OCR
Oxford Cambridge and RSA

Higher

GCSE

Chemisty B Twenty First Century Science

J258/04: Depth in Chemistry (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2022

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.

MARKING INSTRUCTIONS

PREPARATION FOR MARKING

RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor.
3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the RM Assessor messaging system.

5. **Crossed Out Responses**
Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

Rubric Error Responses – Optional Questions
Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple Choice Question Responses
When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).
When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses
When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**)
Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth **two or more marks**)
If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)
Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. Award No Response (NR) if:
   - there is nothing written in the answer space.

   Award Zero '0' if:
   - anything is written in the answer space and is not worthy of credit (this includes text and symbols).

   Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

8. The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

   If you have any questions or comments for your Team Leader, use the phone, the RM Assessor messaging system, or email.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer.

Once the level is located, award the higher or lower mark:

The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.

The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

In summary:

The skills and science content determines the level.

The communication statement determines the mark within a level.

Level of response questions on this paper are **4c** and **6c**

11. 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

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

Annotation	Meaning
I	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

13. **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 Biology/Chemistry/Physics/Combined Science 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	1.2	
		(ii)	**Any two from:** avoid naked flames / don't smoke / no mobile phones / no electronic devices ✓ switch off engine when refuelling ✓ avoid spills/replace cap or petrol nozzle quickly / avoid contact with hands / wear gloves / avoid inhaling vapour ✓	2	1.2	.
	(b)		forms <u>four</u> bonds / has <u>four</u> electrons available for bonding / forms chains/rings/tubes/balls/3 D structures ✓	1	2.1	
	(c)		(structure) polyethene has no bonds between chains / only weak forces between chains / poly(ethene) has weak intermolecular forces / rubber has (sulfur) bonds between chains ✓ (properties) rubber has higher melting point/harder/stronger/not flexible/not stretchy/doesn't break easily ORA ✓	2	2.1	**ALLOW** attractions=forces **ALLOW** cross links=bonds **IGNORE** <u>rubber</u> has double bonds/intermolecular forces
	(d)	(i)	**Any one from:** they are in the shape of balls/tubes ✓ they have only one type of atom / only carbon / only one element ✓ they have a large surface area to volume (ratio) / they are very small / measured in nanometres10^{-9} m ✓	1	2.1	**IGNORE** they are 3-D **ALLOW** carbon atoms in hexagons/pentagons **IGNORE** small/smaller **ALLOW** tiny
		(ii)	**Any two from:** idea that small size allows them to enter cells/tissue/blood ✓ balls and tubes have hollow middles ✓ medicine molecules fit inside ✓	2	1.1	

Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	Reaction is reversible / is an equilibrium reaction / products reform reactants / goes backwards ✓	1	1.1	**IGNORE** not all reactants form products
		(ii)	nitrogen and hydrogen ✓	1	1.1	**IGNORE** N_2 and H_2
	(b)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 13 (%) award 2 marks** 19.5 / 150 ✓ (x 100 =) 13 (%) ✓	2	1.2	**ALLOW (1)** for 0.13 %
	(c)	(i)	The ammonia <u>dissolves</u> / forms a solution / becomes aqueous ✓	1	2.1	**IGNORE** reacts
		(ii)	gas syringe✓	1	3.3b	
	(d)	(i)	accept values >7≤14✓	1	1.2	**ALLOW** above 7 **ALLOW** stated value or range within >7≤14
		(ii)	use <u>universal</u> indicator/paper / pH indicator/paper ✓ compare colour to (pH) chart/scale ✓	2	1.2	**IGNORE** indicator alone **DO NOT ALLOW** other named indicators **IGNORE** colour shows pH alone **ALLOW** M2 if any indicator is given

Question			Answer	Marks	AO element	Guidance
3	(a)	(i)	530 (million years ago) ✓	1	2.1	
		(ii)	7900 (ppm (parts per million))✓	1	2.1	
	(b)		Carbon dioxide was a similar/same level previously / previously low ✓ Quotes value e.g. between 260 – 340 MYA ✓	2	3.2a	**ALLOW** 'carbon' for 'carbon dioxide' **ALLOW** 2 marks for CO_2 was lower 10-20 MYA **IGNORE** 'it's rising now' without reference to the graph **ALLOW** any date between 260-340MYA e.g. '300 MYA'
	(c)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 30 (ppm) award 2 marks** Calculates 400 ppm / shows use of 10 000 in calculation ✓ 400-370 = 30 (ppm) ✓	2	2.2	**IGNORE** 0.04×10^4 alone **ALLOW** (1) for 370÷10000 /0.037
	(d)		idea of changing climate causing crop failure / animals for meat cannot live in changed climate ✓	1	1.1	**ALLOW** greenhouse effect/global warming/droughts/specific example of changed climate for 'climate change' **ALLOW** rising sea levels/flooding reduce land available for growing food

