

Write your name here

Surname

Other names

Centre Number

Candidate Number

**Edexcel GCSE**

**Chemistry**

**Unit C3: Chemistry in Action**

**Foundation Tier**

**Sample Assessment Material**

**Time: 1 hour**

Paper Reference

**5CH3F/01**

**You do not need any other materials.**

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*

### Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed  
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

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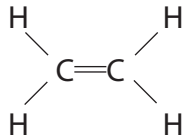
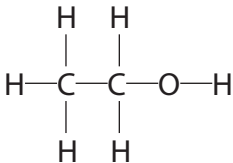
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**Answer ALL questions**

**Some questions must be answered with a cross  $\boxtimes$ .  
If you change your mind about an answer, put a line through the box  $\boxtimes$  and then  
mark your new answer with a cross  $\boxtimes$ .**

**Organic molecules**

**1** (a) The table shows the formulae of some organic substances.

$C_4H_{10}$		$CH_3CH_2CH_3$	
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>

(i) Which substance has the molecular formula  $C_2H_4$ ?

Put a cross ( $\boxtimes$ ) in the box next to your answer.

(1)

**A**

**B**

**C**

**D**

(ii) Which substance is butane?

Put a cross ( $\boxtimes$ ) in the box next to your answer.

(1)

**A**

**B**

**C**

**D**

(iii) Which substance can be oxidised by air to form ethanoic acid?

Put a cross ( $\boxtimes$ ) in the box next to your answer.

(1)

**A**

**B**

**C**

**D**

(iv) Which **two** substances are members of the same homologous series?

(1)

1 .....

2 .....

(b) Substance D reacts with methanoic acid. Methanoic acid is a carboxylic acid.

The reaction makes a substance called ethyl methanoate. Ethyl methanoate smells of raspberries.

(i) Describe a reaction that illustrates that methanoic acid behaves as a typical acid.

(2)

.....  
.....  
.....  
.....

(ii) What type of substance is ethyl methanoate?

(1)

.....  
.....

(iii) Suggest a use for ethyl methanoate.

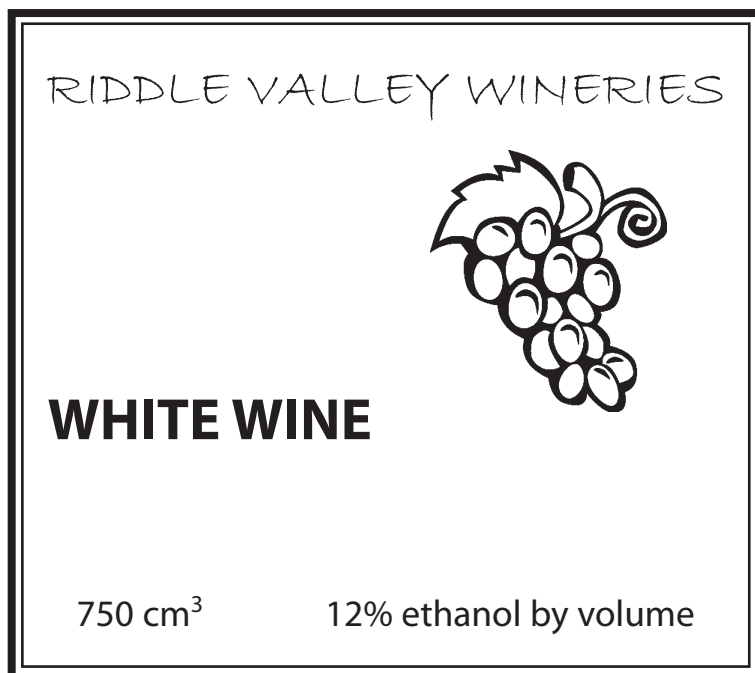
(1)

.....  
.....

**(Total for Question 1 = 8 marks)**

## Alcoholic drinks

2 The diagram shows a label from a bottle of wine.



(a) The ethanol in wine is produced from sugars.

