F

GCSE (9–1)

Chemistry A (Gateway Science)

J248/01: Paper 1 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for November 2020

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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

1. Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
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

2. 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.

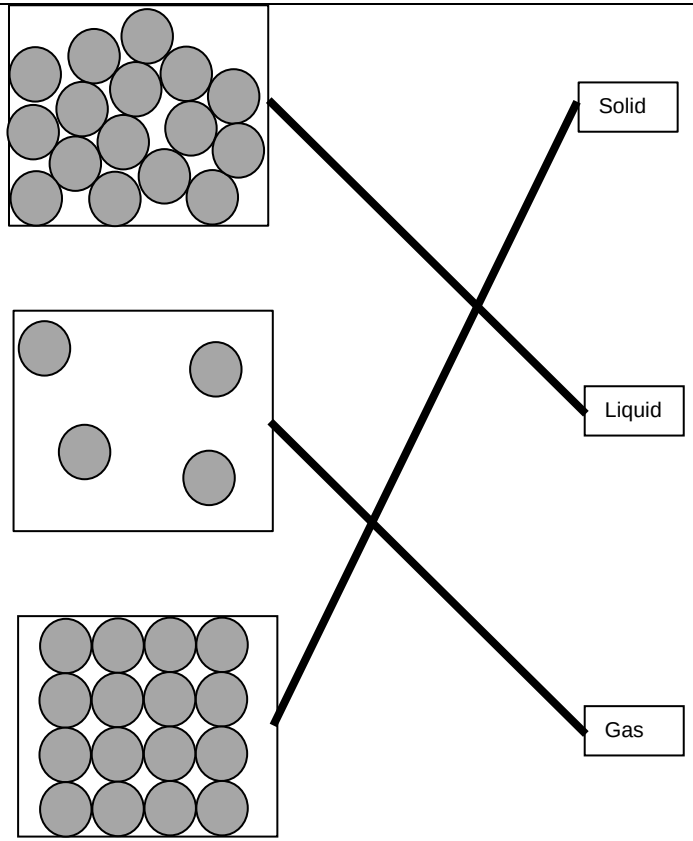
The breakdown of Assessment Objectives for GCSE (9-1) in Chemistry A:

	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.

SECTION A

For answers to section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

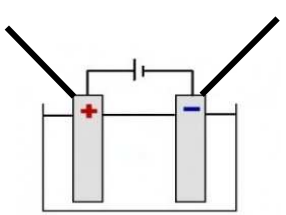
Question	Answer	Marks	AO element	Guidance
1	D	1	1.2	
2	B	1	2.1	
3	A	1	1.1	
4	B	1	2.1	
5	A	1	2.1	
6	A	1	1.1	
7	B	1	2.1	
8	D	1	1.1	
9	B	1	2.1	
10	C	1	2.1	
11	A	1	2.2	
12	B	1	2.1	
13	C	1	2.1	
14	D	1	2.1	
15	B	1	2.1	
	Total	15		

Question			Answer	Marks	AO element	Guidance
16	(a)			2	2 x 1.1	All correct = 2 marks 1 or 2 correct = 1 mark If more than one line drawn to state of matter **DO NOT** award the mark.
		(ii)	**Any one from:** The particles remain the same / No new substance is made ✓ The (changed) arrangement of the particles can be reversed / The change is reversible ✓	1	1.1	**ALLOW** the particles **only** gain or lose energy
	(b)	(i)	A **AND** D ✓	1	3.1a	

Question			Answer	Marks	AO element	Guidance
		(ii)	**Any two from:** Conducts electricity in molten state ✓ Does not conduct electricity in solid state ✓ High melting point ✓	**2**	**3.2b**	ALLOW dissolve in water
	(c)	(i)	Add water (and stir) ✓ Filtration ✓ **B** collects on filter paper ✓	**3**	**3.3a** **1.2** **3.3a**	
		(ii)	Distillation **OR** evaporation **OR** heating ✓ Removes water **OR** dries C **OR** removes some water and leave to crystalise ✓	**2**	**1.2** **3.3a**	**ALLOW** boiling

