OCR
Oxford Cambridge and RSA

Foundation

GCSE

Combined Science B Twenty First Century Science

J260/04: Combined science (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2024

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. Work crossed out:

   a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks

   b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.

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. There is a NR (No Response) option. Award NR (No Response)

   - if there is nothing written at all in the answer space
   - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
   - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.

   Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

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 question on this paper is **2d**

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
/	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 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)	Measuring cylinder ✓	1	1.2	
		(ii)	Conical flask ✓	1	1.2	
	(b)		Safety glasses / eye protection / goggles / gloves / lab coat / keep glassware away from edge of bench / stand up ✓	1	3.3a	**IGNORE** glasses unqualified **IGNORE** don't get it on skin / do not touch **IGNORE** protective clothing / apron
	(c)		(Line drawn from:) Carbon dioxide ✓ (Carbon dioxide to) Turns lime water cloudy when it is bubbled through ✓	2	2.2	**ALLOW** for 1 mark: the correct line with any other lines drawn from hydrogen and oxygen **ALLOW** for 1 mark: any clear indication carbon dioxide selected as long as it is the only gas chosen **DO NOT ALLOW** limewater test joined to any other gas
	(d)	(i)	More particles (in a given volume) ✓ More (frequent) collisions ✓	2	1.1	Answers must be comparative **ALLOW** molecules / atoms **ALLOW** particles more crowded **ALLOW** more successful collisions
		(ii)	**Any two from:** Volume of (hydrochloric) acid / liquid / solution ✓ Mass of calcium carbonate / powder / solid ✓ Particle size of calcium carbonate / powder / solid ✓ Surface area of calcium carbonate / powder / solid ✓ Temperature ✓ Do not use a catalyst ✓	2	3.3a	**IGNORE** amount **ALLOW** weight for mass

Question			Answer	Marks	AO element	Guidance
2	(a)		Lack of exercise ✓	1	3.1a	**ALLOW** exercise
	(b)		High blood cholesterol ✓ Smoking ✓	2	3.2b	**ALLOW** cholesterol
	(c)		**Any one from:** Do you drink alcohol? ✓ Do you have a family history of CVD? ✓ How old are you? ✓ What is your ethnic background? ✓ What is your sex? ✓ Do you have a stressful job? ✓	1	3.1b	Answer does not need to be phrased as a question **IGNORE** existing diseases / medicines

	(d)		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)** Gives arguments for **AND** against treating CVD by both lifestyle changes **AND** medicine *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)** Gives arguments on one side only for lifestyle changes **AND** medicine **OR** Gives arguments for **AND** against **EITHER** lifestyle changes **OR** medicine. *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)** Gives arguments on one side only for lifestyle changes **OR** medicine *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**	**3.1b**	Indicative content may include e.g. **Lifestyle** **For** Stopping smoking has other benefits e.g. reduced cancer risk / financially better off Reduces obesity / complications of obesity / get fitter / better mental health **IGNORE** lifestyle changes treat CVD / make you better unqualified - answer needs e.g. reduces cholesterol / blood pressure etc **Against** Requires will power / difficult to do / difficult to keep up / can be expensive (e.g. gym and food) Takes longer to take effect Difficult to stop smoking / needs will power / enjoy current lifestyle **Medicine** **For** Medicine easy to start / easier to sustain than lifestyle choices Quick impact **IGNORE** medicine treats CVD / makes you better unqualified – answer needs e.g. reduces cholesterol / blood pressure etc **Against** May have side effects Ongoing for rest of life Might forget to take medication Cost of medication May be risky to stop taking Unavailability / supply chain issues May not prevent decline / worsening of CVD May need dose change / medication change

	(e)	**(i)**	1991 ✓	**1**	**3.1a**	
		(ii)	**Any one from:** Stent procedures increased ✓ Rate of increase in stent procedures decreases ✓ **Any one from:** Coronary artery bypasses stayed (relatively) stable ✓ Coronary artery bypasses decreased ✓	**2**	**3.1a**	Each statement should cover range from 1998 to 2013 **IGNORE** figures **IGNORE** statements referencing pre-1998 **ALLOW** coronary artery bypasses increase then decrease

Question			Answer	Marks	AO element	Guidance
3	(a)		Electromagnetic ✓ Sensor ✓ Absorbed ✓	3	2.1	
	(b)		**First check the answer on answer line** **If answer = 0.3 (W) award 3 marks** Select: (power =) voltage x current ✓ Substitute: (power =) 3.0 x 0.1 ✓ = 0.3 (W) ✓	3	 1.2 2.1 x 2	 **ALLOW** (P =) I V
	(c)		Decreased Less heating ✓	1	2.1	
	(d)		220Wh ✓	1	2.1	

Question			Answer	Marks	AO element	Guidance
4	(a)		**First check the answer on answer line** **If answer = 38 (%) award 4 marks** Select data points: 1300 and 800 taken from the graph ✓ Substitution: $\frac{1300-800}{1300}$ $(\times 100)$ ✓ = 38.46153…(%) ✓ = 38 (%) to 2sf ✓	4	**2.2 x 3** **1.2**	**ALLOW** sight of 1300 and 800 **ALLOW** sight of 500 **ALLOW** 500 ÷ 1300 (× 100) **ALLOW** 0.3846153 **ALLOW** one mark for an incorrect calculated answer correctly rounded to 2sf
	(b)	(i)	**Any three from:** Have to carry it around ✓ Idea of inconvenience / inconvenient place or time ✓ Phobia of needles / blood ✓ Risk of infection ✓ Contamination ✓ Pain / distress ✓ Single use plastics ✓	3	3.2a	**IGNORE** inaccurate **IGNORE** one drop of blood is not representative
		(ii)	**Any two from:** Technical issue relating to phone ✓ Technical issue relating to sensor ✓ Lost phone / not having phone on you ✓ Cost ✓ Skin irritation / pain / discomfort ✓ Sensor could fall off / be knocked off / be damaged ✓ May not be able to wear it for certain activities / exercise / jobs ✓	2	3.2a	**IGNORE** inaccurate **/** wrong placement of sensor **ALLOW** e.g. battery / connection / WiFi / app **ALLOW** e.g. dead sensor / sensor not working / broken

