OCR
Oxford Cambridge and RSA

Accredited

GCSE (9–1) Chemistry B (Twenty First Century Science)

H

J258/03 Breadth in chemistry (Higher Tier)

Sample Question Paper

Date – Morning/Afternoon

Version 2

Time allowed: 1 hour 45 minutes

You must have:
- a ruler (cm/mm)
- the Data Sheet

You may use:
- a scientific or graphical calculator

First name	
Last name	
Centre number	
Candidate number	

INSTRUCTIONS
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION
- The total mark for this paper is **90**.
- The marks for each question are shown in brackets **[ ]**.
- This document consists of **24** pages.

Answer **all** the questions.

1 Scientists think that the composition of the early atmosphere changed slowly over many billions of years.

Scientists estimated the composition of the earliest atmosphere on Earth.

Earth's earliest atmosphere

Gas	Percentage composition %
carbon dioxide	1.9
water vapour	95.8
other gases	2.3

Estimated surface temperature = 700–1100 °C

Scientists also estimated the composition of the atmosphere shortly before the first plant life existed.

Atmosphere just before the first plant life

Gas	Percentage composition %
carbon dioxide	89.8
water vapour	2.1
other gases	

(a) Explain the change in the percentage of water vapour shown in the tables.

.....

.....

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

(b) Plants caused further changes to the composition of gases in the atmosphere.

Predict the effect that plants had on the percentage of carbon dioxide in the atmosphere.

Explain your reasoning.

.....

.....

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

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TURN OVER FOR THE NEXT QUESTION

2 Metal extraction produces a lot of waste. The zinc ions from this waste could leak into watercourses and contaminate soil.

Alpine Penny-cress is a plant that grows on waste heaps that contain toxic zinc ions. The cress plants take up the zinc ions and store them in their leaves.

(a) Explain how the planting of Alpine Penny-cress could be used to recycle zinc.

.....

.....

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

(b) Explain how growing these plants could reduce risk.

.....

.....

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

(c) Alpine Penny-cress takes up zinc ions from contaminated soil very well. Oilseed rape cannot take up zinc.

The table shows data on Alpine Penny-cress and oilseed rape.

Plant	Height (cm)	Dry mass per plant (g)	Plants (per m^2)	Time to fully grown (days)
Alpine Penny-cress	25	1	20	100
Oilseed rape	125	2	50	85

Scientists have put genes from Alpine Penny-cress into the oilseed rape plant.

Explain what effect this modified oilseed rape could have on the uptake of zinc ions in contaminated soil.

.....

.....

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

(d) The Alpine Penny-cress contains toxic zinc ions.

Jane decides to do some experimental research to find out whether the Alpine Penny-cress can be used as grazing for sheep.

What research would she need to do to find out if the Alpine Penny-cress is safe for sheep to eat?

.....

.....

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

(e) Jane does some tests to find out which metal ions are in some other samples of mining waste, samples **A**, **B** and **C**.

She adds dilute sodium hydroxide, NaOH, to a solution of the metal ions. These are her results.

Mining waste sample	After adding a few drops of NaOH	After adding excess NaOH
A	white precipitate	precipitate dissolves
B	blue precipitate	no further change
C	no precipitate	

What conclusions can Jane make about the metal ions in the mining waste?

.....

.....

.....

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

3 **(a)** Chlorine is used in the treatment of drinking water.

Describe how you would test a sample of gas to show that it is chlorine.

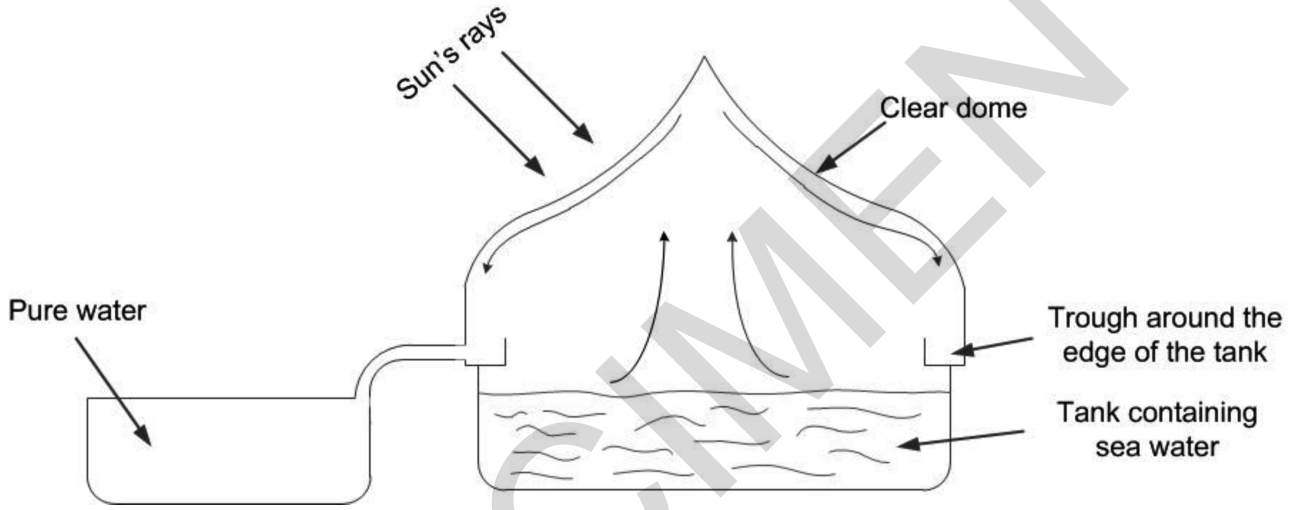
.....

