

Oxford Cambridge and RSA

Friday 17 May 2024 – Morning

GCSE (9–1) Chemistry A (Gateway Science)

J248/03 (Higher Tier)

Time allowed: 1 hour 45 minutes

You must have:

- a ruler (cm/mm)
- the Data Sheet for GCSE (9–1) Chemistry A
(inside this document)

You can use:

- a scientific or graphical calculator
- an HB pencil

H

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Preview from Notesale.co.uk
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4 Which statement about a **reducing agent** is correct?

A It oxidises another species and is itself oxidised. **B**

It oxidises another species and is itself reduced. **C** It

reduces another species and is itself oxidised. **D** It

reduces another species and is itself reduced.

Your answer

☐

[1]

5 Which statement about **alkalis** is correct?

A They form H^+ ions in solution.

B They have a pH value greater than 7.

C They react with metals to form a salt and hydrogen. **D**

They turn universal indicator red.

Your answer

☐

[1]

6 Which equipment is needed to set up an electrolysis experiment?

A A battery, a beaker, a funnel and wires

B A battery, a beaker, electrodes and wires

C A battery, crocodile clips, electrodes and a thermometer

D A beaker, electrodes, a funnel and a thermometer

Your answer

☐

[1]

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11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore

Question			Answer	Marks	AO element	Guidance
	(c)		The empirical formula is CH₂. ☐ The melting point is lower than 5 °C. ☒ The pure liquid contains two compounds. ☐ The pure liquid is an element. ☐ The pure liquid will be a gas at above 35 °C. ☒	2	2 x 2.1	
	(d)		First check the answer on the answer line If answer = 74.0 / 74 award 3 marks 4 x 12.0 = 48.0 OR 2 x 12.0 = 24.0 ✓ 10 x 1.0 = 10.0 OR 5 x 1.0 = 5.0 ✓ (48.0 + 10.0 + 16.0) = 74.0 ✓	3	3 x 2.2	IGNORE any units given ALLOW ECF for addition of incorrect numbers of C, H and O if no other mark awarded

Question			Answer	Marks	AO element	Guidance
18	(a)	(i)	Products are lower (in energy) than reactants / ORA ✓	1	2.1	ALLOW the energy/enthalpy change is negative ALLOW the energy (level) decreases (as the reaction progresses) IGNORE idea that energy is <u>lost</u> in the reaction IGNORE ideas linked to bond breaking / making
	(a)	(ii)	Difference Idea of (energy of) reactants will be lower than (energy of) products / ORA ✓ Similarity There will still be an <u>activation energy</u> / idea that energy will <u>increase then decrease</u> between reactants and products ✓	2	2 x 1.1	ALLOW idea that the energy/enthalpy change will be positive ALLOW the energy (level) increases (as the reaction progresses) IGNORE idea that energy is <u>gained</u> in the reaction IGNORE references to temperature changes ALLOW idea that both will show an upwards curve ALLOW idea of same/similar shape or curve
	(b)	(i)	First check the answer on the answer line If answer = 8514 (kJ/mol) award 3 marks $6 \times 799 = 4794$ ✓ $8 \times 465 = 3720$ ✓ $4794 + 3720 = 8514$ ✓	3	3 x 2.2	ALLOW ECF from bonds formed IGNORE + or - sign
	(b)	(ii)	First check the answer on the answer line If answer = -2034 (kJ / mol) award 2 marks Energy change = Bonds broken – Bonds made / $= 6480 - 8514$ ✓ $= -2034$ ✓	2	2 x 2.2	ALLOW ECF from (b)(i) ALLOW $8514 - 6480 = (+)2034$ (kJ / mol) for 1 mark AND ALLOW ECF from (b)(i)

Question			Answer	Marks	AO element	Guidance
	(c)	(i)	A dilute solution has a low ratio of acid to volume of solution. ☒ A dilute solution of acid contains more acid than a concentrated solution ☐ A strong acid can be made into a concentrated solution or a dilute solution ☒ A strong acid partially ionises in solution. ☐ A weak acid can only be made into a dilute solution. ☐	2	2 x 1.1	
	(c)	(ii)	Any two from: Add more acid to the (current) solution ✓ (Prepare a new solution) using a higher ratio of acid to water / using less water ✓ Idea of using a stronger<u>er</u> acid / acid that ionises fully ✓	2	2 x 3.3b	ALLOW increase the concentration (of H⁺ ions) ALLOW idea of using a (new) less dilute solution IGNORE idea of evaporating water (from the current solution) IGNORE add acid with a lower pH (stem of question) IGNORE reference to OH⁻ ions

Question	Answer	Marks	AO element	Guidance
21 (a)	Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. Level 3 (5–6 marks) Demonstrates detailed knowledge and understanding of the structure and bonding in all 3 structures AND Accurately applies knowledge and a detailed understanding to explain why diamond has the highest melting point. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i> Level 2 (3–4 marks) Demonstrates clear knowledge and understanding of the structure and bonding in some of the structures AND Applies clear knowledge and understanding to explain why diamond has the highest melting point. <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i> Level 1 (1–2 marks) Demonstrates limited knowledge and understanding of the structure and bonding in some of the structures OR Attempts to apply knowledge and understanding to explain why diamond has the highest melting point.	6	3 x 1.1 3 x 2.1	AO1.1 – Demonstrates knowledge and understanding of structures and bonding. - covalent bonds are very strong - a lot of energy is required to break covalent bonds - intermolecular forces are weaker than covalent bonds - more energy is needed to break covalent bonds than overcome intermolecular forces - more atoms in a molecule mean more intermolecular forces - more intermolecular forces require more energy to overcome AO2.1 – Applies knowledge and understanding of structures and bonding to diamond, C₂ and polyethene - diamond only contains covalent bonds - diamond requires high energy to break covalent bonds between atoms - chlorine has intermolecular forces between the molecules - chlorine requires low energy to break intermolecular forces between molecules - polyethene has intermolecular forces between the polymer chains - covalent bonds in chlorine and polyethene are not broken on melting - polyethene has more / stronger intermolecular forces between chains than chlorine does between molecules

Question		Answer	Marks	AO element	Guidance
	(c) (ii)	First check the answer on the answer line If answer = 9.25 (g) award 4 marks 0.1 mol of MgCO_3 reacts with 0.2 mol of HCl ✓ Idea of 1:2 mole ratio $\text{MgCO}_3 : \text{HCl}$ ✓ M_r of $\text{MgCO}_3 = 84.3$ ✓ Mass of MgCO_3 that reacted = $0.1 \times 84.3 = 8.43 \text{ g}$ ✓ Mass of MgCO_3 used in the reaction = $8.43 + 0.82 = 9.25 \text{ g}$ ✓	4	4 x 2.2	ALLOW ECF from incorrect M_r and/or moles of MgCO_3 ALLOW ECF from incorrect mass of MgCO_3