2: Modules C4 C5 C6 (Higher Tier)

OCE/17075

Candidates answer on the Question Paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:
- Pencil
- Ruler (cm/mm)

Monday 28 June 2010
Morning

Duration: 40 minutes

A322202

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **42**.
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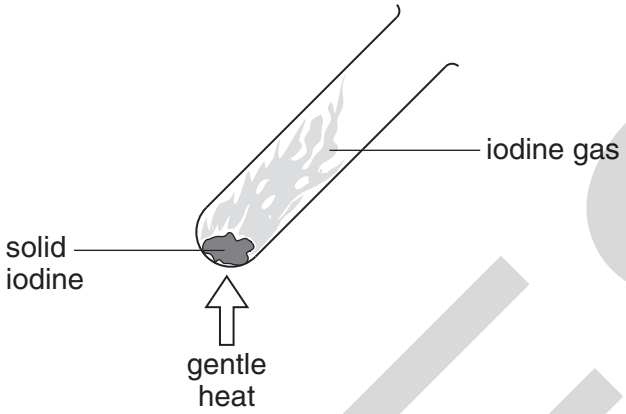
Answer **all** the questions.

1 Iodine is a halogen in Group 7 of the Periodic Table.

Marty warms a small crystal of iodine in a test tube.



(a) What colour change will Marty **see** when solid iodine changes into iodine gas?

Choose words from the list to complete the sentence.

dark grey **orange** **brown** **purple** **green**

The colour changes from …… to …… . **[1]**

(b) Iodine dissolves in water to form a dilute solution.

Give the **formula** and **state symbol** for iodine solution.

formula …… state symbol …… **[1]**

(c) Marty finds some information about other halogens in Group 7.

name of halogen	melting point in °C	boiling point in °C	reactivity	formula of potassium salt
fluorine	–220	–188	most reactive halogen	.....
chlorine	–101	–35	less reactive than fluorine more reactive than bromine	KC*l*
bromine	–7	59	less reactive than chlorine more reactive than iodine	KBr

(i) Fill in the missing formula for potassium fluoride. **[1]**

(ii) Use information from the table to describe the trends in properties of the elements down Group 7.

.....

.....

.....

.....

..... **[3]**

(d) Astatine is another halogen. It is below iodine in Group 7.

Marty makes some predictions about the properties of astatine based on its position in the Periodic Table.

Which of the following predictions about astatine are **likely to be true** and which are **likely to be false**?

Put a tick (✓) in the correct box in each row.

	likely to be true	likely to be false
Astatine is a gas at room temperature.		
Astatine has a lower melting point than bromine.		
Astatine has one electron in its outer shell.		
Astatine forms an ion with a single negative charge.		
Astatine reacts with iron more slowly than iodine does.		

[3]

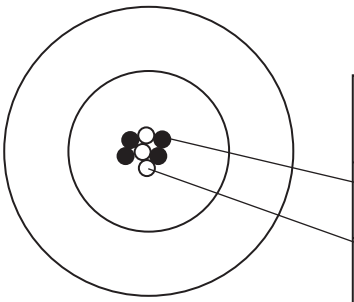
[Total: 9]

2 Lithium is in Group 1.

(a) The Periodic Table shows this information for lithium.

7
Li
lithium
3

The diagram shows the particles in the nucleus of a lithium atom and two electron shells.



particle	name of particle	charge	relative mass
●			
○			

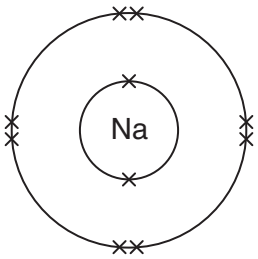
(i) Complete the table of information about the particles in the nucleus. **[2]**

(ii) On the diagram, show the arrangement of electrons.

Use an **x** for each electron. **[1]**

(b) Sodium is another element in Group 1.

The diagram shows the arrangement of electrons in a sodium **ion**.



Which of the following statements about a sodium ion are **true** and which are **false**?

Put a tick (✓) in the correct box in each row.

	true	**false**
A sodium ion has a larger relative mass than a sodium atom.	☐	☐
The total charge on the nucleus of a sodium ion is greater than the total charge on the electrons.	☐	☐
Sodium ions have more protons and electrons than sodium atoms.	☐	☐
A sodium atom forms a sodium ion by gaining one electron.	☐	☐
A sodium ion has fewer shells of electrons than a sodium atom.	☐	☐

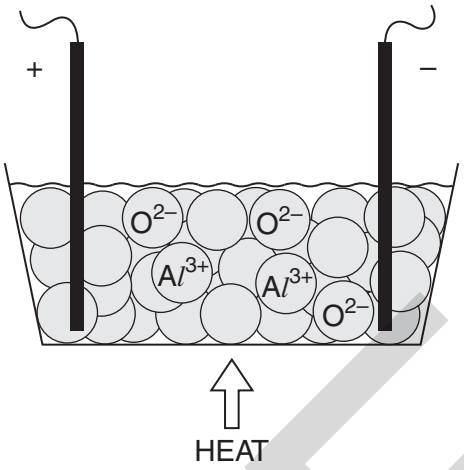
[2]

[Total: 5]

3 Bauxite is an ore of aluminium.

Bauxite contains the ionic compound, aluminium oxide.

Aluminium is extracted from aluminium oxide by electrolysis.



(a) Describe what happens to the oxide ions during the electrolysis.

.....

.....

..... **[2]**

(b) The formula for aluminium oxide is Al_2O_3 .

The relative formula mass of aluminium oxide can be worked out like this.

relative atomic masses: $Al = 27$ $O = 16$

relative formula mass of Al_2O_3: $(2 \times 27) + (3 \times 16) =$ **102**

(i) What is the maximum mass of aluminium that can be made from 204 tonnes of aluminium oxide, Al_2O_3?

mass = ... tonnes **[1]**

(ii) Which one of the following statements about the electrolysis of aluminium oxide is true?

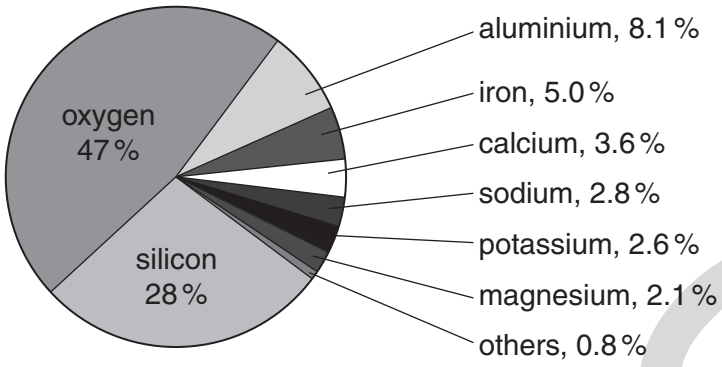
Put a tick (✓) in the box next to the correct statement.

