F

GCSE (9–1)

Chemisty B (Twenty First Century Science)

J258/01: Breadth in Chemistry (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.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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
BOD	Benefit of doubt given
CON	Contradiction
RE	Rounding error
SF	Error in number of significant figures
ECF	Error carried forward
L1	Level 1
L2	Level 2
L3	Level 3
NBOD	Benefit of doubt not given
SEEN	Noted but no credit given
I	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.

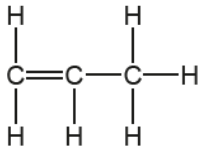
You should ensure that you have copies of these materials.

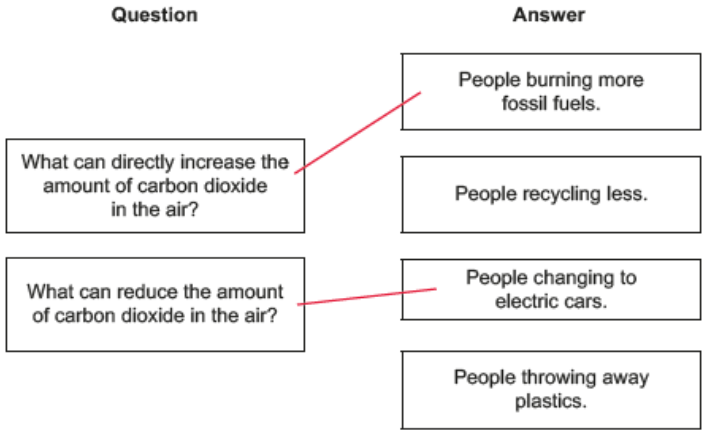
You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New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

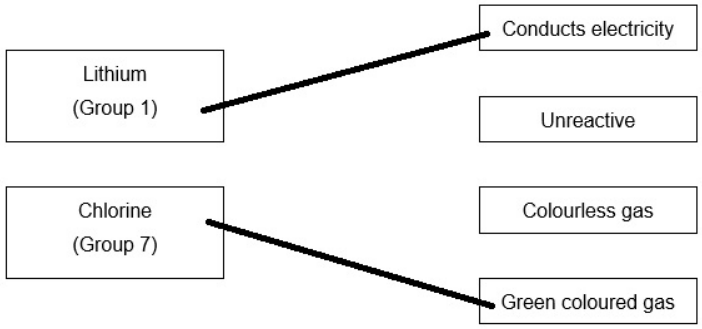
	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge 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)	(i)	 ✓	1	1.1	
		(ii)	CH_3 ✓	1	2.1	
	(b)	(i)	metal/positive ions (top box) ✓ electrons (bottom box) ✓	2	1.1	**DO NOT ALLOW** answers in any other order
		(ii)	(delocalised) electrons ✓	1	1.1	
	(c)		ANY **ONE** FROM: • flexible ✓ • better insulator ✓ • lighter ✓	1	2.1	**ALLOW** any valid point

Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	13.7-13.8 (°C) ✓	1	3.1a	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 0.3/0.31/0.32 award 2 marks** 14.38/14.39/14.4 in 1980 and 14.7 in 2000✓ 0.3/0.31/0.32 (°C) ✓	2	2.2	
		(iii)	1920 – 1940 ✓ 1980 – 2000 ✓	2	3.2b	
	(b)	(i)	They absorb infrared radiation and re-emit it. ✓	1	1.1	
		(ii)	 ✓✓	2	1.1	

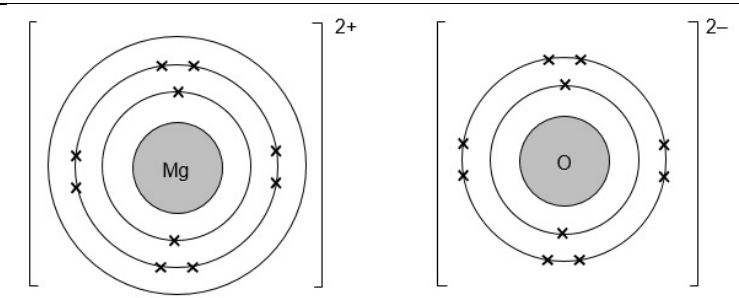
Question			Answer	Marks	AO element	Guidance
3	(a)		Carbon **AND** hydrogen ✓	1	1.1	
	(b)		CH_2 ✓	1	2.2	
	(c)		Alkenes ✓	1	1.1	
	(d)		addition ✓ colourless ✓ double ✓	3	1.1	**DO NOT ALLOW** answers in any other order

