OCR
Oxford Cambridge and RSA

GCSE (9-1)

Chemistry B (Twenty First Century)

Unit **J258F/01**: Foundation Tier – Breadth in chemistry

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.

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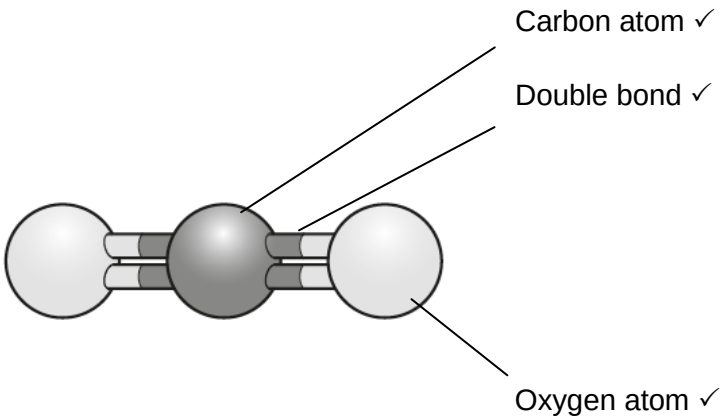
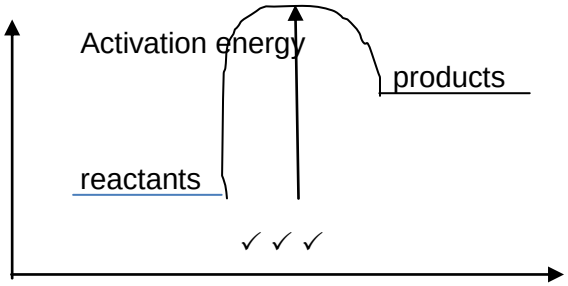
Annotations available in RM Assessor

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

Question			Answer	Marks	AO element	Guidance
1	(a)		Methane ✓	1	1.1	
	(b)	(i)	Irregular rise / generally up but sometimes falls / rises but now constant /AW ✓	1	3.1a	The candidate must discuss the irregularity of the rise in some way
		(ii)	12 ✓	1	2.2	
	(c)			3	1.1 × 3	**ALLOW** the double bond line to either (or both) double bond(s) **ALLOW** oxygen link to either (or both) oxygen atoms **DO NOT ALLOW** a link to 'ionic bond' as this a CON to the double bond mark.

Question			Answer	Marks	AO element	Guidance
2	(a)		Adds sherbet powder to water / carries out the reaction ✓ Temperature falls / AW ✓	2	3.3a 1.1	 Result must relate to an experimentally observable factor i.e. temp [rather than energy]
	(b)			3	1.1 × 3	Curve with single hump ✓ Products line labelled and above reactants line ✓ Activation energy unambiguously labelled ✓ This point can only be gained if the products line is above the reactants line

Question			Answer	Marks	AO element	Guidance
3	(a)	(i)	Hydrogen, nitrogen, oxygen, sulfur ✓	1	1.1	Any other boxes ticked are CON
		(ii)	Nitrogen ✓	1	1.1	
	(b)	(i)	**Any one from**: artificial fertilisers (can) cause environmental damage ✓ uses a waste product ✓	1	3.2a	 **IGNORE** 'environmentally friendly' /soil damage **ALLOW** animals produce it / there are animals on the farm
		(ii)	**Any one from**: not enough manure/cows AW ✓ supply of natural fertilisers is difficult to manage/transport / AW ✓ composition of natural fertilisers is variable / AW ✓	1	3.2a	**IGNORE** 'more effective' unless explained **ALLOW** easier to use / can be used in smaller amounts / AW ✓ 'quicker' BOD 'more reliable' – not enough detail
	(c)	(i)	White ✓ precipitate/solid ✓ Barium sulfate ✓	3	1.2 × 2 2.1	 **IGNORE** reference to ammonium chloride
		(ii)	Evaporate the solution ✓	1	1.2	
	(d)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 0.21 (kg) award 3 marks** 28/132 ✓ = 0.21 (kg) ✓ 2 decimal places ✓	3	 2.2 × 2 1.2	212.12 = 2 marks 212.1212 = 1 mark **ALLOW** the two decimal places as an independent mark.