Complete the sentence by putting a cross (☒) in the box next to your answer.

(i) Ethanol is produced from sugars by

(1)

- A dehydration
- B fermentation
- C neutralisation
- D oxidation

(ii) Yeast is used to produce ethanol from sugars.

Give **one** reason why yeast is needed for this reaction.

(1)

.....

.....

(b) Using the information on the wine label, calculate the volume of ethanol, in  $\text{cm}^3$ , in the bottle.

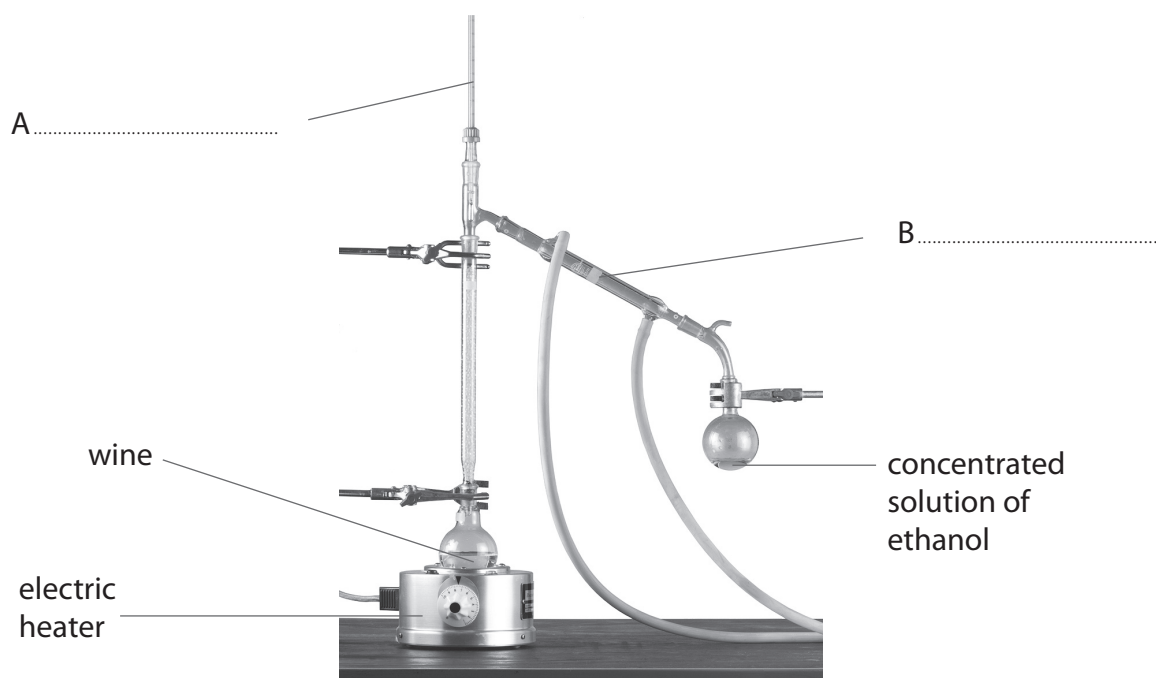
(2)

volume = .....  $\text{cm}^3$

(c) The photograph shows the apparatus used to obtain a more concentrated solution of ethanol from wine by fractional distillation.

Complete the labels for the apparatus shown in the photograph.

