

Thursday 24 May 2012 – Morning

**GCSE TWENTY FIRST CENTURY SCIENCE
CHEMISTRY A**

A323/01 Unit 3: Ideas in Context plus C7 (Foundation Tier)

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

OCR supplied materials:

- Insert (supplied)

Other materials required:

- Pencil
- Ruler (cm/mm)

Duration: 1 hour




Candidate forename		Candidate surname	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- The Insert will be found in the centre of this document.
- 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 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, ‘Do plasticizers make boys more feminine?’

(a) Look at these sentences about PVC.

In each box, put a **ring** around the correct word to make the sentences correct.

The first box has been done for you.

PVC is made by joining many small
large molecules together to make short
long molecules

called polymers.
plasticizers.

The process is called polymerisation.
crystallisation. [2]

(b) (i) Plasticizers change the properties of PVC.

Describe two of the changes they cause.

- 1
- 2 [2]

(ii) Tests have shown that plasticizers are present in most people.

Explain how plasticizers get into people’s bodies.

-
-
- [2]

(c) A recent research study on boys' play activities suggests that phthalates may affect boys' behaviour.

(i) Explain how the article suggests that phthalates may affect boys' behaviour.

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

(ii) This conclusion is controversial.

Suggest what additional evidence is needed to help evaluate this conclusion.

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

(d) One scientist quoted in the article suggests that the danger from phthalates is low.

Give two properties of phthalates that support this suggestion.

1
2 [2]

(e) The two scientists quoted in the article have opposite opinions on the health risks of phthalate plasticizers.

They disagree even though they have both looked at the same data.

Suggest why they have different opinions.

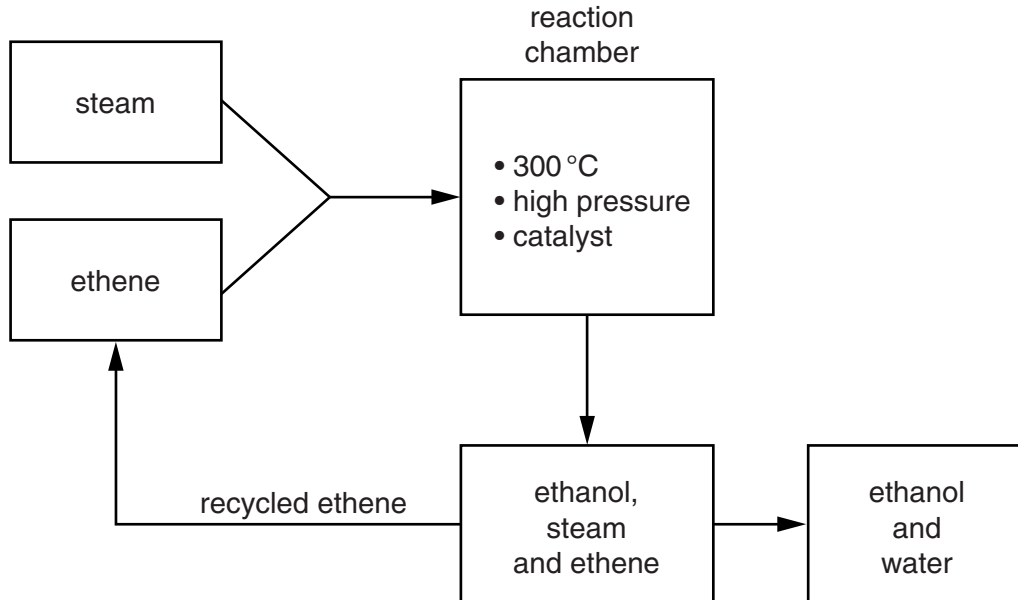
.....
.....
..... [2]

[Total: 13]

2 Ethanol is manufactured from ethene and steam.



The flow diagram shows the process.



(a) The equation for the reaction between ethene and steam has a \rightleftharpoons sign.

What does this tell you about the reaction?

.....

.....

..... [2]

(b) The process makes a mixture of ethanol and water.

