OCR
Oxford Cambridge and RSA

GCSE (9-1)

Chemistry A (Gateway)

Unit **J248F/01**: Foundation Tier – Paper 1

General Certificate of Secondary Education

Mark Scheme for June 2018

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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

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

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.

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			**A** ✓	**1**	1.2	**ALLOW** 1
2			**A** ✓	**1**	1.1	
3			**D** ✓	**1**	1.1	
4			**D** ✓	**1**	1.1	
5			**C** ✓	**1**	1.1	
6			**B** ✓	**1**	2.1	
7			**A** ✓	**1**	2.1	
8			**D** ✓	**1**	2.1	
9			**C** ✓	**1**	1.1	
10			**C** ✓	**1**	2.1	**ALLOW** 4
11			**B** ✓	**1**	2.1	**ALLOW** 2
12			**A** ✓	**1**	1.2	
13			**C** ✓	**1**	1.1	
14			**B** ✓	**1**	1.1	
15			**C** ✓	**1**	1.1	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>16</td><td>(a)</td><td></td><td>
<table>
<tr><th>Reaction</th><th>Temperature at start in ^{o}C</th><th>Temperature at end in ^{o}C</th><th>Temperature change in ^{o}C</th><th>Type of reaction</th></tr>
<tr><td>A</td><td>20</td><td>25</td><td>(+) 5</td><td>exothermic</td></tr>
<tr><td>B</td><td>18</td><td>10</td><td>- 8</td><td>endothermic ✓</td></tr>
<tr><td>C</td><td>21</td><td>35</td><td>(+) 14</td><td>exothermic ✓</td></tr>
<tr><td>D</td><td>20</td><td>20</td><td>0</td><td></td></tr>
</table>
Temperature change in BOTH reactions A and D ✓</td><td>3</td><td>3 x 2.2</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>C ✓</td><td>1</td><td>2.2</td><td>ecf on ΔT</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>100 (kJ) ✓</td><td>1</td><td>2.2</td><td>ALLOW -100</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>50 (kJ) ✓</td><td>1</td><td>2.2</td><td></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>17</td><td>(a)</td><td></td><td><table><tr><th>Element</th><th>Number of atoms</th></tr><tr><td>C</td><td>4</td></tr><tr><td>H</td><td>6</td></tr><tr><td>O</td><td>4</td></tr></table>All correct ✓✓
One or two correct ✓</td><td>2</td><td>2 x 2.1</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>$C_2H_3O_2$ ✓</td><td>1</td><td>2.1</td><td>Order of atomic symbols unimportant
e.g. ALLOW $H_3C_2O_2$</td></tr>
<tr><td></td><td>(c)</td><td></td><td>Solid ✓

Idea that melting point is above 25^{o}C ✓</td><td>2</td><td>2 x 2.1</td><td>

ALLOW not reached 184 ^{o}C/melting point ;
IGNORE boiling point
Independent marking points</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
18	(a)		Salt is soluble or dissolves in water (so filtration will not work) ✓ Distillation ✓	2	2 x 3.3b	**ALLOW** forms (salt) solution **IGNORE** fractional **ALLOW** evaporate **and** condense
	(b)		Fractional distillation ✓ as liquids have different boiling points ✓	2	2 x 3.2b	 **ALLOW** higher level answers in terms of intermolecular forces
	(c)	(i)	Consists of just one element or substance ✓	1	1.2	
		(ii)	No (no mark) pure samples do not have a range of mpt ✓ Sample 4 has range higher than 120^{o}C ✓ **Any one from:** Pure samples cannot have melting point above 120^{o}C ✓ Sample 2 is likely to be most pure ✓	3	 2 x 3.2a 1 x 3.2b	 **ALLOW** pure samples have single mpt/impure samples have a range of mpts/ impure samples have more than one mpt/4 has a range of mpt **ALLOW** sample 4 has higher melting point so cannot be pure/pure sample cannot have a higher mpt./impure sample has lower mpt than 120 ^{o}C **IGNORE** boiling point

Question			Answer	Marks	AO element	Guidance
19	(a)		Solid ✓	1	1.2	
	(b)		1.76 ✓	1	2.2	
	(c)		No (no mark) 20g calcium carbonate will make 11.2g of calcium oxide ✓ and 8.8g of carbon dioxide ✓	2	2 x 3.1b	 **ALLOW** idea that he has the numbers reversed for both marks **ALLOW** idea that mass of CO_2 is **always** lower than CaO for one mark ora
	(d)	(i)	40.3 (g) ✓	1	2.2	**ALLOW** 40
		(ii)	Correct idea of 48.6 + 32 = 80.6 ✓ (demonstrates law of conservation of mass) since both sides are equal ✓	2	1 x 2.2 1 x 3.2a	**ALLOW** 48 + 32 = 80 (must use data) **MAX 1** for full argument using 64.6/64