Question			Answer	Marks	AO element	Guidance
4	(a)	(i)	$C_{25}H_{51}$✓	1	2.1	**ALLOW** $H_{51}C_{25}$ but **IGNORE** $C_{25}h_{51}$
		(ii)	they are already in the simplest ratio / can't divide by 2 / can't divide by the same number ✓	1	1.1	**ALLOW** they have odd numbers of carbon atoms / prime numbers of carbon atoms **ALLOW** formula cannot be simplified / cannot cancel down **IGNORE** you can't have half an atom
	(b)		Accept value in the range 21-200^{o}C ✓ It is a <u>liquid</u> at room temperature / it is a <u>liquid</u> above 20^{o}C / becomes a gas at its boiling point / becomes a gas above room temperature ✓	2	2.2	 M2 is dependent on an acceptable boiling point

Question	Answer	Marks	AO element	Guidance
(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)** Describes features of alkanes **AND** uses ideas about structure **AND** at least one trend to explain why alkanes are a homologous series. *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)** Describes features of alkanes **AND** uses ideas to explain why alkanes are a homologous series. *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)** Makes statements about alkanes and/or homologous series. *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.*	**6**	**3 x 1.1** **3 x 3.1a**	**Recalls features of alkanes (AO1.1)** All alkanes….. • are hydrocarbons / only contain carbon and hydrogen • are saturated/contain all single bonds/do not have any functional groups • example of similar chemical property e.g. all burn/are all flammable/are generally unreactive • covalent bonds / have (weak) intermolecular forces between molecules **Analyses information from the table to interpret and explain why alkanes are a homologous series (AO3.1a)** Structure • General formula is C_nH_{2n+2} • each molecule differs from the last by CH_2 Trends down the series: • MPs/BPs increase • Example of physical property which changes down the series (e.g. less volatile/more dense/less flammable) • states show a trend in their change from gas (to liquid) to solid • intermolecular forces increase **Answers with incorrect statements** should be awarded the lower mark in each level.

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>5</td><td>(a)</td><td></td><td>calcium is more reactive <u>than carbon</u> / above carbon in <u>the reactivity series</u> ✓

copper is less reactive <u>than carbon</u> / below carbon in <u>the reactivity series</u> ✓
✓</td><td>2</td><td>1.1</td><td>ALLOW (1) for ‘calcium is more reactive than copper’ ORA

IGNORE ‘above and below’ alone or ‘above and below in the table’
ALLOW (2) for <u>only</u> metals less reactive than carbon can be extracted by heating with carbon</td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><th>Metal</th><th>Extracted by heating with carbon</th><th>Extracted by electrolysis</th></tr><tr><td>iron</td><td>✓</td><td></td></tr><tr><td>potassium</td><td></td><td>✓</td></tr><tr><td>aluminium</td><td></td><td>✓</td></tr><tr><td>lead</td><td>✓</td><td></td></tr></table>✓✓</td><td>2</td><td>2.1</td><td>All correct (2)
2/3 correct (1)</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>RFM Cu_2S = 159.1/159/160 / sulfur in Cu_2S = 32/32.1 ✓

2CuO = 159/160 / oxygen in 2CuO is 32 ✓

(following correct calculation) therefore the mass stays (approximately) constant ✓</td><td>3</td><td>2.1 x 2

3.2b</td><td>ALLOW (1) mark only for correct calculation of RFM of either 2CuO or Cu_2S if no other mark awarded

DO NOT ALLOW calculations of total mass on each side of the equation

ALLOW it decreases from 159.1 to 159</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Total mass stays the same/stays constant / total mass of products = (total) mass of reactants / total atoms remain the same ✓
Because gas is lost / carbon dioxide is lost / carbon dioxide is a gas ✓</td><td>2</td><td>2.1</td><td>IGNORE mass is conserved
ALLOW no mass created or destroyed / lost or gained
IGNORE not a closed system alone</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>(reduced) because (two) electrons are gained ✓</td><td>1</td><td>2.1</td><td>IGNORE loss of oxygen</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
6	(a)		(Arrangement) Particles become further apart / more space between particles in a gas / no longer in contact with each other / move over a larger space ✓ (Movement) Move faster / more kinetic energy ✓	2	1.1	**IGNORE** random **IGNORE** vibrate faster **IGNORE** have more energy / move more / move more freely
	(b)		Na has one electron in the outer shell/electron arrangement is 2,8,1 ✓ Na loses (one) electron(s) ✓ Ne has a full outer shell of electrons / has eight electrons in the outer shell / has a stable electron arrangement ✓	3	2.1	**ALLOW** shell/ring/energy level/orbit etc **ALLOW 2 marks** for M1 and M2 for sodium atom loses one electron to give a full outer shell **ALLOW** sodium loses electrons unless incorrect number is stated **DO NOT ALLOW** neon has no electrons in the outer shell

