

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE**

TWENTY FIRST CENTURY SCIENCE

A173/01

**CHEMISTRY A/FURTHER ADDITIONAL
SCIENCE A**

Module C7 (Foundation Tier)

THURSDAY 19 JUNE 2014: Afternoon

DURATION: 1 hour

plus your additional time allowance

MODIFIED ENLARGED

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**Candidates answer on the Question Paper.
A calculator may be used for this paper.**

OCR SUPPLIED MATERIALS:

Periodic Table

OTHER MATERIALS REQUIRED:

Pencil

Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the boxes on the first page. 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).

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.

Any blank pages are indicated.

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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?

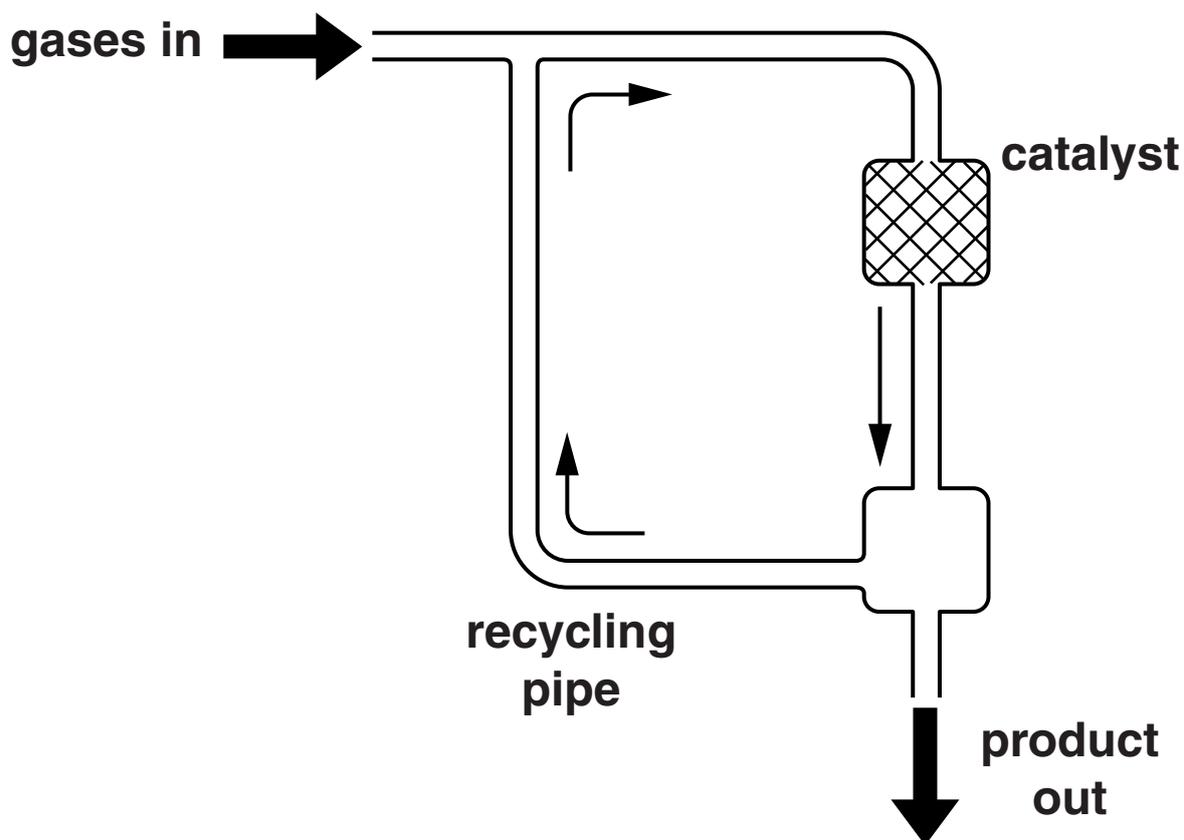
_____ [2]

- (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]

2 In the Haber process, nitrogen and hydrogen react to make ammonia.



Write about the Haber process.

Your answer should include:

what happens

why it uses a catalyst

why the gases are recycled.

[6]



The quality of written communication will be assessed in your answer.