.....

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

(b) A solar still can be used to make sea water safe to drink.

The diagram shows a cross-section through a solar still.



Describe how a solar still produces drinking water from sea water.

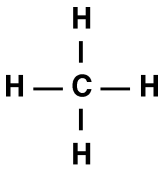
.....

.....

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

4 The surface of the planet Neptune is covered with clouds of dense material. The clouds contain substances in solid, liquid and gas states.

One of the compounds in the clouds is methane.



methane

The table shows the melting point and boiling point of methane.

Melting point (ºC)	–182.5
Boiling point (ºC)	–161.5

(a) The temperature in the clouds is –218 °C.

Predict the state of methane in Neptune's clouds.

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

(b) What is the bonding and structure of methane at room temperature?

.....

.....

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

(c) What is the name for the family of organic compounds (homologous series) that includes methane?

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

5 Methane and hydrogen can both be used in fuel cells for cars.

Table 5.1 shows information about the reactions in a hydrogen/oxygen fuel cell and in a methane/oxygen fuel cell.

Fuel	Source of fuel	Equation for reaction in fuel cell	Energy change for reaction in fuel cell (kJ/mol)
hydrogen	High temperature reaction between natural gas and steam	$H_2(g) + ½\ O_2(g) \rightarrow H_2O(g)$	–286
methane	Directly extracted as natural gas	$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$	–890

(a) Evaluate the use of hydrogen and methane in fuel cells for cars.

Use the information in **Table 5.1** in your answer.

.....

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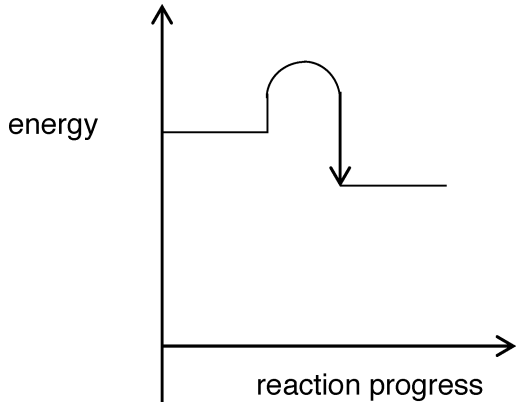
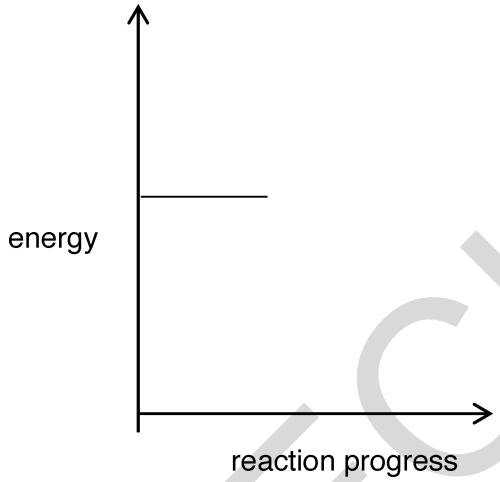
.....

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

(b) The graph shows the energy change when **hydrogen** reacts with oxygen.



(i) Complete the diagram below to show the energy change when **methane** reacts with oxygen.