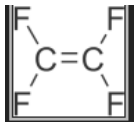
<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>4</td><td>(a)</td><td></td><td>
<table>
<tr><th></th><th>Chlorine</th><th>Bromine</th><th>Iodine</th></tr>
<tr><td>Appearance at room temperature and pressure</td><td>Green gas</td><td>Red liquid ✓</td><td>Grey solid</td></tr>
<tr><td>Colour as a gas</td><td>yellow-green</td><td>Red-brown</td><td>Purple/mauve Violet ✓</td></tr>
<tr><td>Product with sodium</td><td>NaCl ✓</td><td>NaBr</td><td>NaI</td></tr>
</table>
</td><td>3</td><td>1.1 × 3</td><td>ALLOW all the usual alternatives for colour of bromine</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>potassium chloride ✓
KBr ✓</td><td>2</td><td>2.2 × 2</td><td>Symbol for Br must be correct</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>(because) bromine is formed / bromine is red-brown ✓</td><td>1</td><td>2.1</td><td>DO NOT ALLOW ‘bromide’ references</td></tr>
</table>

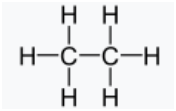
Question			Answer	Marks	AO element	Guidance
5	(a)		**R, and** it conducts electricity ✓	1	1.1	**IGNORE** other comments
	(b)		**R** ✓	1	2.1	If more than one option given, **CON**
	(c)		**Q** ✓ noble gas / Group 0 / unreactive✓	2	2.1 × 2	Mark independently **ALLOW** full outer shell
	(d)		Giant ionic ✓	1	2.1	
	(e)		16 ✓	1	1.1	**ALLOW** ‘2:8:6’

Question			Answer	Marks	AO element	Guidance
6	(a)		chloride ✓ positive✓ electrons ✓	3	1.1 × 3	
	(b)		Chlorine turns litmus (red then) bleached ✓ hydrogen pops when lit ✓ Oxygen should relight **glowing** splint / spill / AW ✓	3	1.2 × 3	 **ALLOW** lit splint burns brighter

Question			Answer	Marks	AO element	Guidance
7	(a)	(i)	Manganese oxide + carbon → carbon oxide/monoxide/dioxide + manganese ✓	1	1.2	**IGNORE** symbol equations
		(ii)	<table><tr><th></th><th>True</th><th>False</th></tr><tr><td>Carbon is more reactive than aluminium</td><td></td><td>✓</td></tr><tr><td>Carbon reduces manganese oxide</td><td>✓</td><td></td></tr><tr><td>Aluminium is more reactive than manganese</td><td>✓</td><td></td></tr><tr><td>Carbon reduces aluminium oxide</td><td></td><td>✓</td></tr></table>	4	1.1 2.1 2.1 2.1	
	(b)	(i)	Middle diagram ringed ✓	1	1.1	
		(ii)	Left-hand box: (lattice of) metal/positive ion(s) **AND** Right-hand box: ('sea' of freely moving / delocalised) electron(s) ✓	1	1.1	

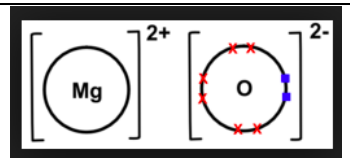
Question			Answer	Marks	AO element	Guidance
8	(a)		OH^- ✓	1	1.1	
	(b)	(i)	Idea of dividing cost by cm^3 ORA✓ Some comparison of unit costs, eg: Gutcalm £1.75 / 24 = £0.073 per cm^3 Milkomag £1.50 / 21 = £0.071 per cm^3 so better ✓	2	3.1a 3.2a	There must be some indication that a calculation has been performed **IGNORE** incorrect rounding as assessed elsewhere
		(ii)	Use a volumetric pipette ✓	1	2.2	

Question			Answer	Marks	AO element	Guidance
9	(a)		**A** High relative breaking strength / less likely to break✓ High temperature needed to soften✓ **OR** **C** **Any two from:** Low cost ✓ Quite a high temperature needed to soften ✓ It is stiff ✓	2	3.2a × 2	**DO NOT** credit choice without reason(s) **IGNORE** flexible**,** references to boiling point
	(b)		**B** ✓ if correct, look for 2nd mark (Lowest) softening temperature ✓	2	3.2a × 2	Only allow the 2nd mark if 'B' is given. **ALLOW** breaking strength **IGNORE** flexibility **CON** cost
	(c)		 ✓	1	2.1	