Aluminium ions give up electrons during the electrolysis.	☐
More atoms of aluminium are formed than atoms of oxygen.	☐
The same total number of electrons is involved in the reaction at each electrode.	☐
Aluminium forms at the positive electrode.	☐

[1]

[Total: 4]

4 The pie chart shows the percentages of common elements found in the Earth's crust.



(a) Three elements make up most of the Earth's crust.

The list below shows compounds found in the Earth's crust.

Which two compounds, when taken together, contain **all three** of these most common elements?

Put a (ring) around the **two** correct answers.

NaCl **SiO_2** **$CaCO_3$** **Al_2O_3** **Fe_2O_3** **[2]**

(b) Sodium chloride, NaCl, is found in some parts of the Earth's crust. It is left behind when sea water evaporates.

Sodium appears in the pie chart of common elements in the Earth's crust but chlorine does not.

Which of the following statements explain why?

Put ticks (✓) in the boxes next to the **two** best answers.

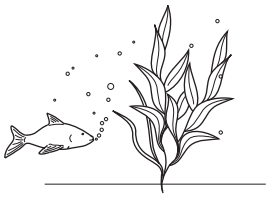
There is much less chlorine than sodium in the Earth's crust.	☐
Chlorine is a gas.	☐
Sodium occurs in other compounds, not only sodium chloride.	☐
The pie chart only shows metals.	☐
There is only a very small amount of chlorine in the sea.	☐

[2]

[Total: 4]

5 The information describes part of the nitrogen cycle in a garden pond.

Nitrogen cycle in a garden pond

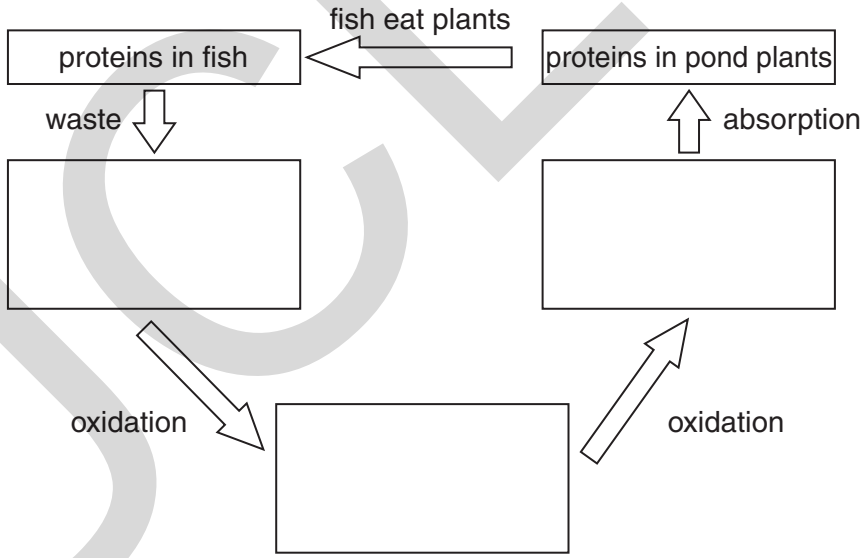


Nitrogen compounds in plants and fish are part of a cycle of changes. Plants in the pond take in (absorb) nitrate ions (NO_3^-) from the water and use them to produce plant proteins. The nitrate ions are formed by the oxidation of nitrite ions (NO_2^-) in the water. Fish eat plant proteins and convert them into proteins in their bodies. They pass out waste nitrogen compounds that contain ammonium ions (NH_4^+) that are easily oxidised to nitrite ions in the water.

(a) The chemical changes in the nitrogen cycle in the pond can be represented in a flow chart.

Use the information to complete the flow chart.

In each box write the **name** and the **formula** of the correct nitrogen ion.

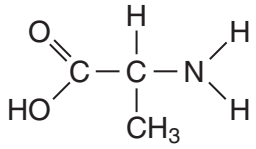


[2]

(b) Proteins are made from amino acids.

The table shows some information about the amino acid, alanine.

alanine



name of atom	percentage by mass in formula
carbon	40 %
hydrogen	8 %

(i) Explain how and why the **percentage by mass** of hydrogen and carbon in alanine seems to disagree with the **number of atoms** of these elements in the formula.

Your answer should include

- how the number of atoms of carbon and of hydrogen in the molecule are different
- how the percentage by mass of carbon and of hydrogen are different
- the reasons why these seem to disagree.

.....

.....

.....

.....

..... **[3]**

(ii) Alanine is typical of molecules found in living things.

Which statement is the best reason why?

Put a tick (✓) in the box next to the **best** answer.

Alanine has a low melting point. ☐

Alanine is soluble in water. ☐

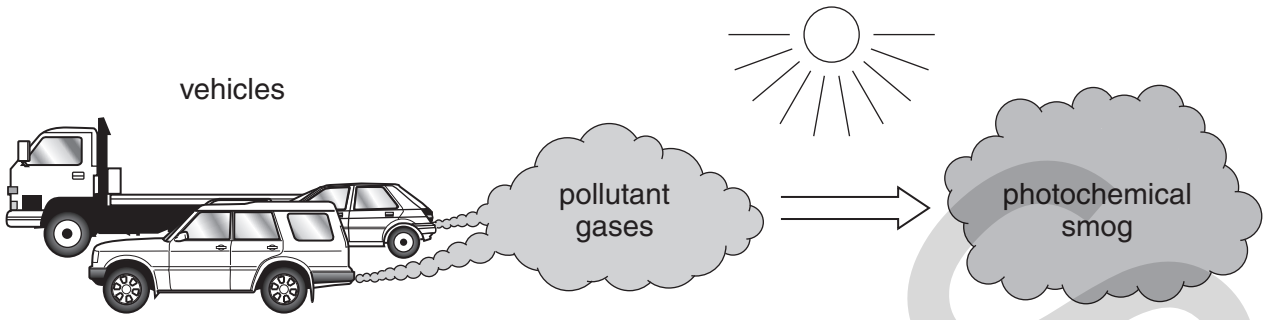
Alanine contains carbon, hydrogen and oxygen. ☐

Alanine is non-toxic. ☐ **[1]**

[Total: 6]

6 Photochemical smog forms when pollutant gases react together in strong sunlight.

The pollutant gases build up in cities where there are a large number of vehicles.