[1]

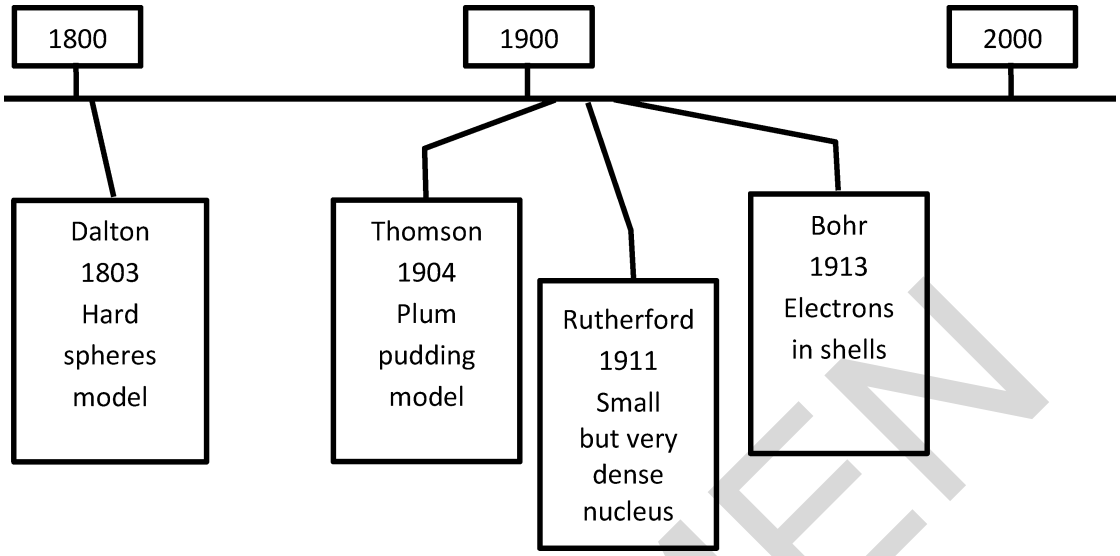
(ii) Use data from **Table 5.1** to explain the energy change you have drawn in **(b)(i)**.

.....

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

6 The models scientists use to describe atoms have changed over the last 200 years.

This timeline shows some of the main ideas.



(a) Write the name of the scientist whose model of the atom could be represented by these pictures of everyday items. Use each name once.




.... **[2]**

(b) Which scientist was the first scientist to include electrons in his model? Put a ring around the correct answer.

Bohr **Dalton** **Rutherford** **Thomson** **[1]**

7 Group 1 and Group 7 of the Periodic Table both contain reactive elements.

(a) Sodium, Na, reacts with water, H_2O.

Write a balanced symbol equation for this reaction.

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

(b) Complete the table to show the molecular formula, state and colour of the three Group 7 elements.

	Chlorine	**Bromine**	**Iodine**
Molecular formula			
State (at room temperature)			
Colour			

[3]

(c) Sodium (Group 1) and chlorine (Group 7) react together as shown by this equation.

$2Na + Cl_2 \rightarrow 2NaCl$

Strontium is an element in Group 2.

Predict the name and formula of the compound that forms when strontium reacts with chlorine.

Name .....

Formula ..... **[2]**

8 Some people have warts on their skin.

Warts can be removed by treating them with a corrosive solution of acids.

(a) Nina uses chromatography to find out what acids are in a medicine used to treat warts.

She needs to use a locating agent on her chromatogram.

Explain why a locating agent is needed.

.....

.....

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

(b) Nina finds out that the medicine contains a mixture of acids.

One of the acids in the medicine is ethanoic acid.

The equation shows ethanoic acid behaving as an acid.

$CH_3COOH(aq) \rightleftharpoons CH_3COO^-(aq) + H^+(aq)$

ethanoic acid

(i) How does the equation show that ethanoic acid is an acid?

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

(ii) Draw the **fully displayed formula** for ethanoic acid.

[2]

(c) Methanoic acid is another acid in the medicine.

HCOOH	CH_3COOH
methanoic acid	**ethanoic acid**

Nina says that she thinks that methanoic acid and ethanoic acid have the same empirical formula.

Do you agree with Nina?

Explain your answer by comparing the empirical formula of each acid.

.....

.....

.....

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

(d) The acids in the medicine are weak acids.

Weak acids are safer to use on skin than strong acids because they are less corrosive.

(i) Which statements about weak and strong acids are **true** and which are **false**?

Put a tick (✓) in one box in each row.

	True (✓)	**False (✓)**
Both types of acids form water in neutralisation reactions.		
Weak acids have a slower rate of reaction with magnesium.		
Strong acids have a lower degree of ionisation than weak acids.		

[3]

(ii) Nina uses the hydrogen ion concentration to estimate the pH values of acids.

Estimate the pH of 0.001 mol/dm^3 hydrochloric acid.

