

**GENERAL CERTIFICATE OF SECONDARY EDUCATION  
TWENTY FIRST CENTURY SCIENCE  
CHEMISTRY A**

**A323/01**

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

**Friday 28 May 2010  
Morning**

**Duration: 60 minutes**

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)




Candidate Forename		Candidate Surname	
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Centre Number							Candidate Number				
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**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]

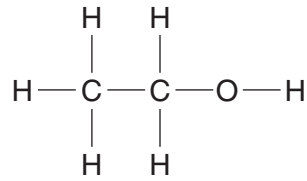
- (ii) Write down the **two** main environmental impacts for reusable nappies.

.....

..... [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: .....

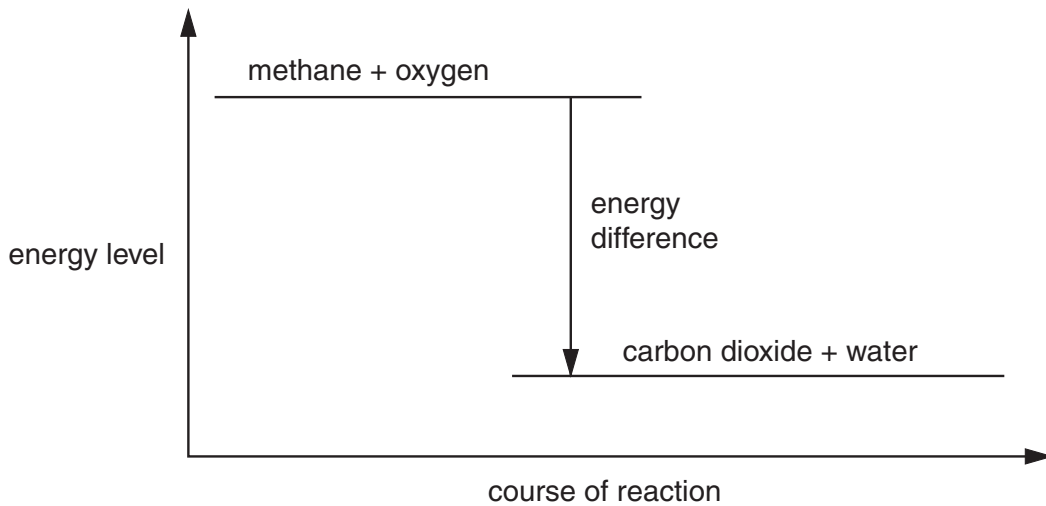
.....

.....

..... [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.

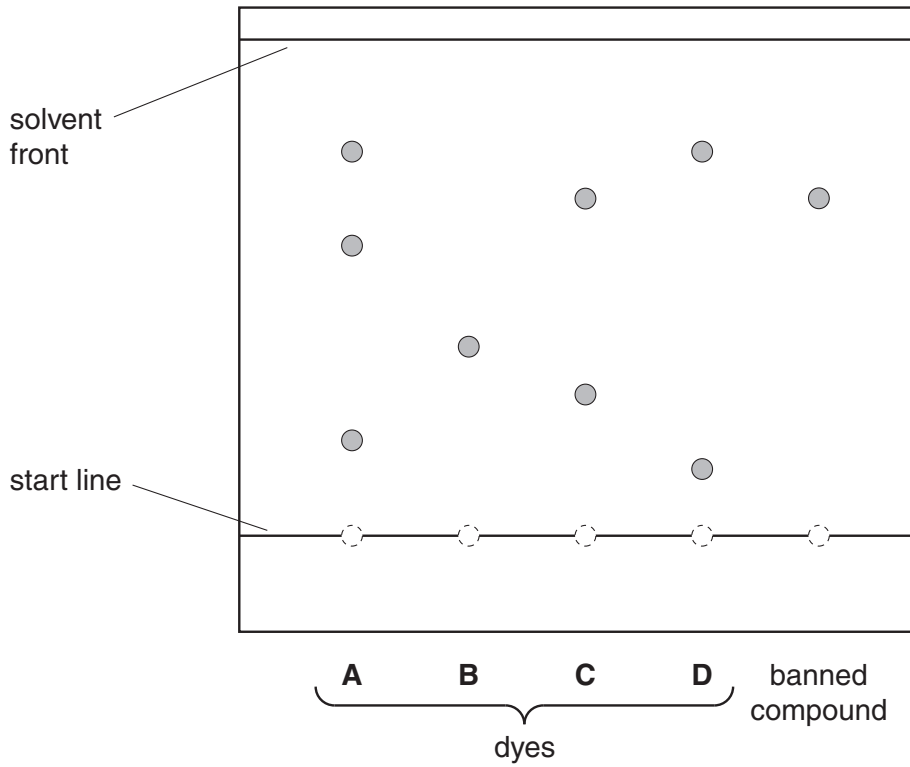
Explain what is meant by the term **activation energy**.

.....  
 .....  
 ..... [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  $\text{dm}^3$ .

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

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

( $1 \text{ dm}^3 = 1000 \text{ cm}^3$ )

.....  
 .....  
 ..... [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  $25.0 \text{ cm}^3$  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  $25 \text{ cm}^3$  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]

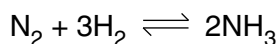
(iii) Explain why she adds an indicator to the sodium hydroxide solution.

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

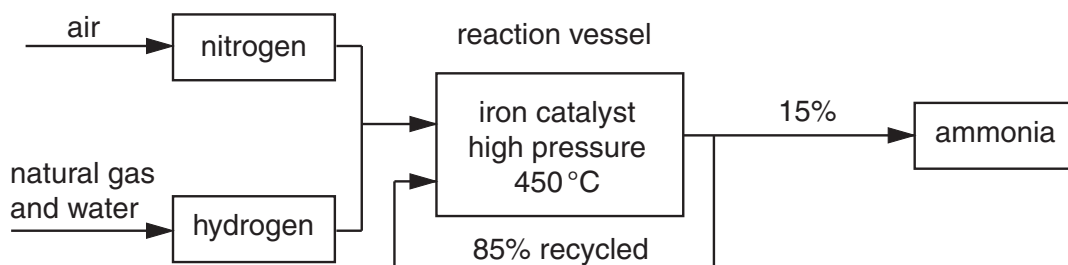
[Total: 7]



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



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**

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# The Periodic Table of the Elements

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

\* 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.