(a) When the concentration of pollutant gases increases, the rate of the reactions that form the smog changes.

What effect does an increase in concentration have on rate of reaction?

Use ideas about colliding particles to explain your answer.

.....

.....

.....

..... **[3]**

(b) A new type of city pavement has a catalyst coating.

The pollutant gases break down when they are in contact with the coating to form less harmful products.

The new pavements are expensive, but the coating keeps working for a very long time.

Explain why the catalyst keeps on working.

..... **[1]**

(c) One of the pollutant gases is nitrogen dioxide.

Nitrogen dioxide makes nitric acid when it dissolves in water. Nitric acid is very acidic.

How does the pH of the water change if a large volume of nitrogen dioxide is bubbled through it?

Put a (ring) around the correct answer in **each row**.

Pure water has a pH of	**1**	**5**	**7**	**9**	**14**
When a large volume of nitrogen dioxide is bubbled through water the pH changes to	**1**	**5**	**7**	**9**	**14**

[1]

(d) Concrete contains calcium carbonate.

Nitric acid in rain water damages concrete because it reacts with calcium carbonate.

Complete the **word** and **symbol** equations for this reaction by filling in the empty boxes.

nitric acid + calcium carbonate → [ ] + [ ] + [ ]

$2HNO_3$ + $CaCO_3$ → $Ca(NO_3)_2$ + [ ] + [ ]

[3]

[Total: 8]

7 Copper nitrate is a salt that is used to give green colours in fireworks.

Eve makes some copper nitrate by reacting copper oxide with nitric acid.

$$CuO + 2HNO_3 \rightarrow Cu(NO_3)_2 + H_2O$$

(a) Eve carries out some calculations on her experiment.

The box shows some of her working.

(i) Fill in the missing relative formula mass of copper nitrate, $Cu(NO_3)_2$.

relative atomic mass:	Cu = 64	O = 16	H = 1	N = 14
relative formula mass:	CuO = 80			
	HNO_3 = 63			
	$Cu(NO_3)_2$ = ...			
	H_2O = 18			

[1]

(ii) Eve weighs out 0.8 g of copper oxide.

She uses the equation and the relative formula masses to work out the mass of nitric acid that will react exactly with 0.8 g copper oxide.

Complete Eve's working by calculating the mass of nitric acid she needs.

$$CuO + 2HNO_3 \rightarrow Cu(NO_3)_2 + H_2O$$

0.8 g CuO reacts with ..... g HNO_3 **[2]**

(b) The formula for copper nitrate is $Cu(NO_3)_2$.

The symbol for a nitrate ion is NO_3^-

(i) What is the symbol for a copper ion?

answer ..... **[1]**

(ii) Some fireworks also contain copper sulfate.

Which acid would Eve need to add to copper oxide to make copper sulfate?

answer .....acid **[1]**

(iii) Lithium nitrate is added to some fireworks to give a red colour.

The symbol for a lithium ion is Li^+.

What is the formula for lithium nitrate?

answer ..... **[1]**

[Total: 6]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

OCR
RECOGNISING ACHIEVEMENT

F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE CHEMISTRY A

A323/01

Unit 3: Ideas in Context plus C7 (Foundation Tier)

OCE/16026

Candidates answer on the Question Paper
A calculator may be used for this paper

OCR Supplied Materials:
- Insert (inserted)

Other Materials Required:
- Pencil
- Ruler (cm/mm)

Friday 28 May 2010
Morning

Duration: 60 minutes

A323 01

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **55**.
- Where you see this icon you will be awarded a mark for the quality of written communication in your answer.
- The Periodic Table is printed on the back page.
- This document consists of **12** pages. Any blank pages are indicated.

Answer **all** the questions.

1 This question is based on the article 'Which nappy is best for the environment?'

(a) Both disposable and reusable 'terry' nappies contain cellulose fibres from cotton. Cotton is generally considered to be a renewable material.

(i) Why is cotton considered to be a renewable material?

.....

..... **[1]**

(ii) Some people say that although cotton is a renewable material its use is not really sustainable because of the way that we grow it.

What information in the article supports this argument?

.....

.....

..... **[2]**

(iii) Some people consider that the use of polyethene and polypropene to make disposable nappies is not sustainable.

Suggest an argument to support this view.

.....

.....

..... **[2]**

(b) Many parents think that reusable nappies cause less environmental damage than disposable nappies.

Despite this, most parents use disposable nappies.

Suggest a reason why they do this.

.....

..... **[1]**

(c) **(i)** The article says that a Life Cycle Assessment (LCA) follows the lifetime of a product 'from cradle to grave'.

Explain what this means.

.....

..... **[1]**

(ii) In an LCA the environmental impact of a number of stages in the lifetime of a product are considered.

Write down two of these stages that are mentioned in the article.

1 .....

2 ..... **[2]**

(d) The article says scientists found that the main environmental impacts are different for each type of nappy.

(i) Write down the **two** main environmental impacts for disposable nappies.

.....

..... **[2]**

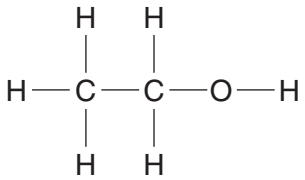
(ii) Write down the **two** main environmental impacts for reusable nappies.

.....

..... **[2]**

[Total: 13]

2 **(a)** The diagram shows the structural formula of the compound ethanol.



(i) To which family of organic compounds does ethanol belong?

..... **[1]**

(ii) What is the molecular formula of ethanol?

..... **[1]**

(b) The table compares some of the properties of ethanol with those of ethane and water.

Complete the table by filling in the blank boxes.

	ethane	**ethanol**	**water**
state at 25°C	gas		liquid
dissolves in water	no		yes
burns in air	yes		

[3]

(c) A dilute solution of ethanol can be made by fermentation of grape juice using yeast.

(i) What substance in the grape juice is used by yeast to produce ethanol?

..... **[1]**

(ii) Why is it not possible to make a concentrated solution of ethanol by fermentation?

.....

..... **[1]**

(iii) Name the method used to separate ethanol from the solution, and explain how it works.

method: .....

explanation: .....