This ethanol solution is then made more concentrated.

What process can be used to make the ethanol solution more concentrated?

Put a (ring) around the correct answer.

chromatography crystallisation distillation filtration reflux [1]

(c) Only 5% of the ethene is converted into ethanol as it passes through the reaction chamber.

However, the process converts 95% of the ethene to ethanol.

Use information from the diagram to help you explain this.

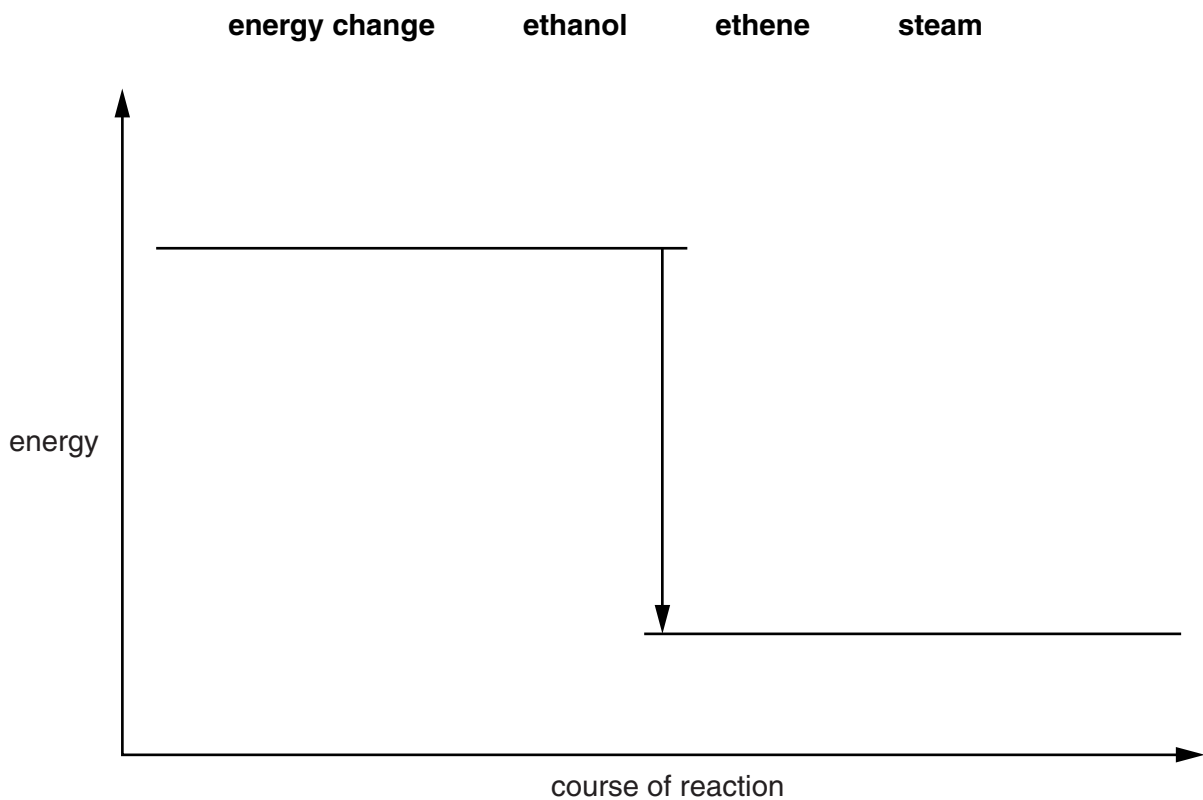
.....

.....

..... [2]

(d) (i) The reaction between ethene and steam is exothermic.

Complete this energy level diagram by adding all of the terms from this list to the diagram.



[3]

(ii) Finish these sentences about an exothermic reaction.

Choose the correct words from this list.

broken gives out less made more takes in

In the first stage of a chemical reaction bonds are

In the next stage bonds are to make new compounds.

The reaction is exothermic if it energy.

[2]

(e) Ethene does not react with water at room temperature.