(2)



Science photo library

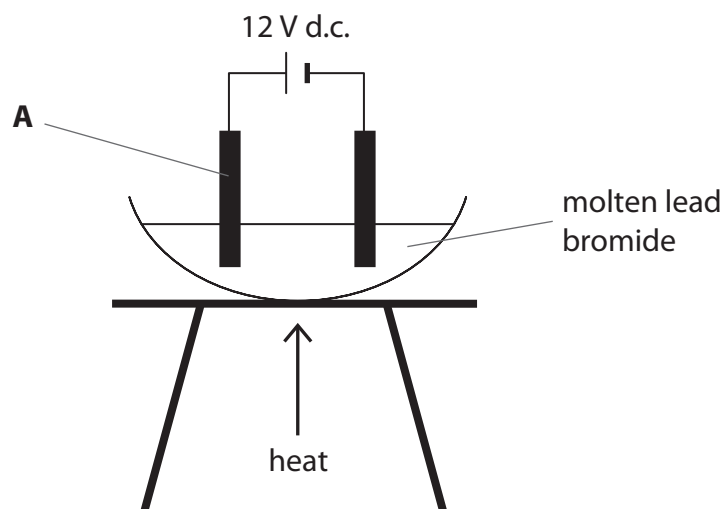
(d) Explain why drinking a bottle of wine every day could be harmful to health.

(2)

**(Total for Question 2 = 8 marks)**

## Electrolysis

- 3 (a) The diagram shows the apparatus that could be used to electrolyse molten lead bromide.



- (i) Name the part of the apparatus labelled **A**.

Put a cross (☒) in the box next to your answer.

- A** battery  
 **B** electrode  
 **C** electrolyte  
 **D** voltmeter

(1)

- (ii) Give **one** reason why lead bromide must be molten for electrolysis to take place.

(1)

.....  
.....

- (b) A chemist investigates what happens when molten calcium fluoride is electrolysed.

Use your knowledge of the electrolysis of molten lead bromide to suggest the **two** products which will be formed when molten calcium fluoride is electrolysed.

(1)

1 .....  
2 .....

(c) Copper sulfate solution can be electrolysed.  
During the electrolysis, the blue colour of the solution fades and bubbles appear on the anode.

(i) Explain these observations.

(2)

.....

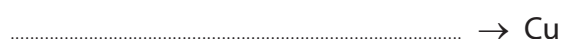
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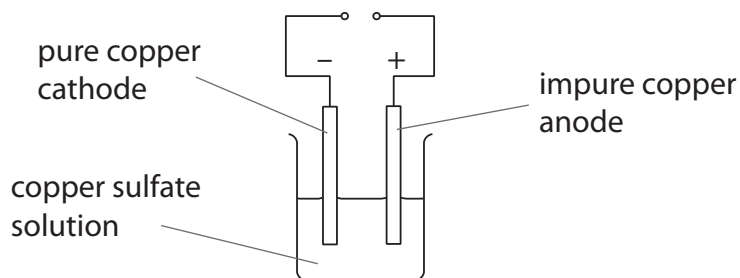
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(ii) Complete the equation for the formation of copper metal in this process.

(2)



(d) Copper can be purified by electrolysis using a pure copper cathode and an impure copper anode.



Martin investigated this reaction and recorded the following results.

time / mins	mass of cathode / g	mass of anode / g
0	1.00	1.00
5	1.15	0.85
10	1.30	0.70
15	1.45	0.55

Use the data to describe the changes that take place at the anode and cathode.

(3)

.....

.....

.....

.....


.....

.....

**(Total for Question 3 = 10 marks)**

### Testing bottled water

4 The following label is found on a bottle of water.

Typical analysis		Canning Hills Spring Water	250 cm <sup>3</sup>
hydrogencarbonate	450.0 mg / litre	Every drop of Canning Hills Spring Water has been naturally filtered through the surrounding limestone hills for thousands of years.	
calcium	160.0 mg / litre		
chloride	75.0 mg / litre		
sodium	62.0 mg / litre		
magnesium	28.0 mg / litre		
sulfate	25.0 mg / litre		
potassium	5.0 mg / litre		
pH at source	7.8		

(a) A white precipitate is formed when a few drops of nitric acid and silver nitrate solution are added to a sample of the spring water.

Which ion in the water is responsible for this reaction?

Put a cross (☒) in the box next to your answer.

