OCR
Oxford Cambridge and RSA

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 Autumn 2021

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.

1. 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 |

2. 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 |

3. **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.

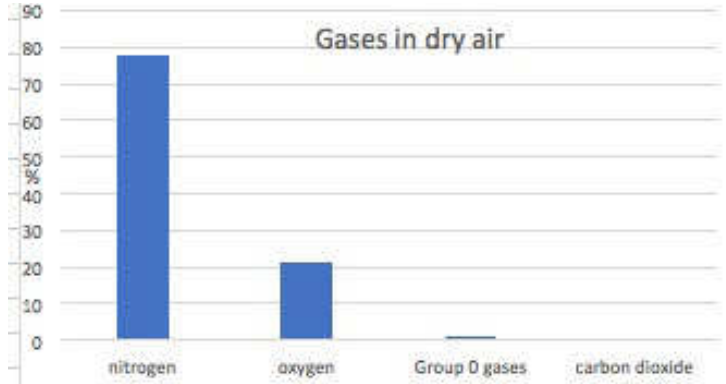
You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New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

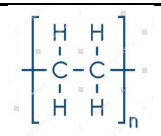
Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

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) | | (Group) 1 ✓ | 1 | 1.1 | |
| | (b) | | They all react with water – TRUE<br>Lithium is the most reactive – FALSE<br>They all react with chlorine – TRUE<br>They are all metals – TRUE<br>✓✓ | 2 | 1.1 | All four correct = 2 marks<br>Any two or three correct = 1 mark |
| | (c) | (i) | N P As ✓ | 1 | 1.1 | |
| | | (ii) | (No), because mean of N and As is not 31 ✓<br>mean is (74.9 + 14.0)/2 = 44.5 ✓ | 2 | 3.2a<br>1.2 | |
| | (d) | | Other scientists ✓<br>**AND any one from:**<br>checking data / checking results ✓<br>checking or repeating methods / experiments / tests ✓<br>evaluation of the work / judgment of the work / assessment of the work / checking claims made ✓<br>publication / post publication ✓ | 2 | 1.2 | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 2 | (a) | | condensation ✓<br>physical change ✓ | 2 | 1.1 | |
| | (b) | (i) | solid, gas, liquid ✓ | 1 | 1.1 | |
| | | (ii) | H–O–H ✓ | 1 | 2.2 | **ALLOW** any bond angle |
| | (c) | (i) | **FIRST CHECK THE ANSWER ON ANSWER LINE**<br>**If answer = 1950 award 2 marks**<br><br>78 ÷ 0.04 ✓<br>= 1950 (:1) ✓ | 2 | 2.2 | |
| | | (ii) |  <br>✓ | 1 | 1.2 | |
| | | (iii) | Group 0 (inert gases) – unreactive ✓<br>Carbon dioxide – lime water ✓<br>Oxygen – rust ✓ | 3 | 1.1 | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 3 | (a) | |  ✓<br>addition ✓ | 2 | 1.1 | |
| | (b) | | $C_8H_{18}$ ✓ | 1 | 1.1 | |
| | (c) | (i) | **FIRST CHECK THE ANSWER ON ANSWER LINE**<br>**If answer = 510 (kJ) award 2 marks**<br><br>279 000 + 220 000 + 11 000 = 510 000 ✓<br>510 000 / 1000 = 510 (kJ) ✓ | 2 | 2.2 | |
| | | (ii) | **FIRST CHECK THE ANSWER ON ANSWER LINE**<br>**If answer = 55 (%) award 3 marks**<br><br>= (279 ÷ 510) × 100 ✓<br>= 54.7....(%) ✓<br>= 55 (%) (2sf) ✓ | 3 | **2.2 x 2**<br><br>**1.2** | |
| | (d) | | broken down by bacteria / in the soil / AW ✓ | 1 | 1.1 | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 4 | (a) | (i) | use a pencil ✓ | 1 | 3.3b | |
| | | (ii) | ink will 'run' (AW) ✓ | 1 | 3.3b | |
| | (b) | (i) | six ✓ | 1 | 3.2b | |
| | | (ii) | B/blue ✓ | 1 | 3.2b | |
| | | (iii) | It rises least up the paper / AW ✓ | 1 | 2.2 | |
| | | (iv) | G/green ✓ | 1 | 2.2 | |
| | (c) | | dissolving ✓<br>heating ✓<br>crystallisation ✓ | 3 | 1.2 | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 5 | (a) | | Thompson ✓ | 1 | 1.1 | |
| | (b) | | nucleus; protons; neutrons; electrons; ✓✓<br><br>protons and electrons ✓ | 3 | 1.1 | For the first four responses<br>All four correct = 2 marks<br>Any two or three correct = 1 mark<br><br>Either order |
| | (c) | (i) | $C_2H_6O$ / $C_2H_5OH$✓ | 1 | 1.1 | |
| | | (ii) | The number of atoms in the molecule ✓<br>The 3D shape of each molecule ✓ | 2 | 1.1 | |
| | (d) | (i) | B ✓<br>D ✓ | 2 | 2.1 | |
| | | (ii) | C ✓ | 1 | 2.1 | |