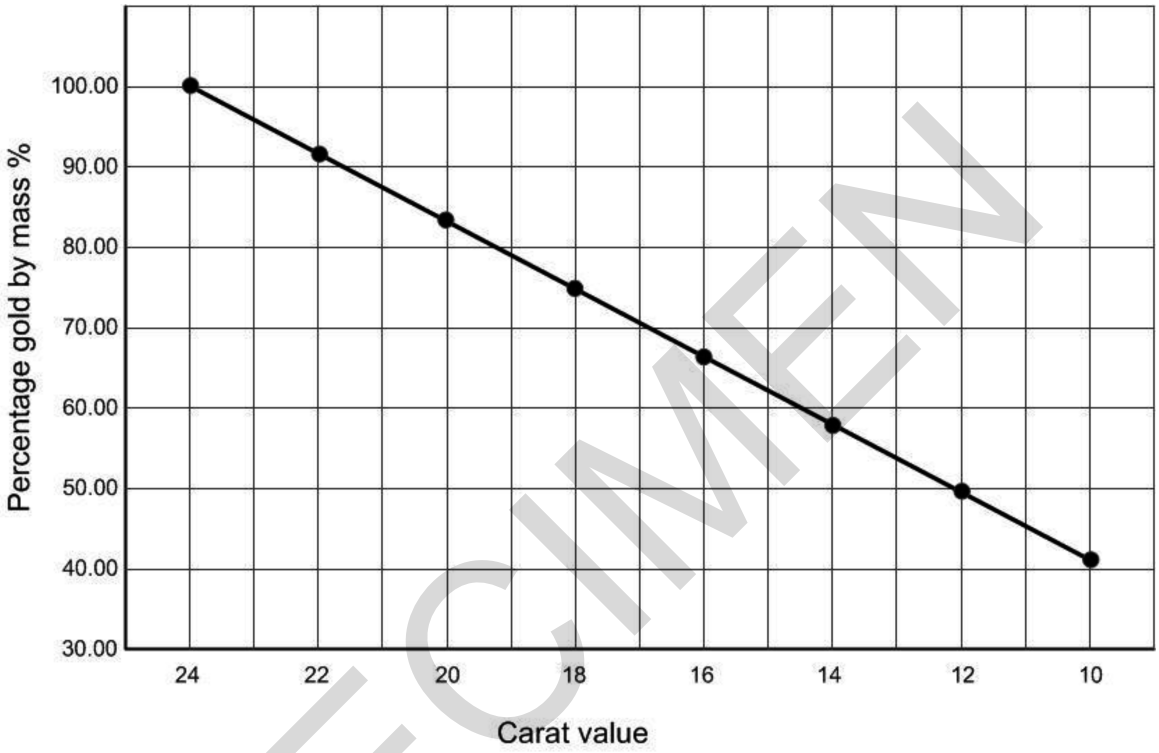
pH = ... **[2]**

9 The purity of gold is measured in carats.

24 carat gold is almost pure gold.

Gold with lower carat values is an alloy which contains other metals such as silver and copper.

The graph shows how the percentage of gold by mass is related to its carat value.



(a) What mass of other metals are in 20 g of 11 carat gold?

Show your working.

Mass = ... g **[2]**

(b) A chemist tests a 50 g sample of gold.

He finds that it contains 0.19 **moles** of gold.

What is the carat value of the sample?

Use the periodic table and the graph above to help you.

Carat value = ... **[3]**

(c) Gold, silver and copper are transition metals.

Transition metals are different from metals in Group 1.

Compare properties of transition metals with the properties of Group 1 metals.

.....

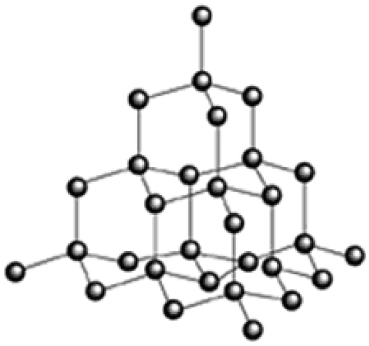
.....

.....

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

10 Diamond and silicon dioxide have similar properties.

Diamond



Silicon dioxide

(a) Describe **two** similarities and **one** difference between the structures of diamond and silicon dioxide.

Similarity 1 .....

.....

Similarity 2 .....

.....

Difference .....

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

(b) The structure of graphite can be used to explain its properties.

