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 June 2019

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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
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

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.

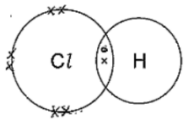
You should ensure that you have copies of these materials.

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 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)		Turns blue litmus red then white. ✓	1	1.2	
	(b)		Chlorine is used to kill micro-organisms in water. ✓ This stops the untreated water causing diseases. ✓ Chorine can be hazardous because it is toxic.✓	3	3×1.1	
	(c)		Diagram contains: shared pair of electrons ✓ 6 electrons around the rest of the chlorine atom AND 0 electrons round the rest of the hydrogen atom ✓	2	2×1.2	**ALLOW** any clear representation of electrons (dots, crosses, dots and crosses etc.) e.g. 

Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	covalent bonds ✓ shared electrons ✓	2	2×1.2	
		(ii)	It shows the shape of the molecule ✓	1	1.2	
	(b)		The molecular formula of butane is C_4H_{10}. ✓ Butane can be shown as ✓	2	2×1.2	
	(c)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 83 (%) award 3 marks** % = 48/58 × 100 ✓ = 82.7(58) (%)✓ = 83 (%) (2sf) / 2 significant figures for value calculated ✓	3	 2x2.2 1.2	**ALLOW** one mark for '82' without working **ALLOW** one mark for sig figs if calculation incorrect as indicated in answer column

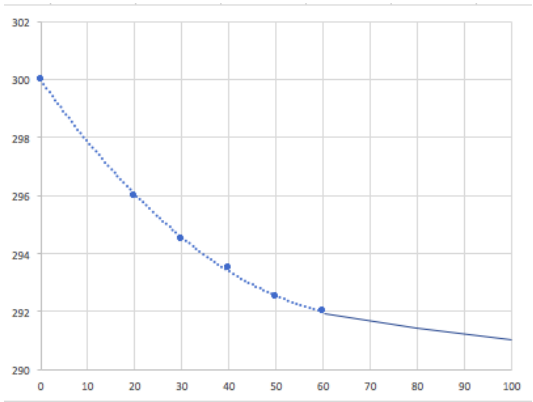
Question			Answer	Marks	AO element	Guidance
3	(a)	(i)	Use (of the light bulb) ✓	1	2.1	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 2122 (MJ) award 2 marks** 2011 light = 343 + 3 + 3540 = 3886 (MJ) **AND** 2015 light = 132 + 2 + 1630 = 1764 (MJ) ✓ Difference = 3886 – 1764 = 2122 (MJ) ✓	2	2×2.1	**ALLOW** (3540 – 1630 =) 1910 for 1 mark (ECF using use of the light bulb data only)
	(b)		Disposal / AW✓	1	1.2	**ALLOW** any 'end of life' wording e.g. recycling, thrown away, dismantled
	(c)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 54 (%) award 2 marks** Decrease = 3540 – 1630 = 1910 ✓ % decrease = 1910 / 3540 × 100 = 54 (%) ✓	2	2×2.2	**ALLOW** 55 **(%)** for 1 mark (ECF)

Question			Answer	Marks	AO element	Guidance
4	(a)		water / AW ✓	1	1.1	
	(b)		Any **two** from: • produce less polluting gases ✓ • produce less/no CO_2 / only produces water ✓ • Reduces use of fossil fuels ✓ • Plentiful supply of water as source of H ✓	2	2×1.1	**IGNORE** More general references to pollution **ALLOW** 'produce less poisonous gases' **ALLOW** lasts longer / won't run out
	(c)	(i)	**A** ✓	1	1.1	
		(ii)	**B** ✓	1	2.1	
	(d)	(i)	18 ✓	1	2.2	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 1200 (kJ) award 2 marks** 20/4 = 5 ✓ Energy = 5 × 240 = 1200 (kJ) ✓	2	2×2.2	

Question			Answer	Marks	AO element	Guidance
5	(a)		The spoon will melt ✓ The temperature (of hot tea) is above 30°C / AW ✓	2	2×3.2b	**ALLOW** soften **IGNORE** 'because the melting point is low' unless linked to the tea/water. **DO NOT ALLOW** second point if BPt water quoted incorrectly, or if water is compared to the **BPt** of gallium instead of the MPt.
	(b)		it has similar reactions to aluminium ✓	1	1.1	
	(c)		Ga^{3+}✓	1	2.1	
	(d)		There are strong attractions between the ions. ✓ A lot of energy is needed to separate the ions ✓	2	2×1.1	
	(e)		Any **two** from: • catches fire ✓ • fizzes more ✓ • moves around faster ✓	2	2×1.2	**IGNORE** 'the potassium melts' **IGNORE** general statements about reactivity - reacts quicker / more violently / hotter

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	A > C > B✓	1	1.2	
		(ii)	A ✓	1	2.1	
	(b)		Copper / Cu ✓	1	2.1	
	(c)		Top line: electron ✓ Bottom line: metal ion ✓	2	2×1.1	
	(d)		Conducts electricity ---------- Electrons can move ✓ Malleable ---------- Particles in the metal can slide over each other ✓	2	2×1.1	