Ethene does react with steam at a high temperature.

Use ideas about activation energy to explain this difference.

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

(f) A catalyst is used to speed up the reaction between ethene and steam.

Explain how a catalyst speeds up a reaction.

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

[Total: 14]

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Question 3 begins on page 8

PLEASE DO NOT WRITE ON THIS PAGE

- 3 Vegetable oils can be changed into bio-diesel for use in diesel engines.

Bio-diesel contains methyl esters.

Gas chromatography is used to identify the methyl esters in a sample of bio-diesel.

The gas chromatography apparatus is first calibrated using a standard mixture of methyl esters.

The table shows the retention times for five methyl esters.

Methyl Ester	Number of carbon atoms	Retention time in min
Lauric	12	1.6
Myristic	14	2.2
Palmitic	16	3.1
Heptadecanoic	17	3.5
Stearic	18	3.9

- (a) (i) What is meant by retention time?

.....
 [1]

- (ii) Why is it important to find the retention times for a standard mixture of the methyl esters?

.....
 [1]

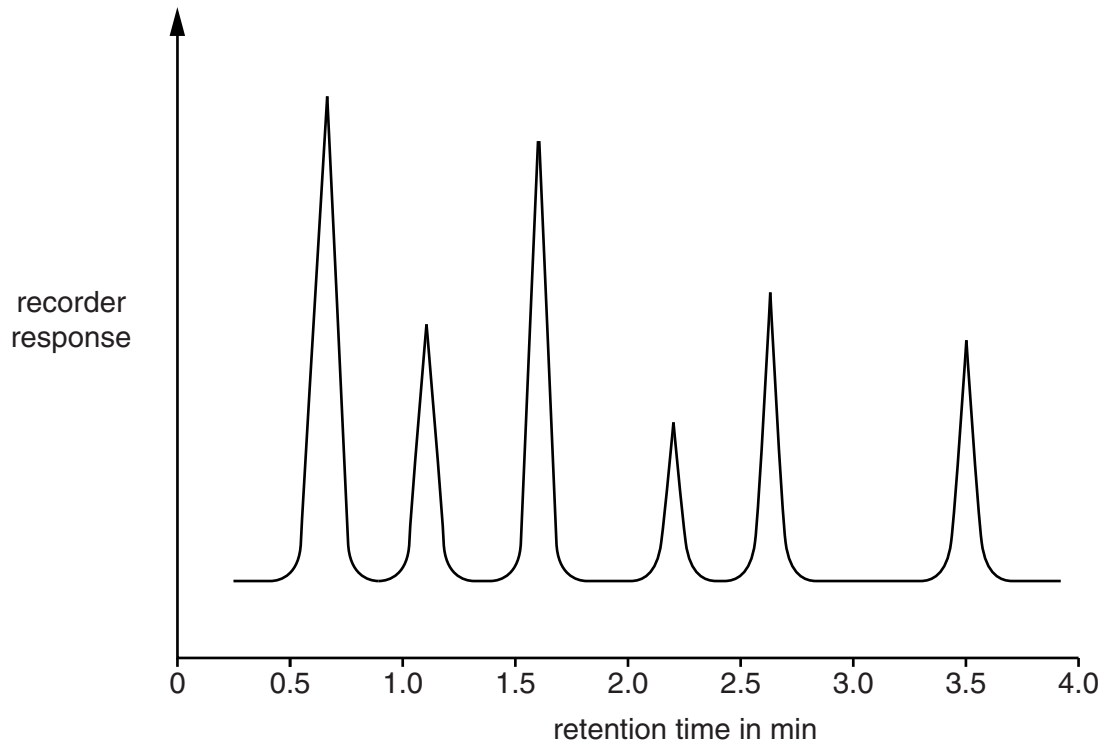
- (iii) The data in the table suggest that there is a correlation between the number of carbon atoms in the methyl esters and their retention times.

Describe this correlation.

.....
 [1]

(b) The gas chromatography trace from one sample of bio-diesel is shown below.