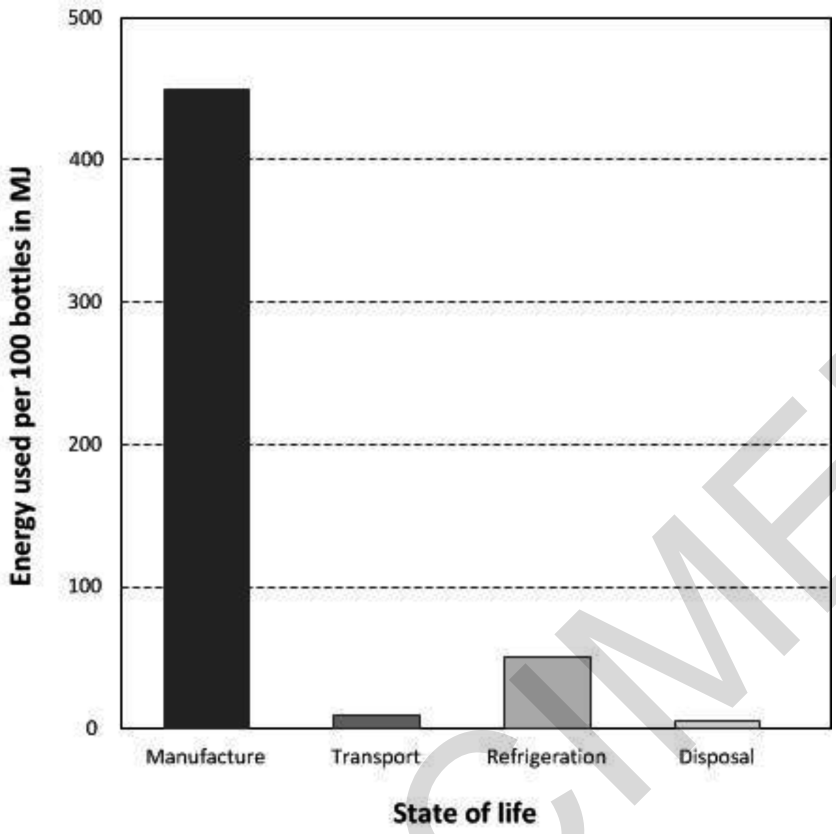
Draw lines to connect each **property** to the correct **explanation**.

Property	Explanation
Conducts electricity.	Structure contains layers
High melting point.	Charged particles in structure can move.
Flaky and soft.	Strong giant structure.

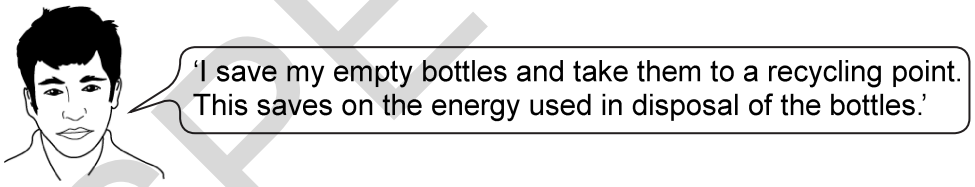
[2]

11 Disposable drink bottles are made from a polymer called PET.

This chart shows the energy used in millions of joules (MJ) for 100 PET bottles during their lifetime.



James talks about recycling waste bottles.



Does saving energy during disposal make a large impact on the life cycle assessment for 100 bottles?

Use data from the chart to explain your answer.

.....

.....

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

12 Eve is a laboratory technician.

She makes up a dilute solution of lime water (calcium hydroxide).

(a) One laboratory use of lime water is to test for a gas.

What is the name of the gas and what is the positive result of the test?

Gas: .....

Result: ..... **[2]**

(b) Eve makes 200 cm^3 of 1.50 g/dm^3 solution of calcium hydroxide.

(i) The formula for calcium hydroxide is $Ca(OH)_2$.

Calculate the concentration of the solution in mol/dm^3.

Give your answer to **three** significant figures.

Concentration of solution = ... mol/dm^3 **[3]**

(ii) Lime water is used to remove sulfur dioxide from waste gases produced by industry.

The equation for this reaction is

$$Ca(OH)_2(aq) + SO_2(g) \rightarrow CaSO_3(s) + H_2O(l)$$

Calculate the volume of sulfur dioxide that Eve's lime water could remove.

- Assume that one mole of gas has a volume of 24.0 dm^3 at room temperature and pressure.

Volume of sulfur dioxide = ... dm^3 **[3]**

13 100 years ago, Fritz Haber was the first scientist to successfully react nitrogen gas from the air with hydrogen to make a compound.

(a) Haber reacted small amounts of nitrogen and hydrogen in a closed system to make ammonia.

The reaction is exothermic.

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

He investigated how changing the conditions affected the yield.

What effect does increasing the pressure, temperature and using a catalyst have on the yield?

.....

.....

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

(b) Haber's reaction vessels were too small scale to make large amounts of ammonia.

Karl Bosch scaled up Haber's laboratory reaction to an industrial scale process.

Compare Karl Bosch's industrial scale process with Haber's laboratory reaction.

.....

.....

.....

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

(c) Ammonia is used to make fertilisers for agriculture.

Ammonia provides nitrogen compounds to make crops grow faster.

