

**Thursday 19 June 2014 – Afternoon****GCSE TWENTY FIRST CENTURY SCIENCE  
CHEMISTRY A/FURTHER ADDITIONAL SCIENCE A****A173/01** Module C7 (Foundation Tier)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)

**Duration:** 1 hour


Candidate forename		Candidate surname	
-----------------------	--	----------------------	--

Centre number						Candidate number				
---------------	--	--	--	--	--	------------------	--	--	--	--

**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- 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).
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

- The quality of written communication is assessed in questions marked with a pencil (.
- 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 **60**.
- 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** Millions of tonnes of hydrogen are made every year.

The hydrogen is usually made from methane.

The process starts with methane and steam, and makes hydrogen and carbon dioxide.

**(a)** Write a word equation for this process.

..... [1]

**(b)** In this process 52 tonnes of methane and steam make 8 tonnes of hydrogen.

**(i)** The waste product of this reaction is carbon dioxide.

What mass of carbon dioxide is made from 52 tonnes of methane and steam?

answer ..... tonnes [1]

**(ii)** Why does this suggest that the process is not very green?

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

**(c)** A new process for making hydrogen is by heating wood from trees.

Both processes for making hydrogen make carbon dioxide.

Suggest why this new process might be greener than the old one.

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

**[Total: 6]**



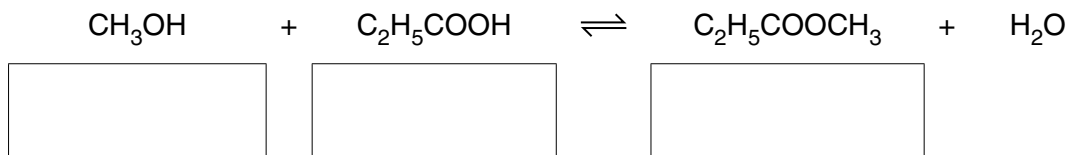
3 Mary and Steve make an ester.

- (a) Mary writes the equation for the reaction.  
Use the words in the list to fill in the boxes.

ester

alcohol

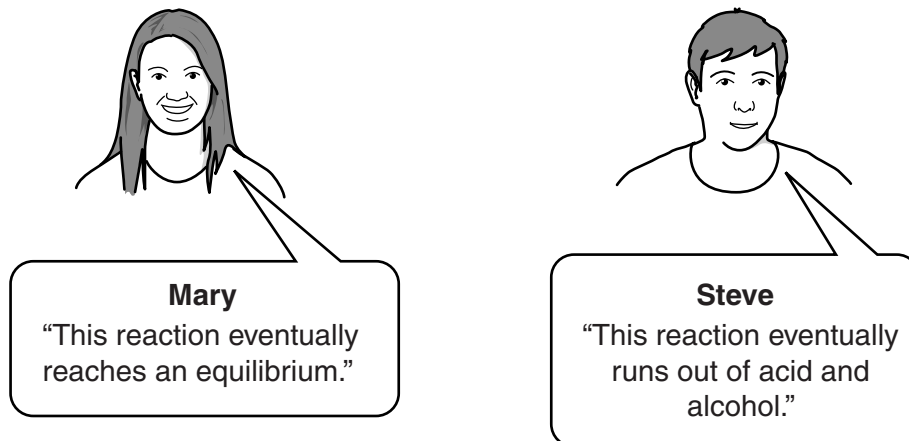
carboxylic acid



[2]

- (b) They know that one molecule of acid reacts with one molecule of alcohol to make the ester. They start with equal amounts of acid and alcohol. They measure the amount of the ester which is made. However long they leave the reaction, they never get as much ester as expected.

They try to explain this.



**Mary**  
"This reaction eventually reaches an equilibrium."

**Steve**  
"This reaction eventually runs out of acid and alcohol."

Explain who is right and who is wrong.

.....

.....

.....

.....

.....

.....

.....

..... [3]

- (c) The substance  $C_2H_5COOCH_3$  is highly flammable. When it burns in oxygen, it makes two products. Suggest the names for these products.

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

[Total: 7]

4 Kate and William decide to make some ethanol.  
Ethanol is an alcohol.  
They add yeast to sugar solution and leave it to ferment.  
Fermentation produces a dilute solution of ethanol.

(a) State two uses of ethanol.

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

(b) Explain why fermentation will produce only a **dilute** solution of ethanol.

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



- (d) An alcoholic drink is made by distilling a dilute alcohol solution. The solution contains a mixture of alcohols.

	<b>Boiling point</b>	<b>Amount which will poison a person [in g]</b>
methanol	65 °C	120
ethanol	79 °C	560
propanol	97 °C	400
butanol	117 °C	350
pentanol	138 °C	120

William says that you should only make the drink from alcohol that distils at 79 °C. He says that it isn't safe to drink alcohol that has been distilled at other temperatures.

Is he right? Explain your answer.

.....

.....

.....

..... [3]

- (e) The formula of ethanol is  $C_2H_5OH$ .

Choose numbers from this list to complete the sentences which follow.

**2            3            5            7            9**

The total number of atoms in the formula is .....

The number of different elements in the formula is .....

[2]

[Total: 15]





(b) James gets these results.

titration number	1	2	3	4
volume of acid in cm <sup>3</sup>	26.4	25.2	25.6	25.4

James decides that the best value for the volume of acid is 25.4 cm<sup>3</sup>.

Show how he arrived at this value.