(1)

- A** calcium
- B** chloride
- C** sodium
- D** sulfate

(b) An analysis of Canning Hills Spring Water showed that it had a total mass of dissolved solids of 960 mg/litre.

What total mass of dissolved solids would you expect from a 250 cm<sup>3</sup> bottle of Canning Hills Spring Water?

(2)

.....  
.....  
.....  
mass = ..... mg



(c) Juan's teacher asks him to investigate whether Canning Hills Spring Water is hard or soft.

Juan's hypothesis is that the spring water is hard water, but that the hardness goes away when the water is boiled.

(i) Describe how Juan could use information from the label to justify his hypothesis.

(2)

.....

.....

.....

(ii) Describe a test that you could perform to show that Canning Hills Spring Water was hard water.

(2)

.....

.....

.....

(d) Juan does some experiments to prove his hypothesis that the spring water is temporarily hard.

Why does temporary hard water cause problems in domestic water supplies?

(3)

.....

.....

.....

.....

.....

**(Total for Question 4 = 10 marks)**

### Chemistry in farming

5 Fertilisers are often used by farmers when they grow crops.

Many fertilisers are manufactured from ammonia,  $\text{NH}_3$ .

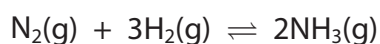
(a) (i) State the name of the process in which ammonia is manufactured from nitrogen and hydrogen.

(1)

(ii) Describe how the hydrogen for this reaction is obtained from a raw material.

(2)

(b) The reaction between nitrogen and hydrogen is shown in the equation



Explain what is meant by the symbol  $\rightleftharpoons$  in this reaction.

(2)

(c) One common fertiliser is ammonium nitrate.

It is made by neutralising ammonia with nitric acid,  $\text{HNO}_3$ .

Complete the balanced equation for this reaction.

(1)





## Salts

6 Copper sulfate,  $\text{CuSO}_4$ , is a salt.

Copper sulfate can be prepared using copper carbonate and dilute sulfuric acid.

(a) Copper carbonate is insoluble.

What is meant by the word **insoluble**?

(1)

(b) Some copper carbonate is added to a beaker containing dilute sulfuric acid.

Describe what is **seen** when the reaction happens.

(2)

(c) A student is given a solution of a different salt.

She investigates the ions present in this solution and records her results in a table.

test number	test performed	observation	conclusion
1	acidified barium chloride solution added	white precipitate	$\text{SO}_4^{2-}$ (sulfate ions)
2	sodium hydroxide solution added	red-brown precipitate	.....

(i) Complete the table to show the formula of the ion responsible for the observation made when sodium hydroxide solution is added.

(1)

(ii) The student repeated test number 2, but warmed the tube gently. She placed some damp red litmus paper at the top of the tube and noticed that it went blue.

Explain the conclusion you can draw from her observations.

(2)





# Sample Mark Scheme

## Unit C3: Chemistry in Action (Foundation Tier)

Question number	Answer	Mark
1(a)(i)	B	(1)

Question number	Answer	Mark
1(a)(ii)	A	(1)

Question number	Answer	Mark
1(a)(iii)	D	(1)

Question number	Answer	Mark
1(a)(iv)	A and C	(1)

Question number	Answer	Acceptable answers	Mark
1(b)(i)	a description including the following:  a named substance to react with the acid (1)  what would be seen/how the acid would react with the substance added (1)	e.g.  reacts with reactive metal (e.g. magnesium) (1) to release hydrogen (1)  reacts with bases (1) to form neutral solution (1)  reacts with carbonates (1) to form carbon dioxide (1)  appropriate colour change (1) with a named indicator (1)	(2)

Question number	Answer	Mark
1(b)(ii)	ester	(1)

Question number	Answer	Acceptable answers	Mark
1(b)(iii)	flavouring/food additive/artificial raspberry	solvent	(1)

**TOTAL: 8 MARKS**

Question number	Answer	Mark
2(a)(i)	B	(1)