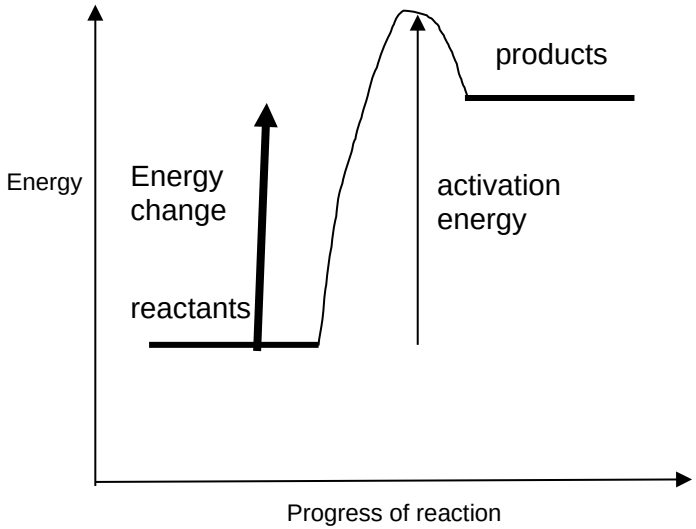
Question			Answer	Marks	AO element	Guidance
17	(a)	(i)	Hydrogen ion/ H^+	1	1.1	
		(ii)	$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$ Reactant✓ Product ✓	2	2.2 x2	
	(b)	(i)	pH meter ✓	1	2.2	**ALLOW** pH probe
		(ii)	Wash the probe with water ✓ Put the probe into the solution ✓	2	1.2	**ALLLOW** calibrate the meter/probe
	(c)*		*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)** Correctly names the acid and the base used in the neutralisation reaction. **AND** Method can be followed to make a pure, dry sample of potassium chloride. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Correctly names the acid and the base used in the neutralisation reaction. **OR** Method can be followed to make a salt sample.	6	1.1 x2 2.2 x2 3.3a x2	**AO1.1 Demonstrates knowledge and understanding of neutralisation reactions** • base neutralises the acid • acid + base → salt + water • potassium chloride is a salt • potassium chloride is neutral **AO2.1 Application of knowledge and understanding related to making a salt by neutralisation** • acid used is hydrochloric acid • base used is potassium hydroxide / potassium oxide / potassium carbonate • pH paper / pH probe is used to show solution made is neutral **AO3.3 Analyse of information and ideas to develop experimental procedures** • pH probe will not contaminate the solution • evaporate some of the water to form crystals

Question			Answer	Marks	AO element	Guidance
			There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence. **Level 1 (1–2 marks)** Method includes adding acid to base. **OR** Correctly names either the acid or the base used in the neutralisation reaction. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** *No response or no response worthy of credit.*			• leave the crystals to dry / dry crystals in an oven

Question			Answer	Marks	AO element	Guidance
18	(a)	(i)	anode  cathode	2	2 x 1.2	All correct = 2 marks 1 or 2 correct = 1 mark
		(ii)	Positive electrode: bromine ✓ Negative electrode: lead ✓	2	2 x 2.2	**DO NOT ALLOW** bromide **ALLOW** reversed 1 mark
		(iii)	$PbBr_2$ ✓	1	2.1	
	(b)	(i)	All points plotted correctly scores 2 mark ✓✓ Straight line of best fit through the points ✓	3	2 x 2.2 1.2	**ALLOW** ± ½ square 3 or 4 points plotted correctly scores 1 mark **ALLOW** correctly drawn line of best fit through incorrectly drawn points; this may be a curve
		(ii)	0.72 (A) ✓	1	3.1a	**ALLOW** answer in the range 0.70 A – 0.74 A/ecf
		(iii)	**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 47(g) award 2 marks** 5A = 15.5(g) = 15.5 x 3 = 46.5(g) ✓ = 47(g) (2 sig. figs) ✓	2	2.1 1.2	**ALLOW** 1.0 A = 3.1 (g) (from graph or table) 10(A) = 31(g) and 5 (A) = 1.55 (g) ✓ 15(A) = 31 + 1.55 = (46.5) 47 (g) ✓

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>19</td><td>(a)</td><td>(i)</td><td>
<table>
<tr><th>Reaction mixture</th><th>Start temperature (°C)</th><th>End temperature (°C)</th><th>Temperature change (°C)</th></tr>
<tr><td>X</td><td>20.0</td><td>25.5</td><td>(+) 5.5</td></tr>
<tr><td>Y</td><td>19.0</td><td>8.0</td><td>–11</td></tr>
<tr><td>Z</td><td>20.0</td><td>20.0</td><td>0</td></tr>
</table>
</td><td>1</td><td>1.2</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Y ✓

the temperature went down / decreased / energy is taken in ✓</td><td>2</td><td>3.2b

1.1</td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td> 

Activation energy ✓
Energy change ✓
Reactants ✓</td><td>3</td><td>1.1</td><td>ALLOW max 1 mark for correct shape if labels are missing / incorrect</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
	(b)		$CH_4 + 2O_2 \rightarrow 2H_2O + CO_2$ Formulae ✓ Balancing ✓	2	2.2 x2	**ALLOW** any correct multiple, including fractions **ALLOW** = / ⇌ instead of → **NOT** and / & instead of → balancing mark is dependent on the correct formulae but **ALLOW** 1 mark for a balanced equation with a minor error in subscripts / formulae e.g. $CH_{4\,(g)} + \mathbf{2}O_{2\,(g)} \rightarrow \mathbf{2}H_2O_{\,(g)} + Co_{2\,(g)}$
	(c)		**Any two from:** Change the glass beaker for a metal container ✓ Move the spirit burner closer to the container/glass beaker/ metal container ✓ Use a draught shield ✓ Add a lid (to the beaker) ✓	2	3.3b x2	**IGNORE** put all thermometer (bulb) in water