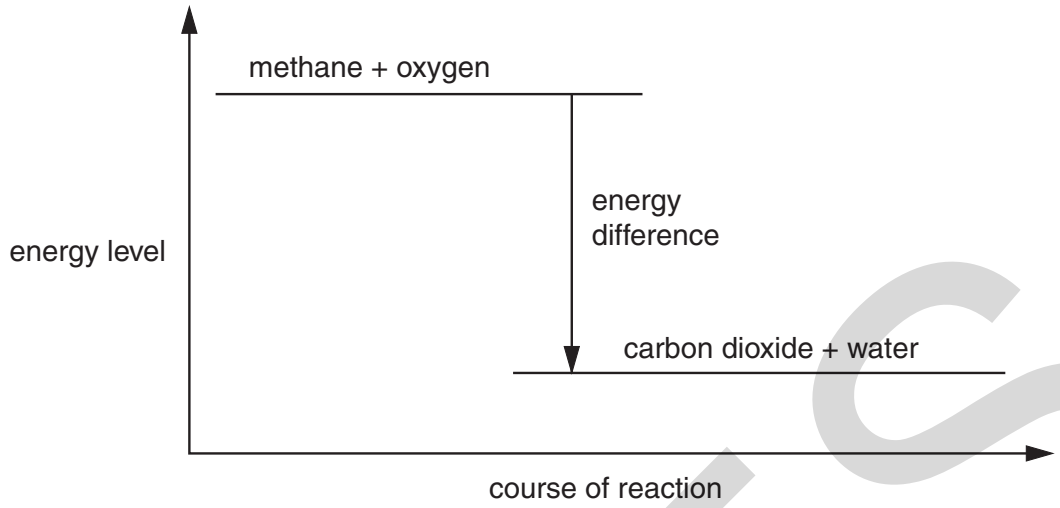
.....

.....

..... **[3]**

[Total: 10]

3 Look at this energy level diagram for the complete combustion of methane in air.



(a) The complete combustion of methane in air is an exothermic reaction.

(i) How does the energy level diagram show that this reaction is exothermic?

.....

.....

..... **[2]**

(ii) Write a word equation for the reaction.

..... **[1]**

(b) Complete these sentences to describe the **energy change** that takes place.

When chemical bonds are broken, energy is ..... .

When chemical bonds are made, energy is ..... . **[1]**

(c) A mixture of methane and oxygen at room temperature does not react.

When a lighted match is applied the mixture burns.

The lighted match supplies the activation energy for the reaction.

Explain what is meant by the term **activation energy**.

.....

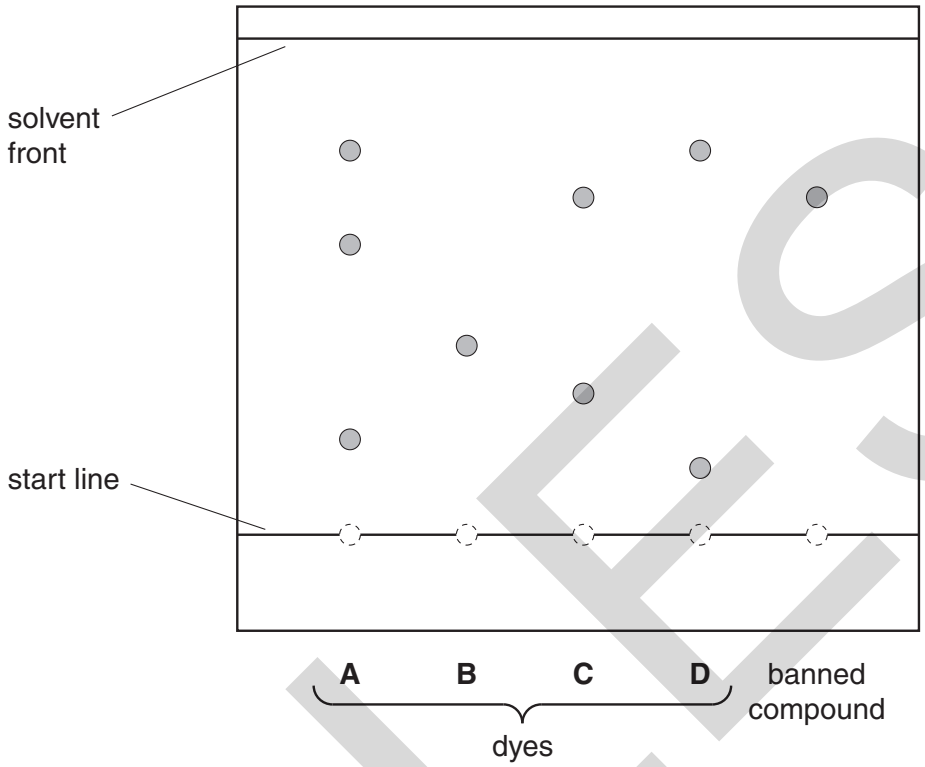
.....

..... **[2]**

[Total: 6]

4 A scientist employed by the Food Standards Agency uses paper chromatography. He tests samples of water-soluble food dyes to see if they contain a banned compound.

The resulting chromatogram is shown below.



(a) Describe how the scientist carries out this chromatography.

One mark is for correct spelling.

.....

.....

.....

.....

..... **[3+1]**

(b) **(i)** Explain what is meant by the label **solvent front**, used in the diagram.

.....

..... **[1]**

(ii) The scientist used a pencil to mark the start line. Suggest why he did not use a pen.

.....

..... **[1]**

(c) (i) Which dye, **A**, **B**, **C** or **D**, contained the banned compound?

answer ..... **[1]**

(ii) Explain your answer to part **(c)(i)**.

.....

..... **[1]**

(iii) State the two measurements the scientist has to make to find the R_f value of the banned compound.

.....

..... **[2]**

[Total: 10]

5 A student uses a titration with nitric acid to find the concentration of a solution of sodium hydroxide.

(a) The student has a stock solution of nitric acid containing 63 g in each dm^3.

She uses this to make up 250 cm^3 of a standard solution containing 6.3 g in each dm^3.

(i) Describe how she makes up this standard solution.

($1\,dm^3 = 1000\,cm^3$)

.....

.....

..... **[2]**

(ii) Finish this statement about the solution she makes by adding the correct units.

The concentration of the solution is 6.3 …… . **[1]**

(b) To carry out the titration the student measures out 25.0 cm^3 of the sodium hydroxide solution.

To this she adds a few drops of indicator.

She then adds the standard nitric acid solution a little at a time.

(i) Why does she not use a 25 cm^3 measuring cylinder to measure out the sodium hydroxide solution?

..... **[1]**

(ii) Suggest what apparatus the student does use to measure out the sodium hydroxide solution.

..... **[1]**

(iii) Explain why she adds an indicator to the sodium hydroxide solution.

.....

.....