The sample contains methyl esters and impurities.



(i) Which three methyl esters are present in the sample of bio-diesel?

1

2

3

[2]

(ii) There are only three methyl esters in this sample of bio-diesel.

Explain why there are more than three peaks on the gas chromatography trace.

.....
 [1]

(iii) Which methyl ester was present in the **lowest** concentration?

..... [1]

(c) Describe how gas chromatography is used to separate a mixture.

Use the following in your answer.

carrier gas sample stationary phase

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

(d) (i) Esters are used in perfumes.

Explain why.

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

(ii) Give one other common use of esters.

..... [1]

[Total: 13]

11
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Question 4 begins on page 12

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4 Amy works in the quality control department of a company that makes aspirin tablets.

The tablets are made in batches. Each batch contains millions of tablets.

Amy uses titration to get a best estimate of the mass of aspirin per tablet in each batch.

This is what she does.

- A** She measures out the correct volume of a stock solution containing 40g/dm^3 of sodium hydroxide. She mixes this with water to make 1dm^3 of a standard solution containing 4.0g/dm^3 sodium hydroxide.
- B** She crushes an aspirin tablet and mixes it with 25cm^3 of water in a conical flask.
- C** She titrates the aspirin mixture with the 4.0g/dm^3 sodium hydroxide solution using an indicator.
- D** She repeats the titration several times using more aspirin tablets from the same batch.
- E** She works out the mean of her results and uses this to calculate a best estimate for the mass of aspirin in each tablet.

(a) (i) In step **A**, what volumes of stock solution and water should Amy use?

.....

 [2]

(ii) Which step, **A**, **B**, **C**, **D** or **E**, helps Amy to identify any outliers in her titration results?

step [1]

(iii) Amy uses a burette to do the titration in step **C**.

Describe how Amy does this titration.

.....

 [3]

(b) Amy works out the mass of aspirin in each tablet.

(i) Aspirin has a relative formula mass of 180.

Show that the relative formula mass of sodium hydroxide, NaOH, is 40.

Use the Periodic Table to help you.

[2]

(ii) The average of Amy's titration results for one batch of aspirin tablets is 27.4 cm³ of 4.0 g/dm³ sodium hydroxide solution.

Use this formula to work out the mass of aspirin in each tablet.

$$\text{mass} = \text{volume of } 4.0 \text{ g/dm}^3 \text{ sodium hydroxide solution} \times \frac{\text{relative formula mass of aspirin}}{10000}$$

Show your working.

mass of aspirin in each tablet = g [2]

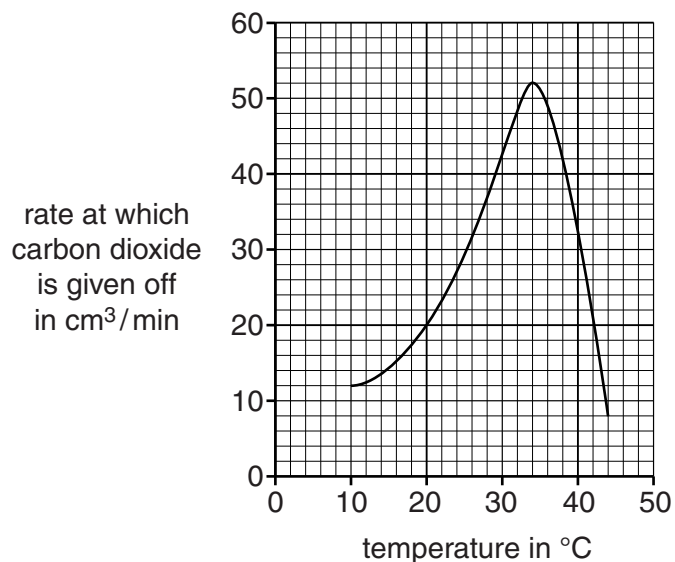
[Total: 10]

5 Ethanol can be made by fermentation using yeast.

Joe carries out fermentation reactions at each of several different temperatures. He keeps all other conditions the same each time.