Question number	Answer	Acceptable answers	Mark
2(a)(ii)	provides an enzyme	zymase catalyses/speeds up reaction	(1)

Question number	Answer	Acceptable answers	Mark
2(b)	$750 \times 12/100$ (1) $= 90 \text{ (cm}^3\text{)}$ (1)	accept any equivalent calculation	(2)

Question number	Answer	Mark
2(c)	A: thermometer B: (Liebig) condenser	(2)

Question number	Answer	Acceptable answers	Mark
2(d)	an explanation linking one of the following pairs:  getting drunk/longer reaction time (1) (leads to) accidents/death, e.g. caused by dangerous driving (1)  alcoholism/dependence (1) (leads to) liver damage/long-term memory damage (1)	an answer that goes into more detail on one point can also score 2 marks e.g. damage to the liver (1) (leading to) cirrhosis/liver failure (1)	(2)

**TOTAL: 8 MARKS**



Question number	Answer	Mark
3(a)(i)	B	(1)

Question number	Answer	Acceptable answers	Mark
3(a)(ii)	ions are free to move	only conducts electricity when molten	(1)

Question number	Answer	Acceptable answers	Mark
3(b)	calcium and fluorine	correct formulae	(1)

Question number	Answer	Mark
3(c)(i)	<p>an explanation linking the following:</p> <p>(bubbles formed because) oxygen gas is produced (1)</p> <p>(blue colour fades because) copper ions are discharged/removed from solution (1)</p>	(2)

Question number	Answer	Acceptable answers	Mark
3(c)(ii)	<p><math>\text{Cu}^{2+}</math> ion shown</p> <p>equation balanced with correct number of electrons</p> <p>i.e. <math>\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}</math></p>	$\text{Cu}^+ + \text{e}^- \rightarrow \text{Cu}$ is worth 1 mark	(2)

Question number	Answer	Mark
3(d)	<p>a description including the following:</p> <p>copper dissolves from anode to form copper ions (1)</p> <p>copper ions discharged at cathode to form copper metal (1)</p> <p>mass lost at anode = mass gained at cathode (1)</p>	(3)

**TOTAL: 10 MARKS**

Question number	Answer	Mark
4(a)	B	(1)

Question number	Answer	Acceptable answers	Mark
4(b)	960 × 250/1000 (1) = 240 (mg) (1)	accept any equivalent calculation  answer alone worth 2 marks	(2)

Question number	Answer	Acceptable answers	Mark
4(c)(i)	a description including the following:  calcium/magnesium ions make the water hard (1)  hydrogencarbonate ions lead to temporary hardness (1)	calcium/magnesium ions not removed by boiling  hydrogencarbonate ions removed by boiling	(2)

Question number	Answer	Acceptable answers	Mark
4(c)(ii)	a description including the following:  add soap and shake (1)  with hard water no lather/scum formed (1)	boil water  with hard water limescale formed	(2)

Question number	Answer	Acceptable answers	Mark
4(d)	an explanation linking the following:  forms limescale (1)  with two from:  (leading to) furring of heating elements/clogging of pipes/inefficient heating (2)	hard water forms scum with soap  (so) soap is wasted/no lather/money wasted on soap	(3)

**TOTAL: 10 MARKS**

Question number	Answer	Mark
5(a)(i)	Haber process	(1)

Question number	Answer	Mark
5(a)(ii)	a description including the following:  water/methane (1)  electrolysis/reaction with steam (1)	(2)

Question number	Answer	Mark
5(b)	an explanation linking the following:  reversible (1) so (the reaction) can go in both directions/ammonia can turn back into nitrogen and hydrogen/does not go to completion (1)	(2)

Question number	Answer	Acceptable answers	Mark
5(c)	NH <sub>4</sub> NO <sub>3</sub>	allow any formula whose atoms add up to NH <sub>4</sub> NO <sub>3</sub>	(1)