[TOTAL: 6]

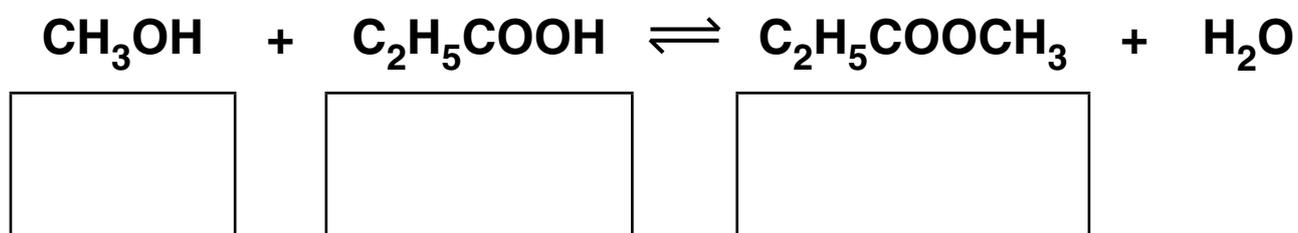
3 Mary and Steve make an ester.

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

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 says “This reaction eventually reaches an equilibrium.”

Steve says “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]

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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.

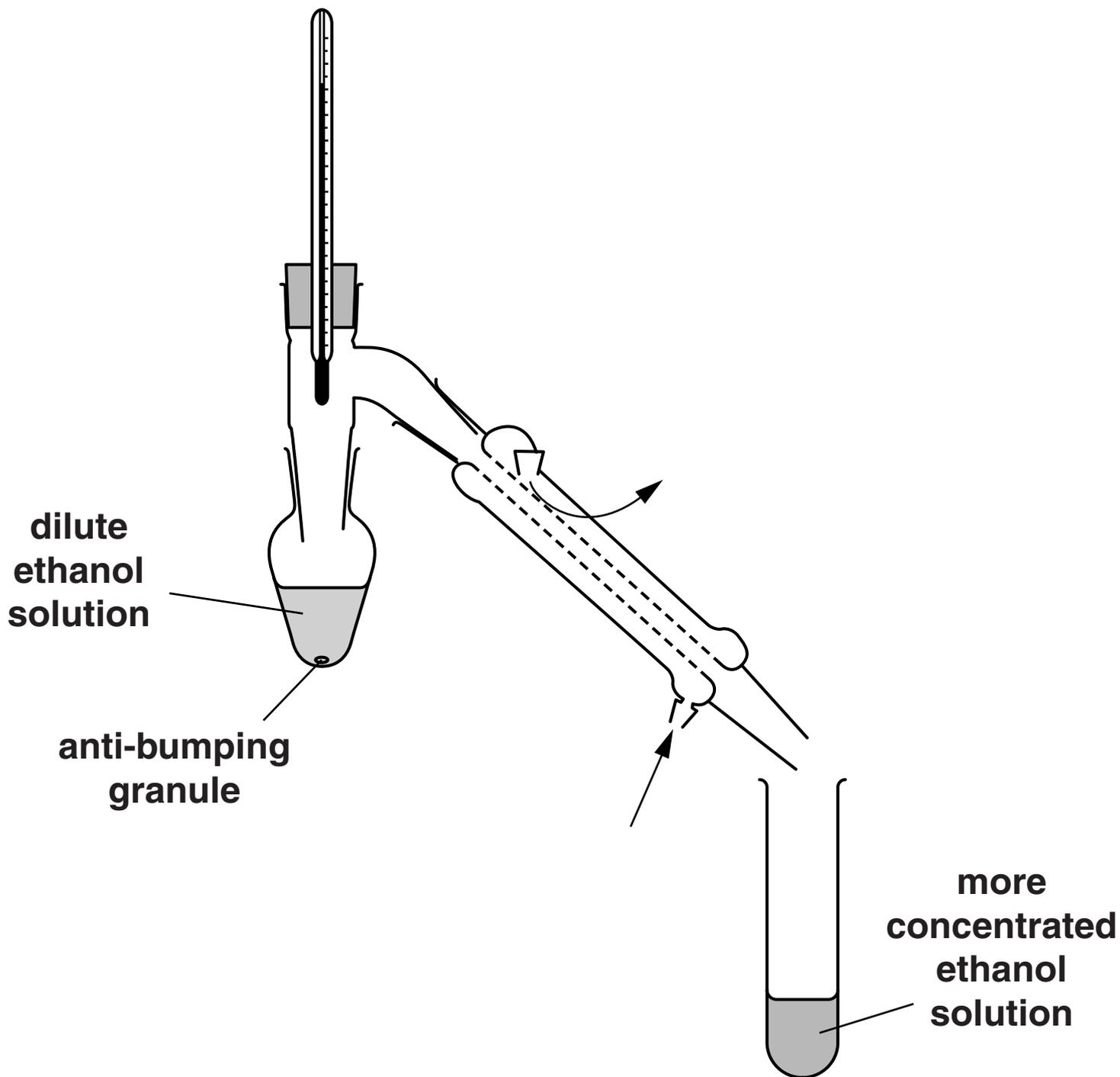
(a) State two uses of ethanol.