Question			Answer	Marks	AO element	Guidance
4	(a)	(i)	Carbon / C atoms ✓	1	1.1	
		(ii)	covalent (bonds) ✓	1	1.1	**ALLOW** 'shared electron(s)'
	(b)		Similarity – any **one** from: High m.p. or b.p. ✓ Both can conduct electricity (depending on state) / AW ✓ Both solids at room temperature ✓ Difference – any **one** from: Graphite is "greasy" / slippery ✓ Graphite conducts electricity when solid ORA with sodium chloride / sodium chloride only conducts when liquid or dissolved in water ✓	2	1.1	**IGNORE** descriptions of structure **ALLOW** any suitable properties

Question			Answer	Marks	AO element	Guidance
5	(a)	(i)	 ✓✓	2	1.1	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 28.4 (g) award 2 marks** (71÷14) × 5.6 ✓ = 28.4 (g) ✓	2	2.2	
		(iii)	Reaction with chlorine is more vigorous / faster ✓	1	1.1	
	(b)		anode: chlorine ✓ cathode: Lithium ✓	2	2.2	
	(c)		A chemical cell produces a voltage until the reactants are used up ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	zinc reacts (instead of iron)/is sacrificial ✓ (zinc) more reactive (than iron and transfers electrons to the oxygen) ✓	2	2.1	
		(ii)	More slowly than ✓	1	3.2b	
		(iii)	less water / air / oxygen can reach/touch nail ✓	1	3.2b	**ALLOW** less water/air/oxygen reacting with nail
	(b)		iron(III) hydroxide ✓	1	2.2	
	(c)		iron + hydrochloric acid → iron chloride ✓ + hydrogen ✓	2	2.2	**ALLOW** iron nail + hydrochloric acid → iron chloride + hydrogen for both marks **IGNORE** oxidation state of iron

Question			Answer	Marks	AO element	Guidance
7	(a)	(i)	lilac ✓	1	1.2	
		(ii)	Nitrogen / phosphorous ✓	1	1.1	
	(b)		K_2SO_4 ✓	1	2.1	
	(c)	(i)	White **AND** solid / precipitate / insoluble ✓	1	1.2	
		(ii)	potassium chloride ✓	1	1.1	
	(d)	(i)	potassium ✓	1	3.2b	
		(ii)	4×10^{-7} (m) ✓	1	1.2	**DO NOT ALLOW 0.0000004**
	(e)		Advantage – cheaper / equipment is readily available / quick / convenient to do / AW ✓ Disadvantage – Lack of sensitivity / not accurate (on small amounts) ✓	2	3.2a	

Question			Answer	Marks	AO element	Guidance
8	(a)		transition metal ✓	1	1.1	
	(b)		titanium ✓ titanium oxide ✓ titanium ✓	3	2.1 2.2 x2	
	(c)		(24.3 + 16.0 =) 40.3 ✓	1	1.2	**DO NOT ALLOW** 40/40.0
	(d)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 60 (%) award 2 marks** (24/40) × 100 ✓ = 60 (%) ✓	2	2.2	
	(e)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 59.9 (%) award 3 marks** (47.9/79.9) x 100 ✓ = 59.94993742 ✓ = 59.9 (%) (1dp) ✓	3	 2.2 x2 1.2	**DO NOT ALLOW** answers to any other rounded value
		(ii)	Reactants now include 2 Mg ✓ (Total) mass of atoms in reactants / bottom of fraction / denominator is larger ✓	2	2.2	**ALLOW** mass of other product is greater
	(f)	(i)	 ✓ ✓	2	1.2	
		(ii)	2 (Mg) + (O_2) → 2 (MgO) ✓	1	1.2	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>9</td><td>(a)</td><td></td><td>
<table>
<tr><th></th><th>True</th><th>False</th></tr>
<tr><td>2 moles of nitrogen react with 3 moles of hydrogen .</td><td></td><td>✓</td></tr>
<tr><td>The reaction can reach 100% yield.</td><td></td><td>✓</td></tr>
<tr><td>At equilibrium, the forward reaction is faster than the backward reaction.</td><td></td><td>✓</td></tr>
</table>
</td><td>3</td><td>1.2</td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td>1. Put some sulfuric acid in a beaker
2. Add ammonia until the solution is alkaline
3. Slowly evaporate the solution until most of the solution has gone
4. Wait for the crystals to form after the solution has cooled down
5. Filter the solution
6. Wash and dry the crystals