Question			Answer	Marks	AO element	Guidance
5	(a)		**First check the answer on answer line** **If answer = 3 award 3 marks** $(1.5 \times 10^{-9}) \div (3.9 \times 10^{-10})$ ✓ = 3.846153846… ✓ = 3 ✓	**3**	**2.2 x 2** **3.2b**	**ALLOW** for 2 marks 3.8
	(b)		Indium tin oxide has Sn or O atoms (as well as In atoms) ✓	**1**	**3.2b**	**ALLOW** there are other (not indium) atoms present / the layer is **not** just made of indium

Question			Answer	Marks	AO element	Guidance
6	(a)		Any two points correctly plotted ✓ **OR** Three points correctly plotted ✓✓	**2**	**2.2**	**IGNORE** extra plots at times other than 120, 140 and 180 s **ALLOW** half a square tolerance
	(b)		Appropriate line of best fit ✓	**1**	**2.2**	Line must extend to first and last plotted points Line must be a single straight line drawn with a ruler
	(c)		**First check the answer on answer line** **If answer is to 2sf and in the range from 0.25 – 0.29 inclusive (mm^3/s) and there is evidence of use of the graph, award 4 marks** Evidence of triangle drawn on the graph ✓ Calculation: rate of respiration = e.g. 66 – 0 ÷ 240 – 0 ✓ = e.g. 0.275 ✓ = e.g. 0.28 (mm^3/s) to 2sf ✓	**4**	**2.2**	**ALLOW** 3 marks for calculation of correct rate without use of graph **ALLOW** e.g. 66 ÷ 240 **ALLOW** answer in range from 0.25 – 0.29 inclusive **DO NOT ALLOW** as final answer indication of recurring digits
	(d)		42 (mm^3) ✓	**1**	**3.2a**	**ALLOW** answer in range 37.5 – 43.5 inclusive **ALLOW** ECF from 6c i.e. 150 x answer to 6c

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>7</td><td>(a)</td><td></td><td>Cl^- H^+ Na^+ OH^- ✓</td><td>1</td><td>2.2</td><td>ALLOW any correct indication</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>Chlorine ✓</td><td>1</td><td>2.2</td><td>ALLOW Cl_2
DO NOT ALLOW chloride or Cl^-</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>(Damp blue) litmus paper ✓

Bleaches / turns white (as final result) ✓</td><td>2</td><td>1.2</td><td>IGNORE other intermediate colours

ALLOW ECF for correct test and result if oxygen is named in 7bi

<table><tr><th>from 7bi</th><th>test</th><th>result</th></tr><tr><td>oxygen</td><td>glowing splint</td><td>relights</td></tr></table></td></tr>
<tr><td></td><td>(c)</td><td></td><td>First check the answer on answer line
If answer = 9 (C) award 3 marks

Conversion: 15 minutes = 900 seconds ✓

Substitution: Charge = 0.01 x 900 ✓

= 9 (C) ✓</td><td>3</td><td>

1.2

2.1 x 2</td><td>

ALLOW 0.01 x 15 for 1 mark

ALLOW 0.15 (C) for 2 marks</td></tr>
<tr><td></td><td>(d)</td><td>(i)</td><td>Variable resistor ✓</td><td>1</td><td>2.2</td><td>ALLOW rheostat
IGNORE resistor alone
IGNORE symbol</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Ammeter ✓</td><td>1</td><td>1.2</td><td>ALLOW ampmeter</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
8	(a)		D or F ✓ **If D is selected** Has the shortest half life (of the beta emitters) ✓ Can be detected outside the body ✓ **If F is selected** **Any two from:** Has the shortest half life (of the gamma emitters) ✓ Least ionising / most penetrating ✓ Can be detected outside the body ✓	3	3.2a	If C is selected maximum 1 mark for the correct explanation: can be detected outside the body If E is selected maximum 2 marks for the correct explanations: can be detected outside the body and least ionising / most penetrating **ALLOW** leaves the body
	(b)		**Any two from:** Wear device that tells you when you've been exposed too long ✓ Store it in (lead-lined) box / container ✓ Wear protective clothing / wear gloves ✓ Do not touch it (if solid) / use tongs ✓ Wash hands after use ✓ Do not point sources directly at people ✓ Reduce time handling ✓	2	3.3a	**IGNORE** leaving the room as this question asks about 'handling' the source **IGNORE** 'reduce the amount exposed to' unqualified **IGNORE** goggles

Question			Answer	Marks	AO element	Guidance
	(c)		**First check the answer on answer line** **If answer = 138 award 2 marks** 88 ✓ 226 – 88 = 138 ✓	**2**	**2.2**	
	(d)		2 (electrons) ✓ (Radium is in) group 2 / group number corresponds to number of electrons in outer shell ✓	**2**	**2.1**	
	(e)		Sodium ✓	**1**	**3.2a**	

Question			Answer	Marks	AO element	Guidance
9	(a)		The number of decay events per second ✓	1	1.1	
	(b)		The time for the activity to fall to half. ✓	1	1.1	
	(c)		Random ✓ Match ✓ Trend✓	3	1.1	

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