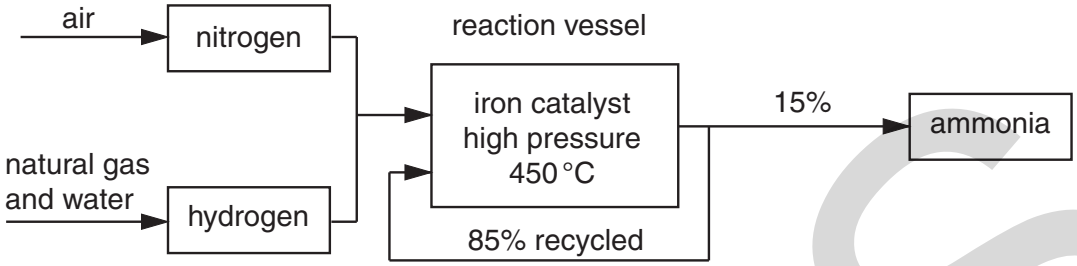
..... **[2]**

[Total: 7]

6 Ammonia is a bulk chemical made by the reaction of nitrogen with hydrogen.

$$N_2 + 3H_2 \rightleftharpoons 2NH_3$$

The diagram shows a flow chart of the Haber process for the manufacture of ammonia.



(a) (i) What is meant by the term **bulk chemical**.

.....

..... **[1]**

(ii) The equation for the formation of ammonia from nitrogen and hydrogen contains the symbol $\rightleftharpoons$.

Why is this symbol used in the equation?

.....

..... **[1]**

(b) Air and natural gas are used to make ammonia.

Suggest how each of these raw materials affects the sustainability of the process.

air: .....

.....

natural gas: .....

..... **[4]**

(c) The process uses an iron catalyst.

What effect does the catalyst have on the process?

..... **[1]**

(d) Ammonia is toxic and corrosive.

It is a gas at room temperature but is transported in road tankers as a liquid under pressure.

Suggest how government safety regulations apply to the transport of ammonia in road tankers.

.....

.....

..... **[2]**

[Total: 9]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
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Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

OCR
RECOGNISING ACHIEVEMENT

F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE CHEMISTRY A

A323/01/INS

Unit 3: Ideas in Context plus C7 (Foundation Tier)

INSERT

Friday 28 May 2010
Morning

Duration: 60 minutes

OCE/16027

INSTRUCTIONS TO EXAMS OFFICER/INVIGILATOR

- Do not send this insert for marking; it should be retained in the centre or destroyed.

INSTRUCTIONS TO CANDIDATES

- This insert contains the article required to answer question 1.

INFORMATION FOR CANDIDATES

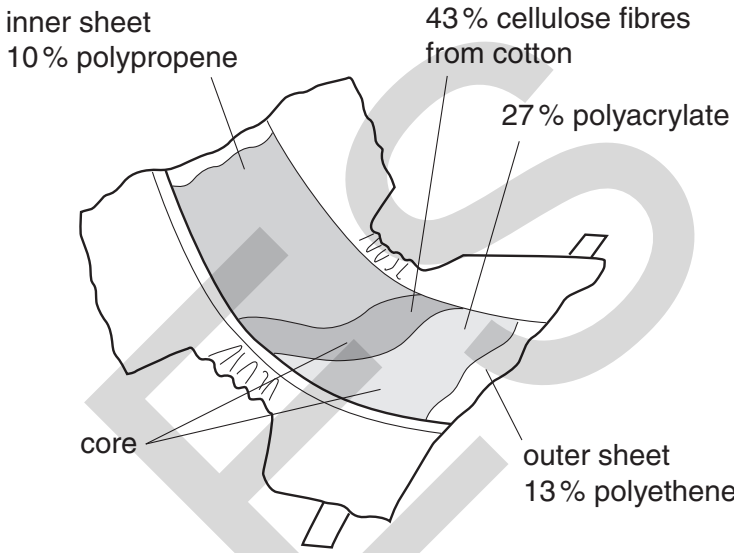
- This document consists of **4** pages. Any blank pages are indicated.

Which nappy is best for the environment?

Babies wear nappies to keep themselves and their surroundings clean. Parents now have a choice between different types of nappy, but this choice might affect the environment.

Disposable nappies

Disposable nappies are used only once. When they have been soiled they are thrown away into dustbins. Most disposable nappies used in the UK contain a core. This core consists of a fluffy pulp of cellulose fibres from cotton together with a layer of superabsorbent polymer (SAP) made from sodium polyacrylate. The core absorbs and retains urine. An inner sheet made of polypropene protects the baby's skin from wetness and an outer sheet of polyethene prevents leakage from the core.



Polymers can be made with different properties. The properties of the polymers used are very important for the nappy to be effective.

UK households produce about 25 million tons of waste material each year. Of this about 18 % is recycled but most of the remainder goes into landfill sites. Disposable nappies make up about 2 % of the household waste going to landfill, a contribution of about 400 000 tons each year.

Reusable nappies

An alternative is to use reusable nappies, also known as 'terry' nappies. These are made from a square of cotton cloth that is folded to fit the baby. When soiled they are laundered in a washing machine and used again many times. The faeces from these nappies are usually disposed of in the sewerage system before the nappy is washed. To make this easier, most parents use a disposable nappy liner to contain the faeces. This is usually made from a thin layer of polypropene.

Life Cycle Assessment

Both disposable and reusable nappies create environmental impacts. These can be assessed in a Life Cycle Assessment, which follows the lifetime of each product 'from cradle to grave'. Each Life Cycle Assessment takes into account the sustainability of making the materials for the nappies. It also includes the environmental impact of making the products from these materials, using the products and disposing of the products. The requirements for energy input at each stage of manufacture also have an effect on the environment.

Environmental impact

Many people take it for granted that reusable nappies must have less environmental impact than disposable nappies. But most parents choose to use disposable nappies, which account for over 95 % of the market.

Reusable nappies reduce the demands on landfill, but they impact on the environment in other ways such as the water and energy used in washing and drying them. Terry nappies are made entirely from cotton, which is the crop that is treated with the most fertiliser and pesticides in the world. Also, the majority of cotton is bleached, using chemicals that are potentially harmful to the environment.

Comparing the main environmental impacts

Scientists working for a manufacturer of nappies compared Life Cycle Assessments on their leading brand of disposable nappy and on reusable 'terry' nappies. Although the impacts were found to be similar, the stages of the Life Cycle Assessment that are the main source of these impacts were found to be different for each type of nappy.

For disposable nappies the main sources of environmental impact are raw material production and use of these materials to manufacture the components of the nappies.