Question			Answer	Marks	AO element	Guidance
20	(a)		Ink dissolves in solvent ✓	1	1.1	**ALLOW** Pencil will not dissolve in solvent **ALLOW** so it doesn't move (with the solvent) / doesn't mix with the spots/solvent / colours in ink don't separate / ink has colours in it / ink would run
	(b)		Circle/dot drawn on start line in diagram ✓	1	2.2	
	(c)		A ✓	1	3.2a	
	(d)		**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 0.62 award 3 marks** 3.7/6 ✓ = 0.61666…… ✓ = 0.62 (2 sig. figs) ✓	3	 **2 x 2.2** **1.2**	 **ALLOW** 3.7 ± 0.1

Question			Answer	Marks	AO element	Guidance
21	(a)	(i)	Condenser ✓	1	1.2	
	(a)	(ii)	Distillation ✓	1	1.1	**DO NOT ALLOW** fractional
	(a)	(iii)	Add thermometer ✓ Water goes in at the bottom (of condenser) **OR** water comes out at the top (of condenser) ✓	2	2 x 3.3b	**ALLOW** take out the funnel
	(b)		Mass of $\mathbf{M}_3$ = 164 – (31 + 16 × 4) = 69 ✓ Mass of **M** = 69/3 = 23 ✓ **M** = sodium **OR** Na ✓	3	2.2	 **ALLOW** metal closest to calculated **M** by **ECF**

Question			Answer	Marks	AO element	Guidance
22	(a)	(i)	ionic✓ oppositely charged ions✓	2	1.1	 **ALLOW** oppositely charged particles / has + and – particles **IGNORE** contains anions and cations (in diagram) **IGNORE** oppositely charged atoms / molecules **DO NOT ALLOW** positive nucleus and negative electrons **Mark independently**
		(ii)	**Any two from:** Idea of many strong ✓ covalent bonds ✓ (which) require a lot of energy to break ✓	2	1.1	**Reference to intermolecular forces / bonds / molecular forces scores 0 for question** **ALLOW** many covalent bonds break at high temperatures for 2 marks **ALLOW** idea that each atom has 4 strong covalent bonds for 2 marks **ALLOW** giant covalent structure for 1 mark
		(iii)	No delocalised electrons / no sea of electron / no mobile charge carriers / ions / electrons structure contains atoms ✓	1	1.1	**IGNORE** just free electrons
	(b)		Layers / metal ions ✓ slide over each other ✓	2	1.1	**IGNORE** metal atoms/electrons **Mark independently**

Question			Answer	Marks	AO element	Guidance
23	(a)		**Any two from:** In order of (Increasing) atomic mass/weight ✓ In groups showing similar <u>chemical</u> properties ✓ Left gaps for elements that had not been discovered ✓	2	1.1	**ALLOW** (increasing) mass number **IGNORE** just in order of mass
	(b)		In order of (Increasing) atomic number / proton number ✓	1	1.1	**IGNORE** electrons **DO NOT ALLOW** atomic mass
	(c)	(i)	Germanium ✓	1	3.1a	
		(ii)	Idea of similar atomic mass **/** 72.6 is closest to 72 / closest atomic mass ✓ Idea of similar density **/** 5.35 is closest to 5.5 / closest density ✓	2	2 x 3.2a	**ALLOW** (Relative) atomic mass of 72.6 is very close to 72 **IGNORE** just atomic masses are 72 and 72.6 **ALLOW** density of 5.35 is very close to 5.5 **IGNORE** just densities are 5.35 and 5.5 **IGNORE** comments about melting point or colour If no marks awarded **ALLOW** 1 for density and relative atomic mass and not melting point
	(d)	(i)	<u>Unreactive</u> ✓ Full outer shell (of electrons) ✓	2	2.1 1.1	**ALLOW** doesn't bond / doesn't lose or gain electrons / doesn't share electrons **ALLOW** (argon has a) stable electronic structure / 8 electrons in outer shell

Question			Answer	Marks	AO element	Guidance
		(ii)	<table><tr><th></th><th>$^{20}_{10}$Ne</th><th>$^{22}_{10}$Ne</th></tr><tr><td>**Proton**</td><td>10</td><td>10</td></tr><tr><td>**Neutron**</td><td>10</td><td>12</td></tr><tr><td>**Electron**</td><td>10</td><td>10</td></tr></table> ✓ ✓ ✓	**3**	**2.1**	1 mark for each row

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