[2]

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

[2]

(c) Kate and William decide to make their dilute ethanol solution more concentrated. They use this apparatus.



(d) An alcoholic drink is made by distilling a dilute alcohol solution.

The solution contains a mixture of alcohols.

	Boiling point	Amount which will poison a person [in g]
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

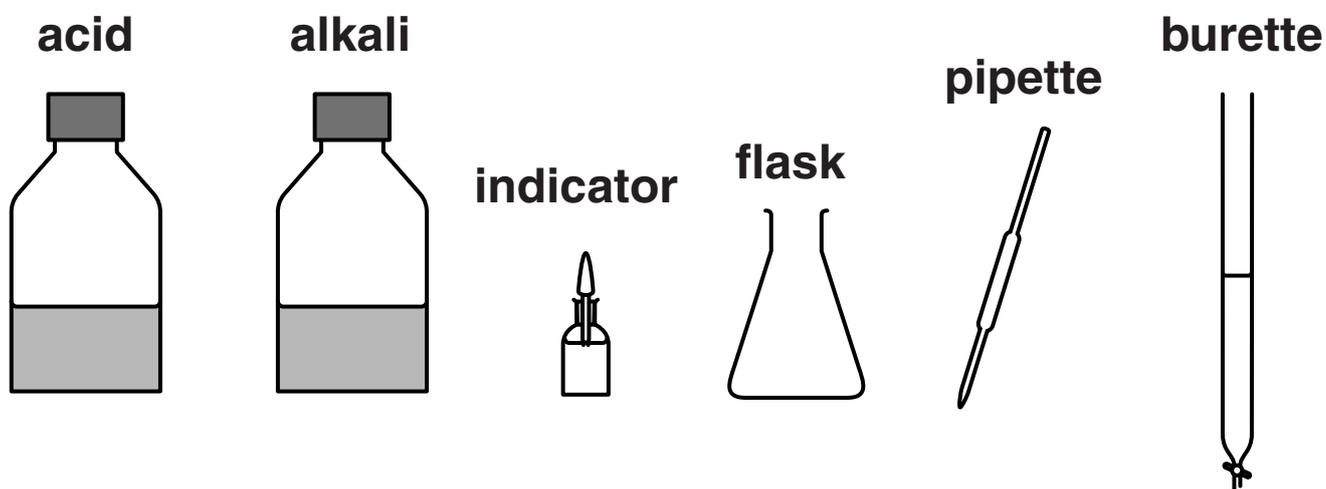
_____ .

[2]

[TOTAL: 15]

5 James does a titration with an acid and an alkali.

(a) He uses dilute sulfuric acid, sodium hydroxide solution and an indicator solution.
He has a burette and a 25.0 cm³ pipette.



Describe how he would do a set of titrations to find out how much acid reacts with 25.0 cm³ of the sodium hydroxide. [6]



The quality of written communication will be assessed in your answer.

(b) James gets these results.

titration number	1	2	3	4
volume of acid in cm³	26.4	25.2	25.6	25.4

James decides that the best value for the volume of acid is 25.4 cm³.