Question	Answer	Marks	AO element	Guidance
(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)** Describes at least one similarity **AND** at least one difference between the models **AND** explains the melting points of neon and sodium 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)** Describes similarities and/or differences between the models **AND** makes a statement about melting points. *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)** Makes statements about the models and/or differences in melting point *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.*	**6**	**2 x 1.1** **4 x 2.1**	**Demonstrates knowledge and understanding of similarities and differences between models (AO1.1)** **(similarities)** • particles in solid are ordered/regular / particles in liquids are irregular • particles move over each other in liquids • particles are fixed in place in solids **(differences)** • Particles in ionic model (6.2) o show identity of ions / sodium and chloride ions / two elements/ions o are different sizes o show different charges / positive and negative • in particle model (6.1) all atoms are the same / neon only contains one type of atom **Ignore** 6.1 inelastic spheres / 6.2 shows ions **Applies knowledge and understanding of models to explains MPts (AO2.1)** • MPt sodium chloride is very high / neon is very low idea • (strong) attraction between ions/opposite charges/electrostatic attraction/ionic bonds in sodium chloride. **ALLOW** 'lot of energy to break…for 'strong' • neon has very low attractive forces between particles/atoms (**ALLOW** intermolecular forces) • <u>fig 6.2/ionic model shows why</u> ions are attracted to each other • <u>fig 6.1/particle model does not show</u> attractive forces **IGNORE** there are fewer ions in liquid than in solid in NaCl **Answers with incorrect statements** should be awarded the lower mark in each level.

Question			Answer	Marks	AO element	Guidance
7	(a)		sodium sulfate ✓ (s) for $Cu(OH)_2$ ✓ (aq) for all others ✓	3	2.1	
	(b)	(i)	filter ✓ (after filtering) wash the residue/solid/precipitate (with water) ✓	2	3.3a	**DO NOT ALLOW** M1 if incorrect separation process is mention e.g. evaporation/heating/crystallisation **IGNORE** use a filter <u>funnel</u> alone / sieve it Must have idea of filtering for M2
		(ii)	**Any two from:** weigh again/check mass after it has been in the oven for longer ✓ completely dry when weighs the same (after being in the oven) idea / if it has a different mass it is not dry ✓	2	3.3b	**ALLOW** mass=weight for all points **ALLOW** (2) for heat it again and see if it weighs the same
	(c)	(i)	Correct plots ✓✓ **OR** 5 correct plots (one error) ✓ **AND** Straight lines to connect points ✓	3	1.2x2 2.2	**ALLOW** +/- ½ square Judge by eye, not necessary to use ruler **ALLOW** + / - 1 square if curved between points 3 and 4
		(ii)	sodium hydroxide is in excess / not enough copper sulfate / copper sulfate is the limiting factor ✓	1	2.2	**ALLOW** all the copper sulfate has reacted **ALLOW** 'copper ions' for copper sulfate **IGNORE** 'not enough <u>copper</u>' **DO NOT ALLOW** all the sodium hydroxide has reacted

		(iii)	(Jane or Alex chosen) (refers to the graph or table) Mass reaches a maximum/stays the same <u>when</u> equal volumes ($20cm^3$) of each solution are used/ratio is 1:1 / ✓ (Alex chosen) (refers to equation) Idea that the reaction ratio is 1:2 / one (mole of) $CuSO_4$ reacts with 2 (moles) NaOH ✓	**2**	**3.2a**	**ALLOW** AW for reaches a maximum e.g. 'the reaction needs' etc **ALLOW** '…. to make 0.98 g / approximately 1g for 'maximum mass'

