

# OCR

Oxford Cambridge and RSA

## Year 10 Test

GCSE (9–1) Combined Science A (Gateway)

J250/03/09 Chemistry

**MARK SCHEME**

**Duration:** 1 hour 10 minutes

**MAXIMUM MARK    60**

**This document consists of 19 pages**

**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. *(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 a 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 9 and 17.

## 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).

<b>Annotation</b>	<b>Meaning</b>
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
<b>DO NOT ALLOW</b>	Answers which are not worthy of credit
<b>IGNORE</b>	Statements which are irrelevant
<b>ALLOW</b>	Answers that can be accepted
( )	Words which are not essential to gain credit
<u>—</u>	Underlined words must be present in answer to score a mark
<b>ECF</b>	Error carried forward
<b>AW</b>	Alternative wording
<b>ORA</b>	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 A:

	<b>Assessment Objective</b>
<b>AO1</b>	<b>Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.</b>
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
<b>AO2</b>	<b>Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.</b>
AO2.1	Apply knowledge and understanding of scientific ideas.

AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
<b>AO3</b>	<b>Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.</b>
<b>AO3.1</b>	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
<b>AO3.2</b>	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.
<b>AO3.3</b>	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 ✓	1	1.2	
2			D ✓	1	1.1	
3			C ✓	1	1.1	
4			C ✓	1	2.1	
5			B ✓	1	1.1	

Question		Answer	Marks	AO element	Guidance
6	(a)	Motion – not moving / vibrating ✓ Arrangement – fixed / regular / in a pattern ✓	2	1.1 x 2	<b>ALLOW</b> moving to and fro <b>ALLOW</b> (molecules) touching each other / very close together
	(b)	Motion – moving rapidly / moving fast ✓ Arrangement – irregular / random ✓	2	1.1 x 2	<b>ALLOW</b> moving quickly <b>ALLOW</b> (molecules) moving in all directions / not in a pattern / they are far apart
	(c) (i)	$I_2 + H_2 \rightarrow 2HI$ Correct formulae of reactants and products ✓ Balancing – dependent on correct formulae ✓	2	2.1 x 2	<b>ALLOW</b> one mark for correctly balanced equation with minor errors in subscript or case e.g. $I2 + H2 \rightarrow 2HI$
	(ii)	Makes a new substance / the formulae of the particles involve changes ✓	1	1.1	<b>ALLOW</b> an irreversible change / a change that involves a large energy change

Question		Answer	Marks	AO element	Guidance
7	(a)	$\text{Cu}^{2+}$ and $\text{H}^+$ ✓	1	2.2	Both needed
	(b)	(An electrode) which does not react (with the electrolyte) / which does not react (with the products) ✓	1	1.2	<b>ALLOW</b> which does not take part in the electrolysis
	(c) (i)	Correct line of best fit through the origin and the four correct points ✓	1	2.2	
	(ii)	<p><b>FIRST CHECK THE ANSWER on the answer line</b></p> <p><b>If = 0.04 award 2 marks</b></p> <p>Read two values of graph e.g. 0.24 mass of copper produced in 6 minutes, therefore, <math>0.24/6</math> ✓</p> <p>= 0.04 ✓</p>	2	<p>1x 3.1a</p> <p>1x 2.2</p>	

Question			Answer	Marks	AO element	Guidance
8	(a)	(i)	barium + magnesium chloride → barium sulfate + magnesium chloride ✓	1	2.1	<b>ALLOW</b> reactants in either order <b>ALLOW</b> products in either order
		(ii)	Aqueous ✓	1	1.1	<b>ALLOW</b> solution (in water)
	(b)		124.51 (g) ✓	1	1.2	
	(c)		Magnesium sulfate – 120.4 ✓ Magnesium chloride – 95.3 ✓	2	2.1 x 2	<b>IGNORE</b> any units given
	(d)		Correct idea of $208.3 + 120.4 = 233.4 + 95.3$ ✓  Demonstrates law of conservation of mass since both sides are equal ✓	2	2.1  3.2a	<b>ALLOW ECF</b> from incorrect relative formula masses <b>THEN</b> <b>ALLOW</b> does not demonstrate law of conservation of mass since both sides are different