For reusable nappies the main sources of environmental impact are the generation of electricity used in washing and drying the nappies and the manufacture of the detergent used in washing.

Recycling

A company has developed a process for the recycling of disposable nappies. In a UK factory planned by the company, nappies will be washed before they are separated into plastics, pulp and sludge. Once separated, pulp and sludge can be used as a biomass fuel. Products such as house cladding and roof tiles can be made by melting and re-moulding the recycled plastics. If this process becomes widely used it will change the outcome of the Life Cycle Assessment for disposable nappies, and may make them more environmentally friendly than reusable nappies.

OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE CHEMISTRY A

A323/02

Unit 3: Ideas in Context plus C7 (Higher Tier)

OCE/16018

Candidates answer on the Question Paper
A calculator may be used for this paper

OCR Supplied Materials:
- Insert (inserted)

Other Materials Required:
- Pencil
- Ruler (cm/mm)

Friday 28 May 2010
Morning

Duration: 60 minutes

A323/02

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **55**.
- Where you see this icon you will be awarded a mark for the quality of written communication in your answer.
- The Periodic Table is printed on the back page.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

1 This question is based on the article 'Which nappy is best for the environment?'

(a) Both disposable and reusable 'terry' nappies contain cellulose fibres from cotton. Cotton is generally considered to be a renewable material.

Some people say that although cotton is a renewable material its use is not really sustainable because of the way that we grow it.

What information in the article supports this argument?

.....

.....

..... **[2]**

(b) Many parents think that reusable nappies cause less environmental damage than disposable nappies.

Despite this, most parents use disposable nappies.

Suggest a reason why they do this.

.....

..... **[1]**

(c) The article says that a Life Cycle Assessment (LCA) follows the lifetime of a product 'from cradle to grave'.

Explain what this means.

.....

..... **[1]**

(d) Use information from the article to describe and explain **one** environmental impact that is greater for reusable nappies than disposable nappies.

.....

.....

.....

..... **[2]**

(e) It might be possible to use the recycling process mentioned in the article to recycle materials from **all** of the disposable nappies used in the UK.

Suggest why this would be difficult to achieve.

.....

.....

.....

.....

..... **[3]**

(f) Disposable nappies contain the polymers polyethene and polypropene.

(i) These polymers melt at low temperatures. This enables the recycled polymers to be melted and made into new products.

Use ideas about forces and energy to explain why these polymers melt at low temperatures.

.....

.....

.....

..... **[2]**

(ii) A polymer with a lower melting point than polyethene might be easier to recycle.

Describe one method that may be used to produce a polymer with a lower melting point and explain how it does this.

.....

.....

.....

..... **[2]**

[Total: 13]

2 A teacher drops a small piece of sodium into a dish of ethanol.

The teacher repeats this demonstration with sodium and water, and then with sodium and the liquid alkane, hexane.

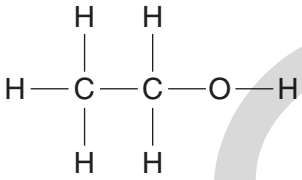
(a) The table below is to record the observations made by a student watching the demonstration.

Complete the table by writing in each empty box **what the student sees**.

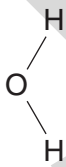
sodium + ethanol	**sodium + water**	**sodium + hexane**

[4]

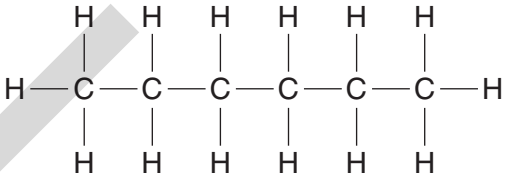
(b) The diagrams show the structural formulae of ethanol, water and hexane.



ethanol



water



hexane

Explain the similarities and differences in the reactions of these three compounds with sodium.

.....

.....

.....

..... **[2]**

(c) A dilute solution of ethanol can be made by fermentation of grape juice using yeast.

(i) Why is it not possible to make a concentrated solution of ethanol by fermentation?

.....

..... **[1]**

(ii) Name the method used to separate ethanol from the solution, and explain how it works.

method: .....

explanation: .....

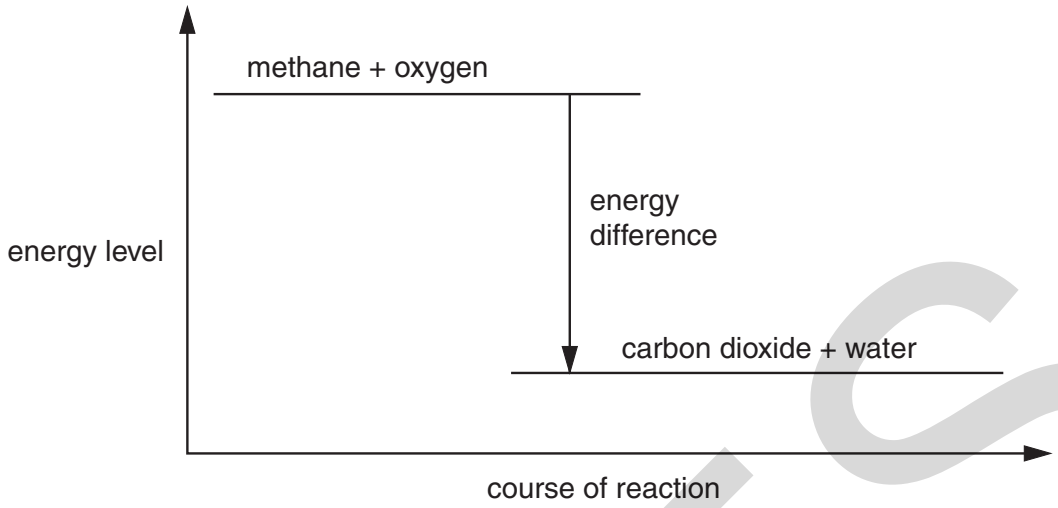
.....

.....

..... **[3]**

[Total: 10]

3 Look at this energy level diagram for the complete combustion of methane in air.



(a) The complete combustion of methane in air is an exothermic reaction.

How does the energy level diagram show that this reaction is exothermic?

.....

.....

..... **[2]**

(b) A mixture of methane and oxygen at room temperature does not react.

When a lighted match is applied the mixture burns.

The lighted match supplies the activation energy for the reaction.

Explain what is meant by the term **activation energy**.

.....

.....

..... **[2]**

(c) Methane burns in air according to this equation.

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

The table shows the energy required to break each of the bonds involved in this reaction.

bond	energy in kJ/mol
C–H	435
O=O	498
C=O	805
H–O	464

The energy used when the bonds in this reaction are broken can be calculated as follows.