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

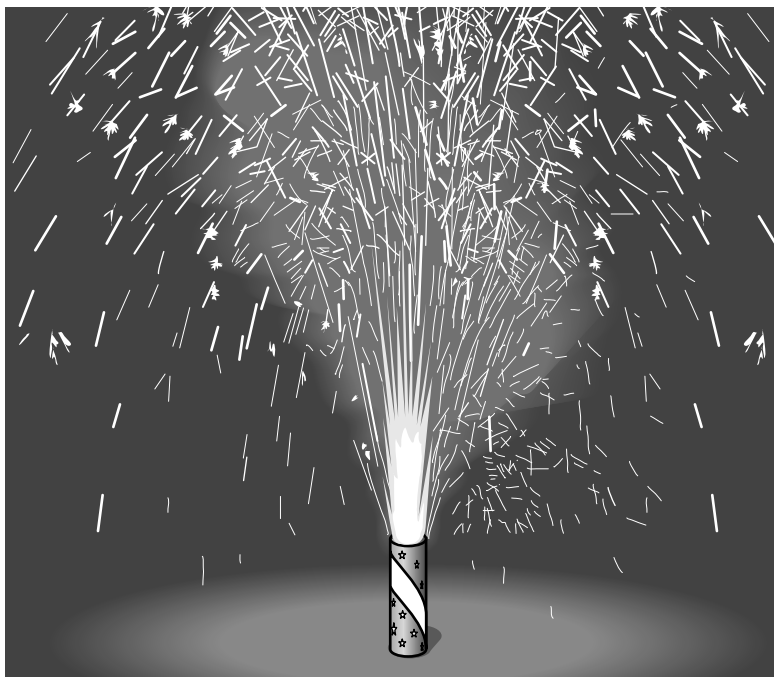
(c) A factory makes a food additive which can be analysed by titration.  
They take several samples throughout the day.  
They analyse each sample as soon as it has been taken.

Suggest why they do these steps.

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

[Total: 11]

- 6 Most fireworks contain gunpowder.



When the gunpowder burns it gives out energy.

- (a) What do we call a reaction which gives out energy?

Put a ring around the correct answer.

**endothermic**      **equilibrium**      **exothermic**      **explosive**      [1]

- (b) Here are some statements about the energy changes in a firework.

Put a ring around the correct word in each statement or phrase.

Jo uses a match to start the reaction.

The reaction starts when energy from the match **breaks / makes / reacts with** chemical bonds in the gunpowder.

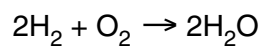
When new bonds are made they **concentrate / dilute / give out / take in** energy.

In a firework the energy change when bonds break is **less than / the same as / more than** when bonds are made.

The energy needed to start the reaction is the **activation / initiation / starting** energy.

[3]

(c) Some rockets which go into space use the reaction between hydrogen and oxygen.



(i) How many molecules of water are shown in this equation?

answer ..... [1]

(ii) The rocket uses different masses of hydrogen and oxygen.

Two molecules of  $\text{H}_2$  react with one molecule of  $\text{O}_2$ .

Relative atomic masses are given in the Periodic Table on the back page.

Calculate the relative masses of

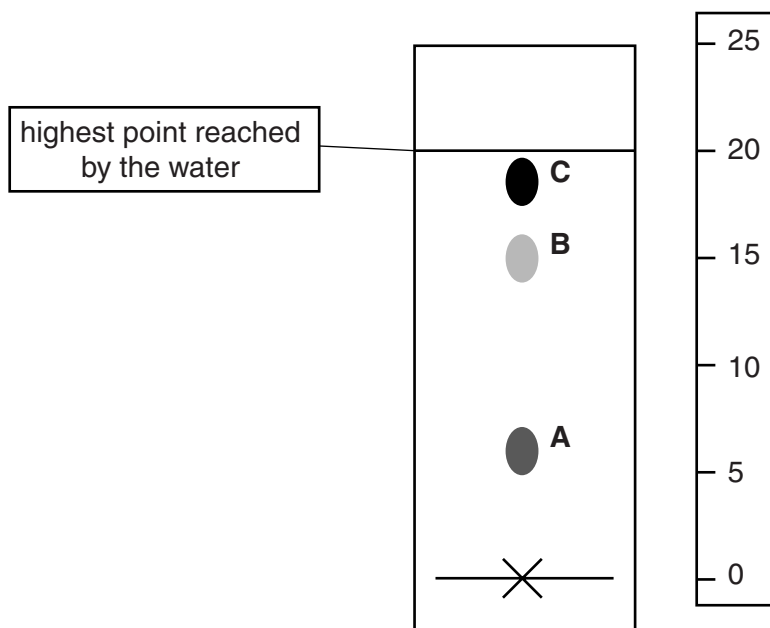
**two** molecules of  $\text{H}_2$  ..... **one** molecule of  $\text{O}_2$  ..... [2]

[Total: 7]

7 Alex does a chromatography experiment using the ink from her pen.

She makes an ink dot on the paper, and then puts the bottom of the paper into a dish of water.

She gets this pattern.



(a) (i) How many colours are in the ink?

answer ..... [1]

(ii) Alex knows that the different colours all dissolve in water.  
Which colour dissolves in water the best?  
Explain your answer.

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

(iii) Use the formula to calculate the R<sub>f</sub> value for colour **B**.

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

Show your working.

R<sub>f</sub> = ..... [2]

- (b) Alex tries out the ink from a different pen. She knows that the ink contains two colours. She gets this result when she runs the chromatogram with water.



- (i) Suggest why no spots appear higher up the paper.

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

- (ii) How could she change her experiment to make the two colours show up?

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

[Total: 8]

END OF QUESTION PAPER

**PLEASE DO NOT WRITE ON THIS PAGE**



**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

# The Periodic Table of the Elements

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

1 <b>H</b> hydrogen 1
--------------------------------

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.