✓✓</td><td>2</td><td>3.3a</td><td>One mark for any three steps in the correct order</td></tr>
<tr><td></td><td>(c)</td><td></td><td>FIRST CHECK THE ANSWER ON ANSWER LINE
If answer = 75 (%) award 2 marks

(9.9÷13.2) × 100 ✓
= 75 (%) ✓</td><td>2</td><td>2.2</td><td></td></tr>
<tr><td></td><td>(d)</td><td></td><td>Sundip is wrong because it is a mixture / impurities aren’t always visible /maybe same colour as desired substance ✓

Jack is wrong because the elements are: combined/reacted / understands that ammonium sulfate is made of (different) elements / ammonium sulfate has a fixed formula and elements are not easily separated ✓</td><td>2</td><td>3.1b</td><td>ALLOW a pure substance contains one chemical for either Sundip or Jack’s answer.
DO NOT ALLOW same reason for both Sundip and Jack.</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
10	(a)		An acid is reacting with an alkali (to form a salt plus water) / AW ✓	1	1.2	**ALLOW** the reaction between acid and a base
	(b)	(i)	an indicator ✓ changes colour ✓	2	1.2	**ALLOW** named acid-base indicator **IGNORE** details of any quoted colour change
		(ii)	Take readings at eye level / take readings from (bottom of) meniscus / make sure no air in burette / add (the NaOH) drop by drop ✓	1	3.3b	**ALLOW** AW for any of the points **ALLOW** repeat and look for a similar value ;
	(c)	(i)	(25.80 – 0.90) = 24.9(0) ✓	1	2.2	
		(ii)	24.95 not used/is an outlier ✓ Mean = (24.55 + 24.65 =24.6)÷3 = 24.6(0) ✓	2	3.2a 1.2	 **ALLOW** Mean = (24.55 + 24.65)/2 = 24.6(0) **ALLOW 1 mark for** correct calculation of a mean using all 4 values (= 24.7 / 24.6875)
		(iii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 0.0037 or 3.7 × 10^{-3} (g) award 4 marks** Rearrange to mass of acid = 0.0908 ÷ volume of acid ✓ = 0.0908 ÷ 24.6 ✓ = 0.00369.... (g) ✓ = 0.0037 or 3.7 x 10^{-3} (g) (2sf) ✓	4	 1.2 2 × 2.2 1.2	 **ALLOW** rearrangement mark if it is clear that 0.0908 is being divided by a volume, even if volume is incorrect. **ALLOW ECF** if incorrect volume is calculated in (ii) and used in (iii) **ALLOW** sf mark on incorrect calculation

Question			Answer	Marks	AO element	Guidance
11	(a)	(i)	When the fizzing stops ✓	1	3.3a	
		(ii)	(broken-up tablet) greater surface area (of solid) (AW) ✓ more solid particles can react (in the same time) / more (successful / frequent) collisions ✓	2	1.1	
	(b)		Particles gain activation energy (AW) / frequency of collisions is greater / more successful collisions ✓	1	1.1	
	(c)	(i)	(the fizz means) a gas is being given off/made / carbon dioxide is being given off/made ✓	1	2.2	
		(ii)	Gradient/slope decreasing ✓	1	2.2	**ALLOW** idea that the curve is less steep (as time increases) **IGNORE** time increases and mass decreases
		(iii)	(Rate of reaction decreases as): number of (reactant) particles decreases / particles further apart ✓	1	2.2	**ALLOW** reactants/tablet/water used up **IGNORE** particles have less energy

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