4 × C–H = 4 × 435 = 1740 kJ/mol

2 × O=O = 2 × 498 = 996 kJ/mol

energy used = 1740 + 996 = 2736 kJ/mol

(i) Calculate the energy released as new bonds are made in this reaction.

energy released = ... kJ/mol **[3]**

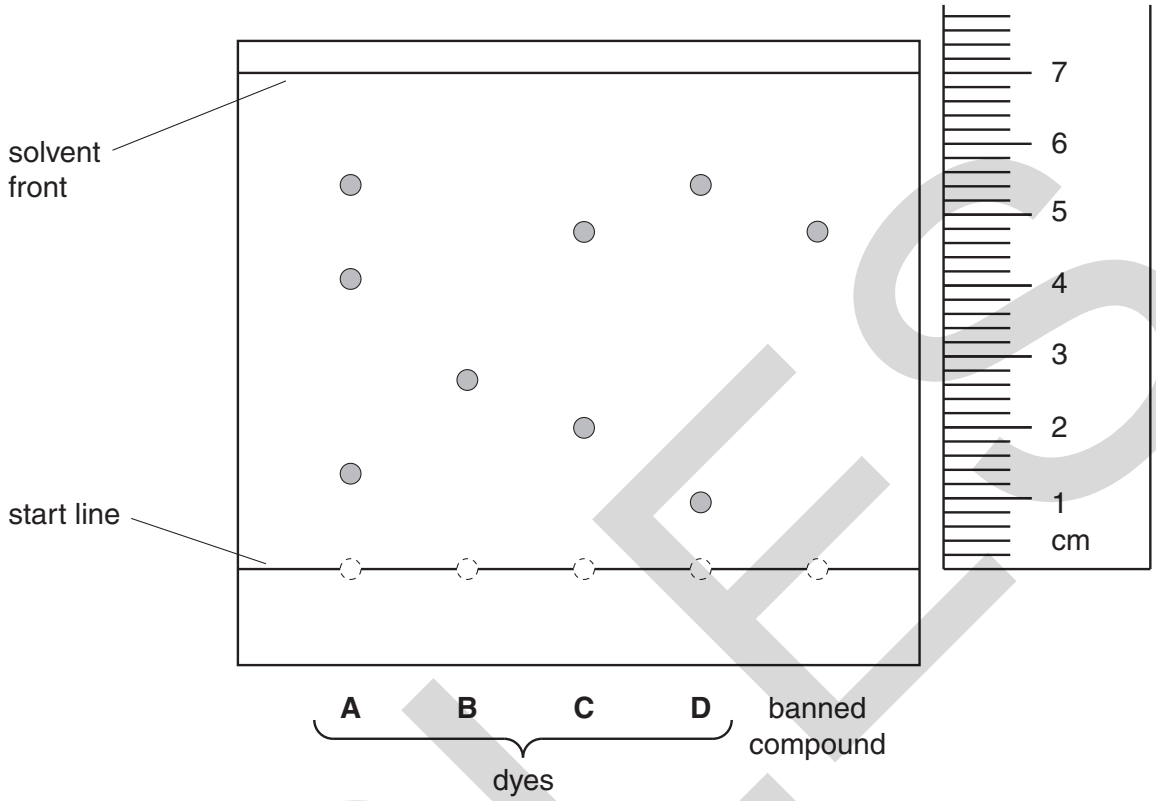
(ii) Calculate the overall energy change for the reaction.

overall energy change = ... kJ/mol **[1]**

[Total: 8]

4 A scientist employed by the Food Standards Agency uses paper chromatography. He tests samples of water-soluble food dyes to see if they contain a banned compound.

The resulting chromatogram is shown below.



(a) The chromatogram shows that dye **C** contains the banned compound.

The identity of this substance can be confirmed using its published R_f value.

(i) Calculate the R_f value for the banned compound.

You must show your working.

$$R_f \text{ value} = \frac{\text{distance travelled by solute}}{\text{distance travelled by solvent}}$$

R_f value = ... **[2]**

(ii) Suggest why R_f values are sometimes a better way to compare spots on different chromatograms than a simple visual comparison.

.....

.....

..... **[2]**

(b) Describe how compounds in the dyes are separated during the chromatography.

Use the terms **stationary phase**, **mobile phase** and **dynamic equilibrium** in your answer.

.....

.....

.....

.....

..... **[3]**

[Total: 7]

5 A student uses a titration with nitric acid to find the concentration of a solution of sodium hydroxide.

(a) The student has a stock solution of nitric acid containing 63 g in each dm^3.

She uses this to make up 250 cm^3 of a standard solution containing 6.3 g in each dm^3.

Describe how she makes up this standard solution.

($1 dm^3 = 1000 cm^3$)

.....

.....

..... **[2]**

(b) The student adds the standard nitric acid solution from a burette into sodium hydroxide solution in a flask.

She uses five 25.0 cm^3 samples of the sodium hydroxide solution.

She obtains the following titration results.

titration number	**1**	**2**	**3**	**4**	**5**
volume of nitric acid in cm^3	28.3	28.2	28.2	28.1	28.2

(i) The student uses the average of her titration results, 28.2 cm^3, as the best estimate of the volume of nitric acid used.

Show by calculation that the mass of nitric acid in 28.2 cm^3 of the standard solution is 0.178 g.

[1]

(ii) Nitric acid and sodium hydroxide react according to the following equation.

$$HNO_3 + NaOH \rightarrow NaNO_3 + H_2O$$

The relative formula mass of nitric acid is 63 and the relative formula mass of sodium hydroxide is 40.

Calculate the mass of sodium hydroxide in 25.0 cm^3 of the sodium hydroxide solution, and hence find the concentration of the sodium hydroxide solution in g/dm^3.

You should show your working.

mass of the sodium hydroxide in 25 cm^3 solution = ... g

concentration of sodium hydroxide solution = ... g/dm^3 **[3]**

(iii) Use the titration results to assess the degree of uncertainty in your value for the concentration of the sodium hydroxide solution.

.....

.....