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.**

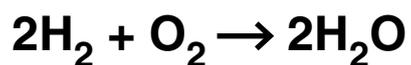
When new bonds are made they **CONCENTRATE / DILUTE / GIVE OUT / TAKE IN energy.**

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 H_2 react with one molecule of O_2 .

Relative atomic masses are given in the Periodic Table.

Calculate the relative masses of

TWO molecules of H_2 _____

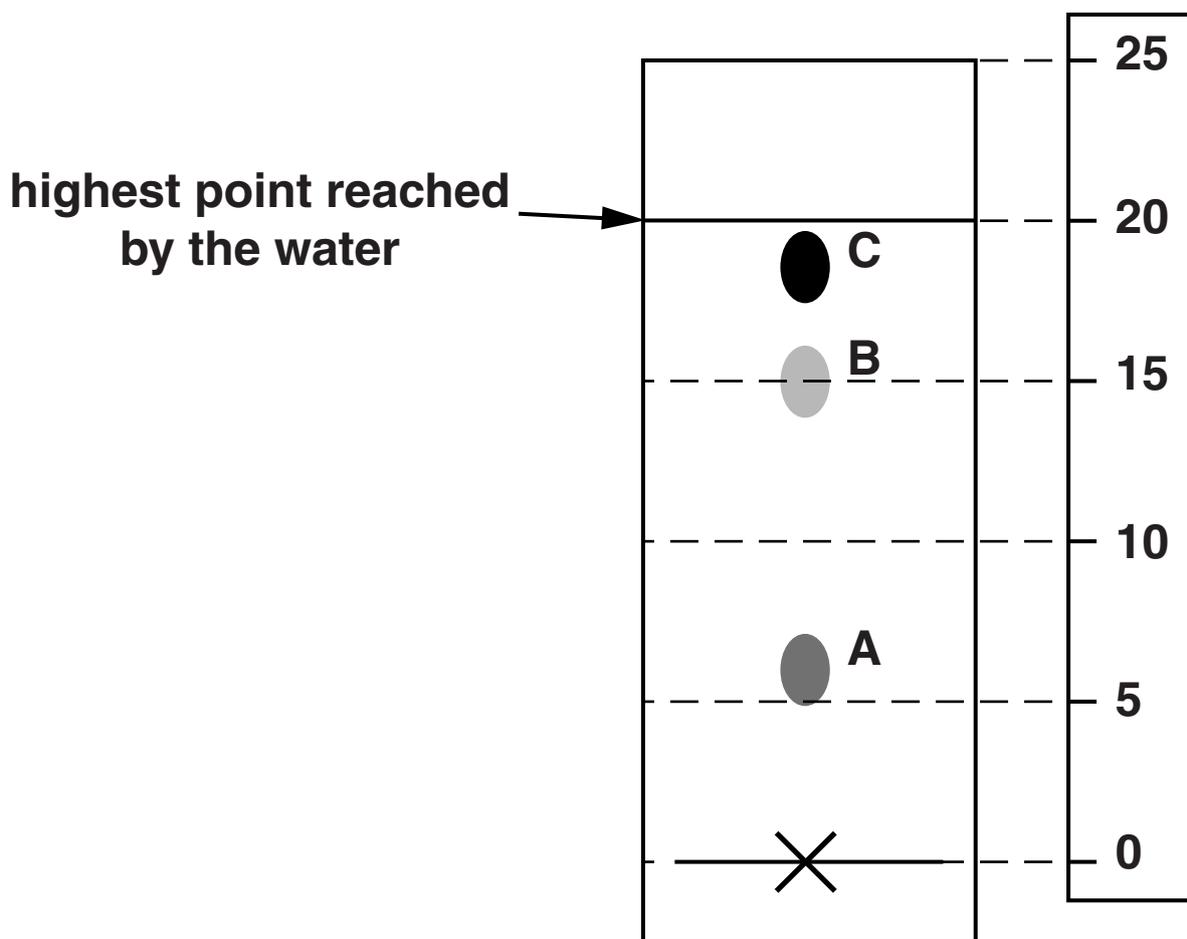
ONE molecule of O_2 _____ [2]

[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 Rf value for colour B.

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

Show your working.

$$R_f = \text{_____} [2]$$

- (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.

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