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>20</td><td>(a)</td><td></td><td>Points plotted correctly ✓

Straight line through all points except point at 6 minutes ✓</td><td>2</td><td>2 x 2.2</td><td>ALLOW ± ½ square</td></tr>
<tr><td></td><td>(b)</td><td></td><td>Point on graph at 6 minutes circled ✓</td><td>1</td><td>2.2</td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td>OH^- and SO_4^{2-} ✓</td><td>1</td><td>2.2</td><td>BOTH REQUIRED</td></tr>
<tr><td></td><td>(d)</td><td></td><td>
<table>
<tr><th>Molten salt</th><th>Formula</th><th>Product at cathode</th><th>Product at anode</th></tr>
<tr><td>potassium chloride</td><td>KCl</td><td>potassium</td><td>chlorine ✓</td></tr>
<tr><td>lead iodide</td><td>PbI_2</td><td>lead ✓</td><td>iodine</td></tr>
</table>
</td><td>2</td><td>2 x 2.2</td><td>DO NOT ALLOW chloride/Cl/Cl^-
ALLOW Cl_2

ALLOW Pb
DO NOT ALLOW Pb^{2+}</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
21	(a)		**DIAMOND** **Any two from:** Transparent ✓ Does not conduct electricity ✓ High melting point ✓ High boiling point ✓ **GRAPHITE** **Any two from:** Good electrical conductor ✓ Soft ✓ High melting point ✓ High boiling point ✓ (Dark) grey ✓	**4**	4 x 1.1	**ALLOW** higher level answers to explain the property e.g has delocalised electrons to explain conduction has no delocalised electrons to explain non-conduction strong (covalent) bonds throughout structure to explain high mpt/bpt layers with weak force between to explain soft/brittle **ALLOW** brittle **ALLOW** black
	(b)		Covalent ✓	**1**	1.1	
	(c)		**Any two from:** Graphite has a layered structure ✓ Weak forces between layers ✓ (which) allow layers to slide (over each other) ✓	**2**	2 x 1.1	**ALLOW** in sheets/in layers **ALLOW** weak bonds between layers **IGNORE** intermolecular forces

Question			Answer	Marks	AO element	Guidance
22	(a)		Electrons ✓	1	1.1	
	(b)		Protons **AND** neutrons ✓	1	1.1	**BOTH REQUIRED**
	(c)		Idea that the relative mass of protons and neutrons is 1 ✓ and that of electrons is 0.0005 or **very** small (in comparison) ✓	2	2 x 1.1	**ALLOW** protons and neutrons have (significant) mass/more mass than electrons **DO NOT ALLOW** grams **ALLOW** mass of electron is negligible **Max 1** if g used
	(d)		**Any two from:** Isotopes ✓ same number of protons/ same atomic number ✓ different numbers of neutrons/ different mass numbers ✓	2	2 x 1.1	 **DO NOT ALLOW** different number of electrons **ALLOW** atomic mass **DO NOT ALLOW** relative atomic mass

Question			Answer	Marks	AO element	Guidance
23	(a)		Water ✓	1	1.2	
	(b)		Idea that different inks move across the paper at different speeds ✓	1	1.2	**ALLOW** inks have different solubilities (in water) / different adsorption (to paper) **ALLOW** different Rf values
	(c)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 0.50 award 2 marks** 2.6 and 5.2 ✓ 2.6/5.2 = 0.5(0) ✓	2	 2.2 2.2	 Ecf **IGNORE** units
		(ii)	A ✓ Has same pattern as ink from cheque ✓	2	2 x 2.2	**ALLOW** green same R_f values

Question			Answer	Marks	AO element	Guidance
24	*		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)** **Analyses the information to identify the type of bonding present in all three substances** **AND** **provides a correct explanation for two of them AND a basic explanation for the third** *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)** **Analyses the information to identify the type of bonding present in two of the substances** **AND** **provides a correct explanation for one of them / a basic explanation for both of them** **OR** **Analyses the information to identify the type of bonding present in two of the substances** **AND** **provides a basic explanation for two of them** **OR** **Analyses the information to identify the type of bonding present in three of the substances** **AND** **provides a basic explanation for one of them** *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.*	**6**	2 x 2.1 2 x 3.1a 2 x 3.2b	**AO3.2b Analyses information to draw conclusions about the three substances** • substance **A** is covalently bonded • substance **A** is simple molecular • substance **B** is a metal / has metallic bonding • substance **C** is an ionic compound **AO3.1a Analyses information to interpret the type of bonding present in all three substances** • substance A has a low melting point and boiling point so is covalent • substance A does not conduct electricity so is likely to be covalent • substance B has high melting point and boiling point and is a good conductor so is a metal or has metallic bonding • substance C has a high melting point and boiling point but does not conduct as a solid so is likely to be an ionic compound • substance C does not conduct as a solid but does when molten so is likely to be an ionic compound **AO2.1 Applies knowledge and understanding to identify information about the three substances** • substance A has a low melting point and boiling point • substance A does not conduct electricity • substance B has high melting point and boiling point and is a good conductor • substance C has a high melting point and boiling point but does not conduct as a solid