Name **two** other important elements that fertilisers provide.

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

14 Sodium and sodium compounds are involved in many different types of reactions.

The equations for four reactions, **A, B, C** and **D** are shown below.

A $2NaBr(aq) + Cl_2(g) \rightarrow 2NaCl(aq) + Br_2(aq)$

B $Na^+(l) + e^- \rightarrow Na(s)$

C $2NaHCO_3(s) \rightarrow Na_2CO_3(s) + CO_2(g) + H_2O(l)$

D $2HCl(aq) + Na_2S_2O_3(aq) \rightarrow 2NaCl(aq) + SO_2(g) + S(s) + H_2O(l)$

(a) (i) Which reaction, **A, B, C** and **D**, can be followed by looking for an orange colour change in the solution?

Answer ..... **[1]**

(ii) Which reaction, **A, B, C** and **D**, can be followed by looking for a precipitate forming in a solution?

Answer ..... **[1]**

(iii) Which reaction, **A, B, C** and **D**, shows sodium being reduced?

Answer ..... **[1]**

(b) Reaction **C** is faster if solid sodium hydrogencarbonate is used as a powder rather than as a large lump.

Explain why.

.....

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

15 Amir works in a lab that tests samples of vinegar to check their quality.

Vinegar is mainly a mixture of ethanoic acid and water.
Vinegar needs to have a minimum of 5% acidity to be used to preserve food.

He uses a titration to find out how much 1 mol/dm^3 sodium hydroxide he needs to add to exactly react with 25.0 cm^3 of vinegar.

(a) Calculate how much ethanoic acid needs to be in 25 cm^3 of vinegar.

Use the equation:

$$\% \text{ acidity} = \frac{\text{mass of ethanoic acid (g)}}{\text{mass of vinegar(g)}} \times 100$$

- 1 cm^3 of vinegar = 1.01 g

Amount of ethanoic acid = ... g **[2]**

(b) The equation below shows ethanoic acid behaving as an acid.

$$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$$

Calculate the minimum volume of sodium hydroxide Amir uses in his titration.

- Relative formula mass of CH_3COOH = 60.0

Volume of sodium hydroxide = ... cm^3 **[3]**

END OF QUESTION PAPER

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OCR
Oxford Cambridge and RSA

H

…day June 20XX – Morning/Afternoon

GCSE (9–1) Chemistry B (Twenty First Century Science)

J258/03 Breadth in chemistry (Higher Tier)

SAMPLE MARK SCHEME

Duration: 1 hour 45 minutes

MAXIMUM MARK 90

This document consists of 16 pages

MARKING INSTRUCTIONS

PREPARATION FOR MARKING

SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris assessor Online Training*; *OCR Essential Guide to Marking*.

2. Make sure that you have read and understood the mark scheme and the question paper for this component. These are posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca

3. Log-in to scoris and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

   YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

MARKING

1. Mark strictly to the mark scheme.

2. Marks awarded must relate directly to the marking criteria.

3. The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the scoris messaging system.

5. Work crossed out:
   a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks
   b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. There is a NR (No Response) option. Award NR (No Response)
   - if there is nothing written at all in the answer space
   - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
   - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.

   Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The scoris **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
   If you have any questions or comments for your Team Leader, use the phone, the scoris messaging system, or email.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciate

10. **Annotations**

Annotation	Meaning
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

11. **Subject-specific Marking Instructions**

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9–1) in Chemistry B:

	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.**
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	**Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.**
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

Question			Answer	Marks	AO element	Guidance
1	(a)		water vapour condensed/turned into a liquid/became oceans ✓ because the Earth cooled/surface temperature fell ✓	2	2.1	
	(b)		carbon dioxide percentage decreases ✓ plants use carbon dioxide for photosynthesis/to make glucose ✓	2	2.1 1.1	
2	(a)		zinc is recovered at the end of the process/ a way of making zinc from waste ✓	1	3.2a	
	(b)		zinc ions are toxic if they enter drinking water/water supplies ✓ risk is reduced if zinc ions are stored in plants ✓	2	3.2a	
	(c)		**any two from:** larger plants therefore take up more zinc ions ✓ more plants grow per m^2 therefore absorb more zinc ions per m^2 ✓ plants grow more quickly therefore more zinc ions can be removed in a shorter time ✓	2	3.1b	
	(d)		find out amount/ concentration of zinc ions in cress ✓ find out tolerance of sheep for zinc ions / whether zinc ions get into wool/meat ✓	2	3.3a	
	(e)		**A** contains zinc (ions) ✓ **B** contains copper (ions) ✓ **C** does not contain any (identifyable) metal ions ✓	3	3.2b	
3	(a)		(blue) Litmus paper ✓ goes red then white / red then bleaches ✓	2	1.1	
	(b)		water evaporates (from sea water) by the heat of the sun ✓ water condenses (on the sides of the dome) and collects in the trough ✓	2	1.1	