Question			Answer	Marks	AO element	Guidance
7	(a)		Any **one** from: • is solid sphere / no empty space / AW ✓ • no nucleus AND (orbiting) particles / electrons ✓	1	1.1	**IGNORE** statements about the 'plum pudding' model
	(b)		electron(s) ✓	1	1.1	
	(c)		charge mass neutron 0 ✓ 1 ✓	2	2×1.1	
	(d)		protons: 9 ✓ neutrons 10 ✓	2	2×2.1	
	(e)		Correct statement about Kai's first statement (atoms smaller than molecules) with evidence of reference to data in table ✓ Correct statement about Kai's second statement (atoms NOT smaller than protons) with evidence of reference to data in table ✓	2	2×3.2a	Look for numbers or statements related to the table Look for annotations on the table itself

Question			Answer	Marks	AO element	Guidance
8	(a)	(i)	points plotted correctly ✓ curve of best fit drawn (to 60 s) ✓	2	2×2.2	 **ALLOW** plotted to +/- half a scale division **DO NOT ALLOW** dot to dot line
		(ii)	291 ± 0.5 ✓	1	3.2a	
		(iii)	F on curve at t = 0 ✓	1	1.2	
	(b)	(i)	(Rate of change) gets slower / decreases (as time increases) / AW ✓	1	3.1a	'During the reaction' is in the stem, so doesn't need stating **IGNORE** 'Mass decreases over time'. It tells us that mass changes but doesn't describe the change.
		(ii)	Slope / tangent measured rate gets less / AW ✓	1	3.1a	**ALLOW** goes from steep to flat
		(iii)	(CO_2) gas is given off / made / evolved / lost ✓	1	2.1	

	(c)		conical flask ✓ burette ✓	**2**	**2×3.3a**	
	(d)	**(i)**	Yes, because readings agree within 0.1 / close together / similar / concordant ✓	**1**	**3.1b**	**ALLOW** no anomalies / outliers
		(ii)	20.1(0) ✓	**1**	**2.2**	

Question			Answer	Marks	AO element	Guidance
9	(a)		Zn + H_2SO_4 --> $\underline{ZnSO_4}$ + H_2 ✓	1	2.2	Small 'n', large 'O' and subscript '4' must be recognisable.
	(b)		Hydrogen / H_2 ✓	1	1.2	
	(c)		surface area is greater / more collisions per second ✓	1	2.1	**IGNORE** easier for acid to get to / easier to break down / energy arguments
	(d)		The copper sulfate is left at the end ✓ The activation energy is lower with the catalyst present ✓	2	2×1.2	

Question			Answer	Marks	AO element	Guidance
10	(a)		there is a mixture of N_2, O_2 and NO ✓ the reaction $N_2(g) + O_2(g) \rightarrow 2NO(g)$ goes in both directions ✓	2	2×1.2	
	(b)		it is too acidic ✓	1	1.1	
	(c)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 15 (%) award 2 marks** Yield = 9 / 60 × 100 ✓ Yield = 15 (%) ✓	2	2×2.2	

Question			Answer	Marks	AO element	Guidance
11	(a)	(i)	strong (covalent) bonds / bonds need a lot of energy to break / each atom bonded to 4 others / lots of bonds/ giant covalent structure ✓	1	1.1	**DO NOT ALLOW –** incorrect type of bonding **DO NOT ALLOW** 'strong intermolecular forces / strong intermolecular bonds'
		(ii)	One mark for each property linked to its correct explanation: PROPERTY • Slippery / soft / lubricating / marks paper / flakes easily • (Electrical / thermal) conductivity • Strength (along layer) EXPLANATION • layers (with weak bonds between) • delocalised/free electrons / sea of electrons / electrons can move • strong bonds (within layers)	2	2×2.1	**ALLOW** one mark for two independent properties OR two independent explanations OR one property and one explanation **IGNORE** 'intermolecular' **IGNORE** melting point, boiling point
	(b)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 3.4 (g) award 2 marks** mass = 1 / 0.29 OR 3.448 / 3.45 / 3.5 etc✓ mass = 3.4 (g) ✓	2	2×2.2	Answer must be to two sig figs
	(c)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 0.0037 (g) award 2 marks** 44/12 ✓ Mass = 0.0037 (g) / 3.7×10^{-3} (g)✓	2	2×2.2	Answer must be to two sig figs

		(ii)	Idea that volume or density of diamond and graphite are different / volume or density are irrelevant ✓ Both contain the same amount (12g) of carbon / graphite is pure carbon and thus makes 44g / same mass of CO_2 produced as same mass of C in each / same number of carbon atoms present in each ✓	**2**	**2×3.2a**	**ALLOW** distance between atoms is irrelevant

Question			Answer	Marks	AO element	Guidance
12	(a)	(i)	propanone and ethanol ✓	1	1.1	**ALLOW** propanone only
		(ii)	propanone ✓	1	2.2	
	(b)	(i)	(Filter) paper ✓	1	1.2	
		(ii)	solvent is above line / dot ✓ otherwise dot will (mostly) dissolve / spread out / dot/dye does not travel up paper✓	2	2×3.3b	
		(iii)	yellow spot ✓ R_f = distance moved by spot ÷ distance moved by solvent front / largest distance moved by a spot / nearest solvent front ✓	2	1.1 2.2	
	(c)		Kareem/it is not pure **AND** because there is more than one spot / ORA✓	1	3.2b	**ALLOW** 'several spots / dots / colours **ALLOW** contains 3 or 4 components/substances/chemicals **ALLOW** idea of can be separated **IGNORE** 'more than one dye' **IGNORE** it is a mixture
	(d)		Sharp (AW) melting point / temperature / melting point same as reference value ✓	1	2.2	**IGNORE** melting point high **IGNORE** melts at the same time

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