Question			Answer	Marks	AO element	Guidance
10	(a)		Alkene ✓	1	1.1	
	(b)		**Any two from:** fossil fuels running out / not sustainable ✓ burning fossil fuels produces pollutants ✓ alternatives to fossil fuels are increasingly used ✓	2	1.1 × 2	**IGNORE** green / environmentally friendly arguments
	(c)	(i)	Yes, because there are three hydrogens per carbon / AW ✓	1	2.2	
		(ii)	Carbon always forms four bonds ✓	1	2.1	
		(iii)	 ✓	1	2.1	

Question			Answer	Marks	AO element	Guidance
11	(a)		10 nm ✓	1	1.1	
	(b)		Uses less ✓ (large surface area means) faster / AW ✓	2	1.1 × 2	
	(c)		**Any two from**: Carbon monoxide / CO ✓ (carbon) particulates ✓ unburnt fuel / AW ✓	2	1.1 × 2	**IGNORE** carbon dioxide
	(d)	(i)	4+ ✓	1	2.1	
		(ii)	**FIRST CHECK ANSWER ON ANSWERLINE** **If answer = 81 / 81.25 / 81.3 (%) award 3 marks** Mass Ce = 160 – 30 **OR** 130g ✓ = 130 × 100/160 ✓ = 81 (%) ✓	3	1.2 × 3	**ALLOW** ecf if % oxygen calculated. Working is then essential eg 30x100/160 ✓ = 18.75(%) or 19(%) ✓ But 19(%) without working gains no credit .

Question			Answer	Marks	AO element	Guidance
12	(a)		**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 0.08 ± 1 (cm^3 / s) award 2 marks** Change in volume = 8 ± 1 (cm^3) ✓ rate = 8 / 100 = 0.08 (cm^3 / s) ✓	**2**	**2.2 × 2**	**ALLOW** use of any number 7- 9 anywhere in calculation (1) **ALLOW ECF for 2nd mark:** rate = change in volume / 100 **ALLOW** 0.07 – 0.09 (2)
	(b)		"Particle size" of carbonate / AW ✓ Temperature ✓	**2**	**3.3a × 2**	**ALLOW** take readings every 200s or less/ same time interval **IGNORE** 'the same time'
	(c)		Particles closer/have less space / more particles in same volume / more (densely) packed ✓ Collide more frequently / higher rate of collisions / more collisions per unit time/per second ✓	**2**	**2.1 × 2**	**ALLOW** molecules for particles **ALLOW** more chance of collisions **IGNORE** more particles / more collisions / faster collisions **/** energy arguments / more successful collisions /
	(d)		**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 17 (cm^3) award 3 marks** 0.07 / 0.10 or 0.10/0.07 ✓ (uses 24)= 16.8 ✓ = 17 (cm^3) ✓	**3**	**2.2 × 2** **1.2**	**IGNORE** 17.0 **ALLOW** MP3 for (incorrect) answer with working rounded to 2sf

Question			Answer	Marks	AO element	Guidance
13	(a)		No overall loss (in mass) idea / No elements/mass/atoms/chemicals/particles/compounds lost / law states that matter is neither (created nor) destroyed in a chemical reaction / AW ✓ Carbon dioxide is a gas / Carbon dioxide leaves the test tube / a gas is given off / idea that all products are not in the test tube / AW ✓	2	3.1b × 2	**ALLOW** It is an open system
	(b)		**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 52.2 /52.4 / 52.3 (%) award 4 marks** (formula mass of reactants or $MgCO_3$) = 84.3/84 ✓ (formula mass of product or CO_2) = 44 ✓ Correct substitution = 44/84.3 x 100 / 44/84 x 100 ✓ Ans+dec pl= 52.2 / 52.4 / 52.3 (%) (1 decimal place) ✓	4	2.2 × 3 1.2	If no marks awarded for MP3 and MP4 **ALLOW** correct working towards formula masses for max (2) 24(.3) + 12 + (3x16) / 12 + (2 x 16) **ALLOW** ecf **ALLOW** 52.1(%) (Rounding assessed in previous question)
	(c)	(i)	2.2 (g)✓	1	2.2	**ALLOW** 2 or more sf
		(ii)	82(%) ✓	1	2.2	**ALLOW** 2 or more sf
	(d)		 Ions with correct electrons ✓ Charges ✓	2	1.2 × 2	**ALLOW (1)** for one correct ion **ALLOW** eight electrons in outer shell of Mg **ALLOW** all oxygen electrons with same symbol **IGNORE** correct inner shells **DO NOT ALLOW** incorrect inner shells

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The Triangle Building
Shaftesbury Road
Cambridge
CB2 8EA

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