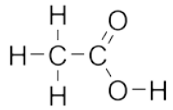
Question			Answer	Marks	AO element	Guidance
4	(a)		solid ✓	1	2.1	
	(b)		covalent ✓ simple structure / single molecules ✓	2	1.1 2.1	
	(c)		alkanes ✓	1	1.1	
5	(a)		hydrogen needs more energy to produce/ ora ✓ hydrogen only produces water (which is not a pollutant) / does not produce carbon dioxide / methane produces carbon dioxide ✓ methane gives out more energy (per mole) ✓	3	3.1b 2.1 3.1b	
	(b)	(i)	shows products lower than reactants and energy change greater than for hydrogen ✓	1	2.2	
		(ii)	-890 ≈ 3 -286 therefore 3 x as much energy produced so energy change on diagram 3 x as large ✓	1	3.1b	**DO NOT ALLOW** just 'more energy produced' without calculation

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>6</td><td>(a)</td><td></td><td>left to right:
Bohr, Dalton, Rutherford, Thomson ✓✓</td><td>2</td><td>2.1</td><td>3 or 4 correct = 2 marks
2 correct = 1 marks
1 correct = 0 mark</td></tr>
<tr><td></td><td>(b)</td><td></td><td>Thomson ✓</td><td>1</td><td>1.1</td><td></td></tr>
<tr><td>7</td><td>(a)</td><td></td><td>$2Na + 2H_2O \rightarrow 2NaOH + H_2$ ✓✓</td><td>2</td><td>1.1</td><td>One mark for correct symbols
One mark for balancing</td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><td></td><td>Chlorine</td><td>Bromine</td><td>Iodine</td></tr><tr><td>Formula</td><td>Cl_2</td><td>Br_2</td><td>I_2✓</td></tr><tr><td>State</td><td>gas</td><td>Liquid</td><td>Solid✓</td></tr><tr><td>Colour</td><td>Green/yellow</td><td>red/brown/ orange</td><td>Purple/grey✓</td></tr></table></td><td>3</td><td>1.1</td><td>(1) for each correct row</td></tr>
<tr><td></td><td>(c)</td><td></td><td>strontium chloride ✓

$SrCl_2$ ✓</td><td>2</td><td>2.2</td><td>

DO NOT ALLOW $SrCl$</td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>8</td><td>(a)</td><td></td><td>acids are colourless / cannot be seen ✓

locating agent gives spots colour / dyes the spots ✓</td><td>2</td><td>1.1</td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>H^+ ion is made ✓</td><td>1</td><td>1.1</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td> 
COOH drawn fully correctly ✓

CH_3 drawn correctly ✓</td><td>2</td><td>1.2</td><td>Allow -OH without O-H bond shown

CH_3 must be fully displayed</td></tr>
<tr><td></td><td>(c)</td><td></td><td>(no because….)

empirical formula of methanoic acid is CH_2O_2 ✓

empirical formula of ethanoic acid is CH_2O ✓

ratio of oxygen atoms is different / more oxygen (by proportion) in methanoic acid ✓</td><td>3</td><td>2.2</td><td></td></tr>
<tr><td></td><td>(d)</td><td>(i)</td><td><table><tr><th></th><th>true (✓)</th><th>false (✓)</th></tr><tr><td>Both types of acids form water in neutralisation reactions.</td><td>✓</td><td></td></tr><tr><td>Weak acids are always less concentrated than strong acids.</td><td></td><td>✓</td></tr><tr><td>The same concentration of a weak and strong acid will have a different pH.</td><td>✓</td><td></td></tr><tr><td>Weak acids have a higher degree of ionisation than strong acids.</td><td></td><td>✓</td></tr></table></td><td>3</td><td>1.1</td><td>All correct = (3)
2 or 3 correct = (2)
1 correct = (1)</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
		(ii)	**FIRST CHECK THE ANSWER ON THE ANSWER LINE** **If answer = 3 award 2 marks** $HCl \rightarrow H^+ + Cl^-$ $[H^+] = 0.001$ moles. $= 1 \times 10^{-3}$ moles ✓ pH = 3 ✓	**2**	**2.1**	