Question			Answer	Marks	AO element	Guidance
			Level 1 (1–2 marks) **Analyses the information to identify the type of bonding present in one of the substances** **AND** **provides a basic explanation** *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.*			• substance C does not conduct as a solid but does when molten

Question			Answer	Marks	AO element	Guidance
25	(a)	(i)	Particles close together / particles compact /particles already touching / particles tightly packed / AW ✓	1	1.1	**ALLOW** idea of particles with no spaces between them **ALLOW** any type of particles Mark can be awarded from a diagram **IGNORE** particles are in fixed positions **IGNORE** particles are in a regular arrangement / particles are in a lattice **IGNORE** intermolecular forces
	(a)	(ii)	**Any three from:** Particles in a solid are in fixed positions ✓ Particles in a solid vibrate ✓ Particles in a liquid can move (past each other) ✓ as forces between particles in a liquid are less than in a solid ✓	3	3 x 1.1	**ALLOW** any type of particles **ALLOW** particles in a solid cannot move (past each other) **IGNORE** solid cannot flow, but **ALLOW** particles in a solid cannot flow **IGNORE** particles move around on the spot **IGNORE** liquid can flow, but **ALLOW** particles in a liquid can flow **ALLOW** liquid particles have enough energy to overcome attractions (between particles) **DO NOT ALLOW** no forces between particles **IGNORE** intermolecular forces

Question			Answer	Marks	AO element	Guidance
	(a)	(iii)	**Any two from:** Particles are moving quickly (in all directions) ✓ Particles are far apart ✓ Particles spread out ✓ Weak forces between the particles ✓	**2**	2 x 1.1	**ALLOW** any type of particles **ALLOW** particles can move freely or randomly **ALLOW** M2 from a diagram showing no particles touching **IGNORE** intermolecular forces **IGNORE** no forces between particles
	(b)		$Mg + 2H_2O \rightarrow Mg(OH)_2 + H_2$ Correct formulae ✓ Balancing ✓	**2**	1.1 2.2	Balancing mark is conditional on correct formulae **ALLOW** = or ⇌ instead of → **DO NOT ALLOW** and or & instead of + **ALLOW** any correct multiples including fractions e.g. $2Mg + 4H_2O \rightarrow 2Mg(OH)_2 + 2H_2$ **ALLOW** one mark for correct equation with minor errors in case, subscript or superscript e.g. $MG + 2H^2O \rightarrow 2Mg(OH)2 + H_2$ **IGNORE** state symbols
	(c)		148.3 ✓	**1**	2.2	**ALLOW** 148

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>26</td><td>(a)</td><td></td><td>Any four from:
Titration ✓

Put acid in burette ✓
Pipette (a known volume of) sodium hydroxide into flask ✓

Use a (named) indicator / use of a pH meter ✓
Add acid to sodium hydroxide until colour of indicator changes ✓
Repeat (to get an accurate value) ✓
Repeat again with no indicator ✓
Evaporate (off the water) / crystallise ✓</td><td>4</td><td>4 x 3.3a</td><td>ALLOW other methods involving adding acid to sodium hydroxide solution using the principles outlined on the LHS
eg ALLOW mix or react acid with alkali

ALLOW alkali in burette
ALLOW acid in flask

DO NOT ALLOW marks in incorrect context</td></tr>
<tr><td></td><td>(b)</td><td></td><td>$NaOH + HCl \rightarrow NaCl + H_2O$ ✓</td><td>1</td><td>2.2</td><td>ALLOW = or ⇌ instead of →
DO NOT ALLOW and or & instead of +

ALLOW any correct multiples including fractions

IGNORE any state symbols</td></tr>
<tr><td></td><td>(c)</td><td></td><td><table><tr><th>Acid used</th><th>Other starting material</th><th>Salt made</th></tr><tr><td>sulfuric acid</td><td>copper oxide</td><td>copper sulfate ✓</td></tr><tr><td>nitric acid ✓</td><td>zinc carbonate</td><td>zinc nitrate</td></tr><tr><td>hydrochloric acid</td><td>magnesium oxide/ magnesium hydroxide / magnesium carbonate / magnesium ✓</td><td>magnesium chloride</td></tr></table></td><td>3</td><td>3 x 2.2</td><td>ALLOW correct formulae</td></tr>
<tr><td></td><td>(d)</td><td></td><td>Neutralisation ✓</td><td>1</td><td>2.2</td><td></td></tr>
</table>

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