He measures the rate at which carbon dioxide is given off at each temperature.

His results are shown in the graph.



(a) In the reaction glucose is changed into ethanol and carbon dioxide.

Write a word equation for this reaction.

..... [1]

(b) (i) Use the graph to suggest an optimum temperature for the fermentation of glucose by yeast.

optimum temperature = °C [1]

(ii) Describe and explain the shape of the graph.



One mark is for correct spelling.

.....

 [2+1]

[Total: 5]

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 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		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		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		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		201 Hg mercury 80	201 Hg mercury 80	201 Hg mercury 80	[272] Rg roentgenium 111		
				59 Co cobalt 27	59 Co cobalt 27	59 Ni nickel 28	59 Ni nickel 28		
				56 Fe iron 26	56 Fe iron 26	56 Fe iron 26	56 Fe iron 26		
				55 Mn manganese 25	55 Mn manganese 25	55 Mn manganese 25	55 Mn manganese 25		
				48 Ti titanium 22	48 Ti titanium 22	48 Ti titanium 22	48 Ti titanium 22		
				45 Sc scandium 21	45 Sc scandium 21	45 Sc scandium 21	45 Sc scandium 21		
				91 Zr zirconium 40	91 Zr zirconium 40	91 Zr zirconium 40	91 Zr zirconium 40		
				89 Y yttrium 39	89 Y yttrium 39	89 Y yttrium 39	89 Y yttrium 39		
				178 Hf hafnium 72	178 Hf hafnium 72	178 Hf hafnium 72	178 Hf hafnium 72		
				181 Ta tantalum 73	181 Ta tantalum 73	181 Ta tantalum 73	181 Ta tantalum 73		
				184 W tungsten 74	184 W tungsten 74	184 W tungsten 74	184 W tungsten 74		
				[264] Bh bohrium 107	[264] Bh bohrium 107	[264] Bh bohrium 107	[264] Bh bohrium 107		
				[277] Hs hassium 108	[277] Hs hassium 108	[277] Hs hassium 108	[277] Hs hassium 108		
				[268] Mt meitnerium 109	[268] Mt meitnerium 109	[268] Mt meitnerium 109	[268] Mt meitnerium 109		
				[271] Ds darmstadtium 110	[271] Ds darmstadtium 110	[271] Ds darmstadtium 110	[271] Ds darmstadtium 110		
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				[262] Db dubnium 105	[262] Db dubnium 105	[262] Db dubnium 105	[262] Db dubnium 105		
				[261] Rf rutherfordium 104	[261] Rf rutherfordium 104	[261] Rf rutherfordium 104	[261] Rf rutherfordium 104		
				[227] Ac* actinium 89	[227] Ac* actinium 89	[227] Ac* actinium 89	[227] Ac* actinium 89		
				[226] Ra radium 88	[226] Ra radium 88	[226] Ra radium 88	[226] Ra radium 88		
				[227] La* lanthanum 57	[227] La* lanthanum 57	[227] La* lanthanum 57	[227] La* lanthanum 57		
				[98] Tc technetium 43	[98] Tc technetium 43	[98] Tc technetium 43	[98] Tc technetium 43		
				101 Ru ruthenium 44	101 Ru ruthenium 44	101 Ru ruthenium 44	101 Ru ruthenium 44		
				103 Rh rhodium 45	103 Rh rhodium 45	103 Rh rhodium 45	103 Rh rhodium 45		
				106 Pd palladium 46	106 Pd palladium 46	106 Pd palladium 46	106 Pd palladium 46		
				108 Ag silver 47	108 Ag silver 47	108 Ag silver 47	108 Ag silver 47		
				112 Cd cadmium 48	112 Cd cadmium 48	112 Cd cadmium 48	112 Cd cadmium 48		
				63.5 Cu copper 29	63.5 Cu copper 29	63.5 Cu copper 29	63.5 Cu copper 29		
				65 Zn zinc 30	65 Zn zinc 30	65 Zn zinc 30	65 Zn zinc 30		
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