Question			Answer	Marks	AO element	Guidance
9	(a)		**FIRST CHECK THE ANSWER ON THE ANSWER LINE** **f answer = 11 (g) award 2 marks** percentage gold = 45% / reads 45% from graph other elements = 55 % ✓ $\frac{55}{100} \times 20 = 11(g)$ ✓	**2**	**2.2**	
	(b)		**FIRST CHECK THE ANSWER ON THE ANSWER LINE** **f answer = 18 (carat) award 3 marks** mass = number of moles x RAM or gives correct numbers = 197 x 0.19 ✓ = 37.43 ✓ % of gold = $\frac{37.43}{50} \times 100 = 74.86$ % = 18 carat ✓	**3**	**2.2**	
	(c)		**any two from:** group 1 metal only form ion with +1 charge whereas transition metals form ions with variable charges ✓ group 1 metals produce white compounds whereas transition metals produce coloured compounds ✓ transition metals act as catalysts whereas group 1 metals do not ✓	**2**	**1.1**	**IGNORE** comments on density/melting point

Question			Answer	Marks	AO element	Guidance
10	(a)		similarities: • both covalently bonded ✓ • both giant structures ✓ one difference from: • silicon dioxide contains two elements but diamond only contains one (carbon) ✓ • all carbon atoms form four bonds in diamond but only silicon atoms form four bonds in silicon dioxide✓	3	1.1	**IGNORE** melting points/boiling points/electrical conductivity **ALLOW** both are giant covalent lattices/structures for 2 marks
	(b)		**property** / **explanation** Conducts electricity. — Charged particles in structure can move. High melting point. — Strong giant structure. Flaky and soft. — Structure contains layers	2	1.1	All three correct = (2) One or two correct = (1)

Question			Answer	Marks	AO element	Guidance
11			(no because) energy of disposal is very small / only about 10 MJ / does not make a big difference ✓ total energy is about 500 MJ / energy cost of manufacture is about 450 MJ ✓	**2**	**3.2b**	
12	**(a)**		carbon dioxide ✓ turns lime water milky / cloudy ✓	**2**	**1.1**	
	(b)	**(i)**	**FIRST CHECK THE ANSWER ON THE ANSWER LINE** **If answer = 0.0202 award 3 marks** calculates formula mass of $Ca(OH)_2$ = 74.1 (g) ✓ 1.5 / 74.1 = 0.0202(42…) ✓ gives answer to 3 sig figs ✓	**3**	**2.2**	
	(b)	**(ii)**	**FIRST CHECK THE ANSWER ON THE ANSWER LINE** **If answer = 0.09696 award 3 marks** 200 cm^3 = 0.2 dm^3 ✓ 0.0202 x 0.2 = 0.00404 ✓ volume of SO_2 (1:1 ratio) = 0.00404 x 24 = 0.09696 (dm^3) ✓	**3**	**2.2**	**ALLOW** answers to significant figures or more correctly rounded **ALLOW** 0.0971(65…) calculator value carried forward from 12(b)(i) **ECF**

Question			Answer	Marks	AO element	Guidance
13	(a)		increasing the pressure increases the yield ✓ increasing the temperature decreases the yield ✓ using a catalyst has no effect on yield ✓	3	1.1	
	(b)		larger scale/ larger vessels ✓ reactant / products continuously added/ removed/ continuous process ✓ conditions used to compromise between rate and yield/ high temperature to increase rate but reduces yield ✓	3	1.1	
	(c)		phosphorous ✓ potassium ✓	2	1.1	
14	(a)	(i)	**A** ✓	1	1.2	
		(ii)	**D** ✓	1	1.2	
		(iii)	**B** ✓	1	1.1	
	(b)		higher surface area to volume ratio ✓ higher rate of collisions per unit time ✓	2	1.1	

Question			Answer	Marks	AO element	Guidance
15	(a)		**FIRST CHECK ANSWER ON ANSWER LINE if answer = 1.2625 g award 2 marks** mass of vinegar in 25 cm^3 = 25 × 1.01 g = 25.25 ✓ mass of ethanoic acid = $\frac{5 \times 25.25}{100}$ = 1.2625 (g) ✓	2	2.2	**ALLOW** answer of 1.26 to 1.3 (g)
	(b)		**FIRST CHECK ANSWER ON ANSWER LINE if answer = 21 cm^3 award 3 marks** number of moles of ethanoic acid in 25.0 cm^3 = $\frac{1.2625}{60}$ = 0.021 ✓ ratio 1:1 0.021 moles of Na0H required 1 (conc of Na0H) = $\frac{0.021}{\text{volume}}$ ✓ volume of Na0H = 0.021 dm^3 = 21 (cm^3) ✓	3	2.2	**ALLOW ECF** from 15(a)

Summary of updates

Date	Version	Change
May 2018	2	We've reviewed the look and feel of our papers through text, tone, language, images and formatting. For more information please see our assessment principles in our "Exploring our question papers" brochures on our website

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