Question number	Indicative content	Mark
*5(d) QWC	<p>an evaluation including some of the following benefits and drawbacks:</p> <p>Benefits:</p> <ul style="list-style-type: none"> <li>• improve/speed up growth</li> <li>• improve yield</li> <li>• replace elements or minerals missing from soil</li> <li>• improve soil/add nutrients to soil</li> <li>• increase soil fertility/allow intensive farming</li> </ul> <p>Drawbacks:</p> <ul style="list-style-type: none"> <li>• excess fertiliser runs off into water</li> <li>• encourages excess algal growth</li> <li>• removes oxygen from water</li> <li>• so that other organisms in water die</li> <li>• eutrophication</li> </ul>	(6)
Level	0	No rewardable material
1	1-2	<ul style="list-style-type: none"> <li>• a limited description that addresses one side of Reena's statement - either benefits or drawbacks</li> <li>• communicates ideas using simple language and little scientific terminology</li> <li>• spelling, punctuation and grammar are used with little accuracy</li> </ul>
2	3-4	<ul style="list-style-type: none"> <li>• a description of some of the key points of both benefits and drawbacks with a limited attempt to evaluate the statement; or a very thorough description of one side of the argument only</li> <li>• communicates ideas showing some evidence of clarity and organisation and uses some scientific terminology appropriately</li> <li>• spelling, punctuation and grammar are used with some accuracy</li> </ul>
3	5-6	<ul style="list-style-type: none"> <li>• a clear description of the key points for and against fertiliser use and an evaluation weighs up the pros and cons</li> <li>• communicates ideas clearly and uses scientific terminology appropriately</li> <li>• spelling, punctuation and grammar are used with few errors</li> </ul>

**TOTAL: 12 MARKS**

Question number	Answer	Mark
6(a)	does not dissolve	(1)

Question number	Answer	Mark
6(b)	a description including the following: blue solution (forms) (1) colourless gas (given off) (1)	(2)

Question number	Answer	Acceptable answers	Mark
6(c)(i)	Fe <sup>3+</sup>	Fe(III) ion	(1)

Question number	Answer	Acceptable answers	Mark
6(c)(ii)	an explanation linking the following: ammonia produced (because) salt is ammonium salt/contains ammonium ions	litmus touches tube where sodium hydroxide was added and sodium hydroxide is an alkali	(2)

Question number	Indicative content		Mark
*6(d) QWC	an explanation including some of the following: <ul style="list-style-type: none"> <li>acid is warmed to increase rate of reaction</li> <li>solid remaining means excess copper carbonate/all acid has reacted/provides visual indication that reaction is over / no more solid can react</li> <li>filtering removes unreacted copper carbonate</li> <li>heating concentrates the solution so that crystals form more rapidly on cooling</li> <li>product forms as solid/crystals/crystals contain water of crystallisation/more impurities remain in solution</li> <li>filtration separates the crystals from remaining liquid</li> <li>blotting paper dries crystals/crystals would lose water of crystallisation if heated</li> </ul>		(6)
Level	0	No rewardable material	
1	1-2	<ul style="list-style-type: none"> <li>a limited explanation of the steps needed to make the salt, with many of the steps unexplained or with poor explanation.</li> <li>communicates ideas using simple language and little scientific terminology</li> <li>spelling, punctuation and grammar are used with little accuracy</li> </ul>	
2	3-4	<ul style="list-style-type: none"> <li>an explanation of the key steps needed to make the salt, with a few steps either unexplained or explained inaccurately</li> <li>communicates ideas showing some evidence of clarity and organisation and uses some scientific terminology appropriately</li> <li>spelling, punctuation and grammar are used with some accuracy</li> </ul>	
3	5-6	<ul style="list-style-type: none"> <li>a clear explanation of the key steps involved in making the salt</li> <li>communicates ideas clearly and uses scientific terminology appropriately</li> <li>spelling, punctuation and grammar are used with few errors</li> </ul>	

**TOTAL: 12 MARKS**