Question			Answer	Marks	AO element	Guidance
8	(a)		(hydrogen) pops when lit / pops with a lighted splint ✓ (oxygen) glowing splint relights ✓	2	1.2	**IGNORE** 'pop test'
	(b)	(i)	Refers to 2:1 ratio idea in the equation / equation has $2H_2$ but only (1)O_2 (on LHS) ✓	1	2.1	**IGNORE** $2H_2$ produces four electrons alone **ALLOW** each hydrogen molecule loses 2 electrons and each oxygen molecule needs 4 electrons / Electrons in ratio of 1:2 **IGNORE** twice as much hydrogen as oxygen alone (repeats the Q) **ALLOW** 'atoms' 'molecules' formulae' 'moles' etc for 'equation'
		(ii)	2 marks: Fully correct equation: $2H_2 + O_2 \rightarrow 2H_2O$ ✓✓ **OR** 1 mark: Equation with some or all spectator species: $2H_2 + 4OH^- + O_2 + 2H_2O + 4e^- \rightarrow 4OH^- + 4H_2O + 4e^-$ ✓	2	2.1	**ALLOW** $H_2 + 1/2O_2 \rightarrow H_2O$
		(iii)	it is an ionic compound / contains ions idea ✓	1	1.1	**DO NOT ALLOW** electrons move/delocalised electrons
		(iv)	provides OH^- (ions)/provides hydroxide (ions) (to make water / to react with hydrogen) ✓	1	3.1b	**DO NOT ALLOW** need hydroxide ions to make oxygen
	(c)		hydrogen and/or oxygen are used up / reactants are used up / less hydrogen and/or oxygen available ✓	1	2.2	**ALLOW** the gases are used up
	(d)	(i)	diesel engines produce …carbon monoxide / carbon dioxide / carbon particulates / NOx / SOx / acidic products / diesel leakage ✓ Hydrogen fuel cells produce only water ✓	2	3.1b	**IGNORE** produces greenhouse gases **IGNORE** releases hydrogen
		(ii)	difficult to store / hydrogen is a gas / need more space to store / more flammable / danger of explosion ✓	1	3.1b	**IGNORE** cost arguments alone

Question			Answer	Marks	AO element	Guidance
9	(a)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 370 (g/dm^3) award 2 marks** Gives reading from the graph 37 g ✓ Unit conversion (37 x 1000/100) = 370 (g/dm^3) ✓	**2**	**2.2**	**ALLOW ECF** for incorrect reading in M2 e.g. 360/380/335 (1)
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 6.32 (mol/dm^3) award 3 marks** Calculates RFM of NaCl = 58.5 ✓ Shows or demonstrates use of formula number of moles = mass ÷ RFM ✓ mass ÷ RFM to 3 sig figs / 370(ECF)/58.5 = 6.32 (must be 3 sig figs) ✓	**3**	**2.2**	**Allow ECF** for all 3 marks from (a) (i) **ALLOW ECF** on incorrect RFM for M2 and M3 3 sig figs is dependant on calculation of mass÷ RFM **ALLOW** 6.324786r for (2) marks
	(b)	**(i)**	Uses word 'proportional' in the answer ✓ Does not go through origin / at 0^{o}C solubility is not 0 (g) / at 0^{o}C solubility has another value / solubility does not double when temperature doubles / does not increase by same factor / equation for line is not mx / equation is mx+c ✓	**2**	**1.1** **3.1a**	**IGNORE** inversely/directly/indirectly etc. **IGNORE** correlation **IGNORE** temperature and solubility do not increase at the same rate

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td></td><td></td><td>(ii)</td><td>FIRST CHECK THE ANSWER ON ANSWER LINE
If answer =
56 - 59.3 (g/100g water) <u>with working</u>
award 3 marks

(Reads the graph) Gives two correct readings for solubility linked to temperatures from the graph / quotes a value for <u>change</u> in solubility AND <u>change</u> in temperature ✓

(Does a calculation)
calculates a solubility change AND adds to relevant solubility ✓

Value 56 - 59.3 (g/100g water) <u>with working</u> ✓</td><td>3</td><td>3.1b</td><td>Values from graph:
<table><tr><th>°C</th><th>g/100g</th><th></th><th>Values for change
Ignore dec pl</th></tr><tr><td>0</td><td>26 +/-1</td><td></td><td></td></tr><tr><td>10</td><td>29 +/-1</td><td></td><td>3/10</td></tr><tr><td>20</td><td>32 +/-1</td><td></td><td>6/20</td></tr><tr><td>30</td><td>35 +/-1</td><td></td><td>9/30</td></tr><tr><td>40</td><td>39 +/-1</td><td></td><td>12/40 or 13/40</td></tr><tr><td>50</td><td>42 +/-1</td><td></td><td>16/50</td></tr><tr><td>60</td><td>46 +/-1</td><td></td><td>20/60</td></tr><tr><td>70</td><td>49 +/-1</td><td></td><td>23/70</td></tr><tr><td>80</td><td>52 +/-1</td><td></td><td>26/80</td></tr></table>
Solubility change methods:
dy/dx x temp change + relevant solubility
e.g. 26/80 x 100 +26= 58.5

OR solubility change by subtraction + relevant solubility
e.g. (change in 20° = 6) 6+52=58

ALLOW (1) mark for correct answer without working</td></tr>
</table>

Need to get in touch?

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