..... **[2]**

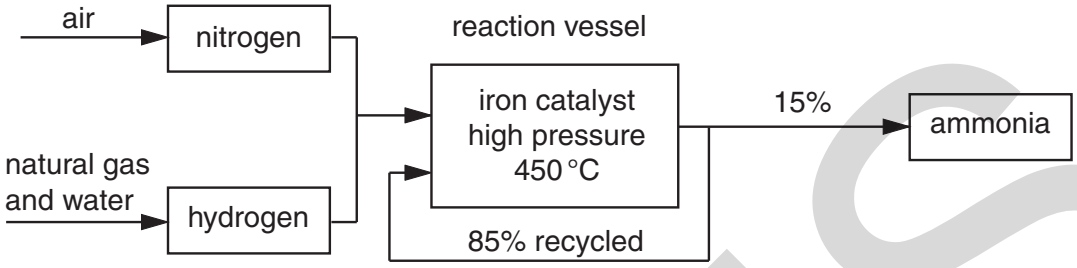
[Total: 8]

6 Ammonia is a bulk chemical made by the reaction of nitrogen with hydrogen.

$$N_2 + 3H_2 \rightleftharpoons 2NH_3$$

The reaction is reversible, forming a dynamic equilibrium.

The diagram shows a flow chart of the Haber process for the manufacture of ammonia.



(a) Air and natural gas are used to make ammonia.

Suggest how each of these raw materials affects the sustainability of the process.

air .....

.....

natural gas .....

..... **[4]**

(b) The process uses an iron catalyst. A catalyst speeds up the rate of conversion of reactants to products.

Use ideas about energy to explain how a catalyst works.

One mark is for using the correct scientific terms.

.....

.....

..... **[2+1]**

(c) Although the reaction is reversible, all of the nitrogen and hydrogen are eventually converted to ammonia.

Use the flow chart to explain how this is achieved.

.....

.....

..... **[2]**

[Total: 9]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

OCR
RECOGNISING ACHIEVEMENT

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GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE CHEMISTRY A

A323/02/INS

Unit 3: Ideas in Context plus C7 (Higher Tier)

INSERT

Friday 28 May 2010
Morning

Duration: 60 minutes

OCE/16019

INSTRUCTIONS TO EXAMS OFFICER/INVIGILATOR

- Do not send this insert for marking; it should be retained in the centre or destroyed.

INSTRUCTIONS TO CANDIDATES

- This insert contains the article required to answer question 1.

INFORMATION FOR CANDIDATES

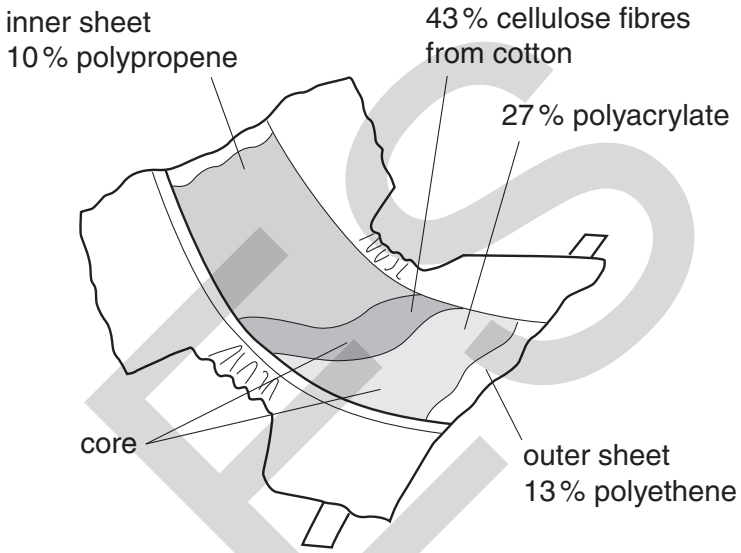
- This document consists of **4** pages. Any blank pages are indicated.

Which nappy is best for the environment?

Babies wear nappies to keep themselves and their surroundings clean. Parents now have a choice between different types of nappy, but this choice might affect the environment.

Disposable nappies

Disposable nappies are used only once. When they have been soiled they are thrown away into dustbins. Most disposable nappies used in the UK contain a core. This core consists of a fluffy pulp of cellulose fibres from cotton together with a layer of superabsorbent polymer (SAP) made from sodium polyacrylate. The core absorbs and retains urine. An inner sheet made of polypropene protects the baby's skin from wetness and an outer sheet of polyethene prevents leakage from the core.



Polymers can be made with different properties. The properties of the polymers used are very important for the nappy to be effective.

UK households produce about 25 million tons of waste material each year. Of this about 18 % is recycled but most of the remainder goes into landfill sites. Disposable nappies make up about 2 % of the household waste going to landfill, a contribution of about 400 000 tons each year.

Reusable nappies

An alternative is to use reusable nappies, also known as 'terry' nappies. These are made from a square of cotton cloth that is folded to fit the baby. When soiled they are laundered in a washing machine and used again many times. The faeces from these nappies are usually disposed of in the sewerage system before the nappy is washed. To make this easier, most parents use a disposable nappy liner to contain the faeces. This is usually made from a thin layer of polypropene.

Life Cycle Assessment

Both disposable and reusable nappies create environmental impacts. These can be assessed in a Life Cycle Assessment, which follows the lifetime of each product 'from cradle to grave'. Each Life Cycle Assessment takes into account the sustainability of making the materials for the nappies. It also includes the environmental impact of making the products from these materials, using the products and disposing of the products. The requirements for energy input at each stage of manufacture also have an effect on the environment.

Environmental impact

Many people take it for granted that reusable nappies must have less environmental impact than disposable nappies. But most parents choose to use disposable nappies, which account for over 95 % of the market.

Reusable nappies reduce the demands on landfill, but they impact on the environment in other ways such as the water and energy used in washing and drying them. Terry nappies are made entirely from cotton, which is the crop that is treated with the most fertiliser and pesticides in the world. Also, the majority of cotton is bleached, using chemicals that are potentially harmful to the environment.

Comparing the main environmental impacts

Scientists working for a manufacturer of nappies compared Life Cycle Assessments on their leading brand of disposable nappy and on reusable 'terry' nappies. Although the impacts were found to be similar, the stages of the Life Cycle Assessment that are the main source of these impacts were found to be different for each type of nappy.

For disposable nappies the main sources of environmental impact are raw material production and use of these materials to manufacture the components of the nappies.

For reusable nappies the main sources of environmental impact are the generation of electricity used in washing and drying the nappies and the manufacture of the detergent used in washing.

Recycling

A company has developed a process for the recycling of disposable nappies. In a UK factory planned by the company, nappies will be washed before they are separated into plastics, pulp and sludge. Once separated, pulp and sludge can be used as a biomass fuel. Products such as house cladding and roof tiles can be made by melting and re-moulding the recycled plastics. If this process becomes widely used it will change the outcome of the Life Cycle Assessment for disposable nappies, and may make them more environmentally friendly than reusable nappies.