Question		Answer	Marks	AO element	Guidance
9	*	<p><i>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</i></p> <p><b>Level 3 (5–6 marks)</b>  <b>Suggestion would enable pure samples of all three components to be obtained in the correct sequence with clear explanations of why the methods work.</b>  <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p><b>Level 2 (3–4 marks)</b>  <b>Suggestion would enable pure samples of two of the components of the mixture to be obtained with an attempt at an explanation.</b>  <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p><b>Level 1 (1–2 marks)</b>  <b>Suggestion would enable a pure sample of one of the components to be obtained.</b>  <i>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</i></p> <p><b>0 marks</b>  <i>No response or no response worthy of credit.</i></p>	6	2 x 1.2 2 x 2.2 2 x 3.1a	<p><b>AO3.1a: Analysis of information from table</b></p> <ul style="list-style-type: none"> <li>• Use fractional distillation to separate substance <b>A</b> from substance <b>B</b>.</li> <li>• Substance <b>B</b> will come off first as it has lowest boiling point.</li> <li>• Filtering removes substance <b>C</b> as substance <b>C</b> is insoluble in water.</li> <li>• Fractional distillation works as substances <b>A</b> and <b>B</b> have different boiling points.</li> </ul> <p><b>AO1.2: Knowledge of forces between molecules</b></p> <ul style="list-style-type: none"> <li>• Because there are differing forces of attraction between the molecules.</li> <li>• Because there are stronger forces between molecules in substance <b>A</b> / ora.</li> </ul> <p><b>AO2.1: Apply knowledge of procedures and techniques</b></p> <ul style="list-style-type: none"> <li>• Add mixture of <b>A</b>, <b>B</b> and <b>C</b> to water.</li> <li>• Filter mixture to remove substance <b>C</b>.</li> <li>• Substance <b>C</b> can be washed with water and dried.</li> <li>• Heat mixture to boil off substances <b>A</b> and <b>B</b>.</li> </ul>

## SECTION C

Question	Answer	Marks	AO element	Guidance
10	A ✓	1	1.1	
11	C ✓	1	1.1	
12	C ✓	1	2.1	
13	B ✓	1	2.2	
14	C ✓	1	2.2	

Question			Answer	Marks	AO element	Guidance
15	(a)	(i)	<p><b>FIRST CHECK THE ANSWER</b></p> <p><b>If both <math>R_f</math> values = 0.47 award 2 marks</b></p> <p><math>R_f</math> for <b>B</b> = <math>1.3 \text{ to } 1.5 \div 3.0 = 0.47 \checkmark</math></p> <p><math>R_f</math> for first spot in <b>M<sub>2</sub></b> = <math>1.3 \text{ to } 1.5 \div 3.0 = 0.47 \checkmark</math></p>	2	2.2	<p><b>ALLOW</b> 1 mark if <b>both</b> <math>R_f</math> values given as 0.5 (ie not to 2 significant figures)</p> <p><b>ALLOW</b> any value between 0.43 and 0.50</p> <p><b>IF</b> answers are incorrect allow 1 mark for <math>1.3 \text{ to } 1.5 \div 3.0</math></p> <p><b>OR</b></p> <p>1 mark for <math>R_f = \frac{\text{distance travelled by substance}}{\text{distance travelled by solvent}}</math></p>
		(ii)	Idea that <b>M<sub>2</sub></b> may contain substance <b>B</b> because $R_f$ values for second spot in <b>M<sub>2</sub></b> and substance <b>B</b> are the same $\checkmark$	1	3.1a	
	(b)		<p><b>M<sub>1</sub></b> does not contain substance <b>B</b> /</p> <p><b>M<sub>1</sub></b> does not contain substance <b>C</b> /</p> <p><b>M<sub>1</sub></b> contains a substance which is not any of the (known) substances <b>A</b>, <b>B</b> or <b>C</b> <math>\checkmark</math></p>	1	3.2b	