| | | (iii) | B ✓<br>C ✓ | 2 | 1.1 | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 6 | (a) | (i) | point (50,40) ringed ✓ | 1 | 3.2b | |
| | | (ii) | not heated for long enough / AW ✓ | 1 | 3.2a | **ALLOW** Plausible ECF if the wrong point is ringed |
| | (b) | | **FIRST CHECK THE ANSWER ON ANSWER LINE**<br>**If answer = 1.28 (g) award 3 marks**<br><br>Mass of white = mass of blue ÷ 1.5625 ✓<br>Mass of white = 2 ÷ 1.5625 ✓<br>Mass of white = 1.28 (g) ✓ | 3 | 2.2 | |
| | (c) | | (Jane is correct) because water molecules are lost / AW ✓<br>(Kai is correct) because mass of 'blue copper sulfate' = mass of 'white copper sulfate' + mass of water ✓ | 2 | 2.1 | |
| | (d) | | 100 – 64 = 36 (g) ✓ | 1 | 2.2 | |
| | (e) | (i) | Yes **AND** the blue (solid) is formed again ✓ | 1 | 3.1b | |
| | | (ii) | exothermic ✓ | 1 | 1.1 | |
| | | (iii) | (horizontal) line labelled 'blue copper sulfate' below the line drawn ✓ | 1 | 2.2 | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 7 | (a) | | Mixture ✓ | 1 | 1.1 | |
| | (b) | (i) | methane, butane ✓ | 1 | 2.1 | |
| | | (ii) | they boil below room temp ✓ | 1 | 2.1 | |
| | (c) | | 16 ✓ | 1 | 2.2 | |
| | (d) | | As RFM increases, boiling point increases / ORA ✓ | 1 | 3.1a | |
| | (e) | | $C_6H_{14}$ ✓ | 1 | 2.2 | |
| | (f) | (i) | Plotted at (16,287) ✓ | 1 | 1.2 | |
| | | (ii) | Straight line of best fit ✓ | 1 | 1.2 | |
| | | (iii) | 215±10 ✓ | 1 | 2.2 | |
| | (g) | | Boiling point ✓ | 1 | 1.1 | |
| | (h) | (i) | full structural form $C_4H_{10}$ ✓ | 1 | 1.2 | |
| | | (ii) | 2:5 ✓ | 1 | 2.2 | |
| | | (iii) | $C_2H_5$ ✓ | 1 | 2.2 | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 8 | (a) | | kills microorganisms / bacteria ✓ | 1 | 1.1 | **ALLOW** pathogens/viruses/fungi<br>**IGNORE** sterilise/disinfect/removes bacteria/kills germs |
| | (b) | | red ✓<br>white ✓ | 2 | 1.2 | **ALLOW** colourless |
| | (c) | (i) | Brown/yellow colour ✓ | 1 | 1.2 | **DO NOT ALLOW** red<br>**ALLOW** orange |
| | | (ii) | bromine (displaced) ✓ | 1 | 1.2 | **ALLOW** $Br_2$ |
| | (d) | | Slower **AND** sodium is less reactive than potassium / idea of more reactive down the group ✓ | 1 | 2.1 | Need explanation, not only the tick |
| | (e) | | $CaCl_2$ ✓ | 1 | 1.2 | |
| | (f) | | Its atoms are larger than atoms of iodine ✓<br>It is a solid at room temperature ✓ | 2 | 3.2a | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 9 | (a) | (i) | Slope = 0 / zero ✓ | 1 | 2.2 | |
| | | (ii) | Reaction has finished / Rate is zero ✓ | 1 | 2.1 | **ALLOW** idea of (all) zinc has been used up<br>**IGNORE** zinc is <u>being</u> used up<br>**IGNORE** acid used up |
| | (b) | | 14 $cm^3$ per min ✓ | 1 | 2.2 | |
| | (c) | | **FIRST CHECK THE ANSWER ON ANSWER LINE**<br>**If answer = 0.1 (g) award 2 marks**<br><br>quotes 40 (from the graph) ✓<br><br>calculated mass = 0.1 (g) ✓ | 2 | 2.2 | |
| | (d) | | **Any two from:**<br>Surface area (of metal) ✓<br>Temperature ✓<br>Amount/mass of metal ✓ | 2 | 3.3a | **ALLOW** volume/amount of acid / concentration of acid |
| | (e) | | A = magnesium<br>B = zinc<br>C = iron<br>✓✓ | 2 | 3.2b | All three correct = 2 marks<br>One or two correct = 1 mark<br>**ALLOW** symbols |

**OCR (Oxford Cambridge and RSA Examinations)**
**The Triangle Building**
**Shaftesbury Road**
**Cambridge**
**CB2 8EA**

**OCR Customer Contact Centre**

**Education and Learning**
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

**www.ocr.org.uk**