

**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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MODIFIED LANGUAGE

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

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]

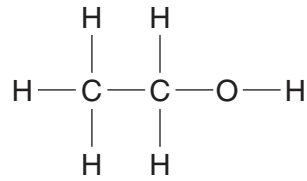
- (ii) Write down the **two** main environmental impacts for reusable nappies.

.....

..... [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:

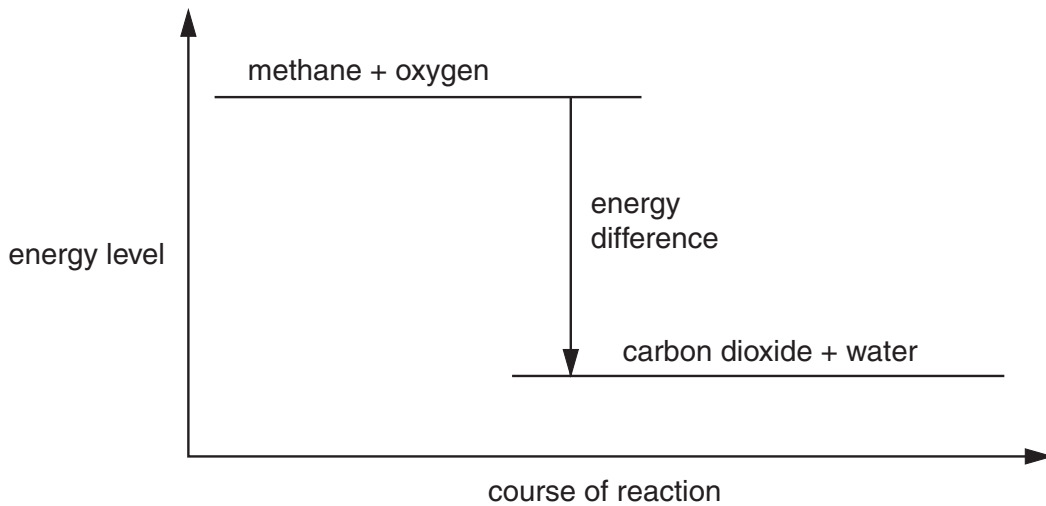
.....

.....

..... [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**.

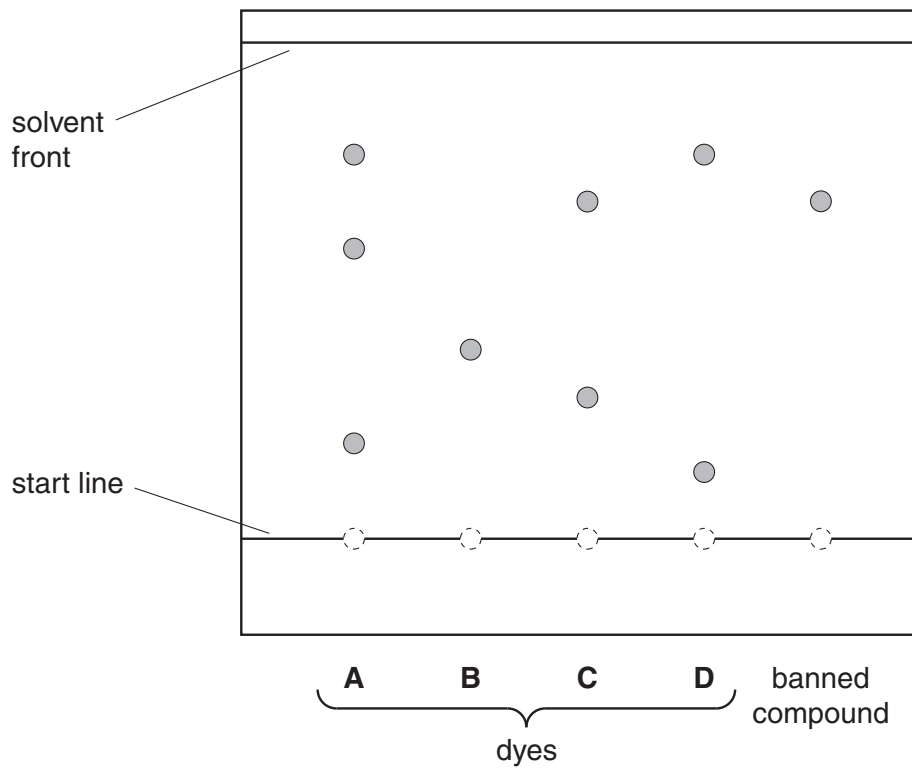
.....

 [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.

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

.....

 [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 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 uses to measure out the sodium hydroxide solution.

..... [1]

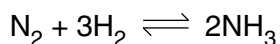
(iii) Explain why she adds an indicator to the sodium hydroxide solution.

.....

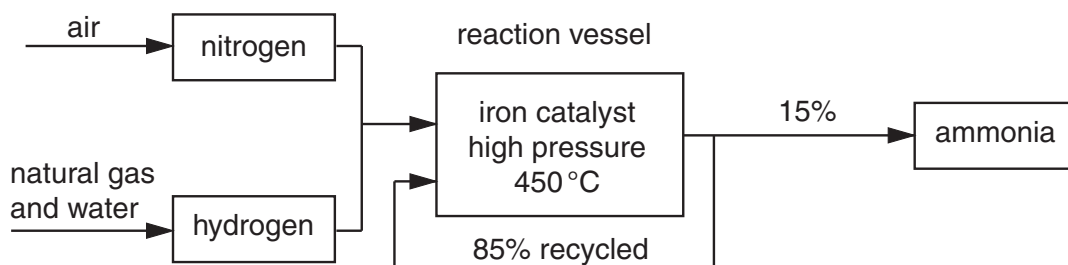
 [2]

[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										
	7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 Mg magnesium 12	13 Al aluminium 13	14 Si silicon 14	15 P phosphorus 15	16 S sulfur 16	17 Cl chlorine 17	18 Ar argon 18								
	19 K potassium 19	20 Ca calcium 20	23 V vanadium 23	24 Cr chromium 24	25 Mn manganese 25	26 Fe iron 26	27 Co cobalt 27	28 Ni nickel 28	29 Cu copper 29	30 Zn zinc 30	31 Ga gallium 31	32 Ge germanium 32	33 As arsenic 33	34 Se selenium 34	35 Br bromine 35	36 Kr krypton 36		
	37 Rb rubidium 37	38 Sr strontium 38	39 Y yttrium 39	40 Zr zirconium 40	41 Nb niobium 41	42 Mo molybdenum 42	43 Tc technetium 43	44 Ru ruthenium 44	45 Rh rhodium 45	46 Pd palladium 46	47 Cd cadmium 47	48 In indium 48	49 Sn tin 49	50 Sb antimony 50	51 Te tellurium 51	52 I iodine 52	53 Xe xenon 53	54 Rn radon 54
	55 Cs caesium 55	56 Ba barium 56	57 La* lanthanum 57	72 Hf hafnium 72	73 Ta tantalum 73	74 W tungsten 74	75 Re rhenium 75	76 Os osmium 76	77 Ir iridium 77	78 Pt platinum 78	79 Au gold 79	80 Hg mercury 80	81 Tl thallium 81	82 Pb lead 82	83 Bi bismuth 83	84 Po polonium 84	85 At astatine 85	86 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						

1
H
hydrogen
1

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.