Question		Answer	Marks	AO element	Guidance												
16	(a)	<p>Most of the atom is empty space / less dense space / positively charged (alpha) particles passed through empty space ✓</p> <p>Idea that atoms have a positively charged nucleus (containing most of its mass) / positively charged (alpha) particles are deflected by the positively charged nucleus ✓</p>	2	1.1													
	(b)	<table border="1"> <thead> <tr> <th>Particle</th> <th>Relative charge ✓</th> <th>Relative mass ✓</th> </tr> </thead> <tbody> <tr> <td>Proton</td> <td>+1</td> <td>1</td> </tr> <tr> <td>Neutron</td> <td>1</td> <td>1</td> </tr> <tr> <td>Electron</td> <td>-1</td> <td>almost 0 / 0.0005</td> </tr> </tbody> </table>	Particle	Relative charge ✓	Relative mass ✓	Proton	+1	1	Neutron	1	1	Electron	-1	almost 0 / 0.0005	2	1.1	<p><b>ALLOW</b> <math>\frac{1}{1836}</math> or <math>\frac{1}{1840}</math></p>
Particle	Relative charge ✓	Relative mass ✓															
Proton	+1	1															
Neutron	1	1															
Electron	-1	almost 0 / 0.0005															
	(c)	<p><b>FIRST CHECK THE ANSWER on the answer line</b> <b>If <math>9.27 \times 10^{-23}</math> award 2 marks</b></p> <p><math>55.8 \div 6.022 \times 10^{23}</math> ✓ <math>9.27 \times 10^{-23}</math> ✓</p>	2	2.1	<p><b>ALLOW</b> 1 mark for <math>9.2660246 \times 10^{-23}</math> or correctly rounded up but not to 3 sig. fig.</p>												

Question	Answer	Marks	AO element	Guidance
17*	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p><b>Level 3 (5–6 marks)</b>  <b>Fully describes the atomic structure of oxygen-18, to include the electronic structure</b>  <b>AND</b>  <b>this is clearly linked to the correct identification of the period and group of oxygen</b>  <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p><b>Level 2 (3–4 marks)</b>  <b>Mostly describes the atomic structure of oxygen-18</b>  <b>AND</b>  <b>the group AND period of oxygen are identified</b>  <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p><b>Level 1 (1–2 marks)</b>  <b>Some description of the atomic structure of oxygen-18 is included</b>  <b>OR</b>  <b>the group OR period of oxygen is identified</b>  <i>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</i></p> <p><b>0 marks</b>  <i>No response or no response worthy of credit.</i></p>	6	1x1.1 1x2.1 1x3.1a 3x3.2a	<p><b>AO1.1: Knowledge of nomenclature of atomic structure</b></p> <ul style="list-style-type: none"> <li>• 8 protons (in the nucleus)</li> <li>• 18 protons and neutrons in total (in the nucleus)</li> </ul> <p><b>AO2.1: Apply knowledge and understanding of nomenclature</b></p> <ul style="list-style-type: none"> <li>• 10 neutrons (in the nucleus)</li> <li>• 8 electrons (orbiting the nucleus)</li> </ul> <p><b>AO3.1a: Interpret the nomenclature</b></p> <ul style="list-style-type: none"> <li>• electronic structure of oxygen is 2.6</li> </ul> <p><b>AO3.2a: Make judgments from the data to identify position in PT</b></p> <ul style="list-style-type: none"> <li>• oxygen-18 is in group 6 or 16</li> <li>• because it has 6 electrons in its outer shell</li> <li>• oxygen is in the second period</li> <li>• because it has two shells occupied by electrons</li> </ul>

Question		Answer	Marks	AO element	Guidance
18	(a)	<p><b>Any two from:</b>            Idea that an excess of zinc must be added ✓            so reaction is complete / all hydrochloric acid is reacted ✓            filter off excess zinc ✓            evaporate off some of the water ✓            allow to crystallise ✓</p>	2	3.3b	
	(b)	(i)	2	2.2 1.2	<b>ALLOW</b> oxidation is loss of electrons
		(ii)	2	1.1 2.1	<p><b>ALLOW</b> any correct multiple, including fractions  <b>ALLOW</b> = / <math>\rightleftharpoons</math> instead of <math>\rightarrow</math>  <b>NOT</b> and / &amp;            balancing mark is dependent on the correct formulae but  <b>ALLOW</b> 1 mark for a balanced equation with a minor error in subscripts / formulae            e.g. <math>\text{ZN} - 2\text{e}^- \rightarrow \text{Zn}^{2+}</math></p>

Question		Answer	Marks	AO element	Guidance
19	(a)	(As pH increases from 3 to 6) the hydrogen ion concentration decreases / ORA ✓	1	2.2	
	(b)	<p>Idea that a dilute acid contains a low ratio of acid to volume of solution ✓</p> <p>Idea that a weak acid is partially ionised in solution / only partially dissociated (into ions) in solution / only a small fraction of the molecules release hydrogen ions ✓</p>	2	1.1	