OCR
Oxford Cambridge and RSA

H

GCSE (9–1)

Combined Science B (Twenty First Century Science)

J260/08: Combined Science (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for November 2020

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.

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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.

Annotations

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

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 Combined Science B:

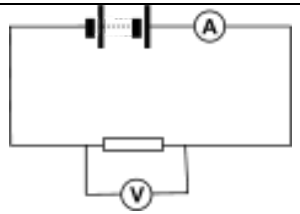
	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge 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)		absorbed ✓ infrared ✓ absorbed ✓ methane ✓	4	1.1	Must be in the correct order
	(b)	(i)	Idea that (mass of) carbon released over time increases / Positive correlation ✓ **AND** Any **two** from; increased fossil fuel burning / consumption ✓ increased construction / industry ✓ increased deforestation ✓ increased electricity generation increased use of cars/transportation ✓	3	**1 x 3.1a** **2 x 3.2a**	**ALLOW** increases from 1950 Must imply an increase
		(ii)	Any **one** from: Idea that the mass of the gas was difficult to measure or quantify✓ Scientists didn't/couldn't repeat their measurements ✓ Carbon dioxide only measured in millions of tonnes ✓ The technology or measuring equipment in the past didn't give accurate measurements✓ The data released from each country may not be accurate✓	1	3.2a	
		(iii)	Any **two** from: global temperature will increase / climate change✓ change in places crops can be grown ✓ more extreme weather will be seen ✓ sea level rise ✓ Idea that habitats may be changed e.g. desertification ✓	2	2.1	
	(c)		Any **two** from: Could lead to the continued use of fossil fuels ✓ Uses a large amount of energy ✓ Carbon could leak / escape ✓ Unknown effects on ecosystems / habitats / animals ✓	2	2.1	**IGNORE** cost arguments

	(d)	**(i)**	Non-renewable is finite or will run out / renewable is infinite or can be replaced ✓	**1**	**2.1**	**DO NOT ALLOW** renewable can be used again or reused ORA
		(ii)	Plants take in CO_2 when they photosynthesise ✓ Burning plants releases the same mass of carbon dioxide they absorb. ✓	**2**	**2.1**	

Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	Any **one** from: vaseline /wax ✓ timer / stop clock ✓	1	3.3a	**ALLOW** any substance that could be used to seal
		(ii)	Any **one** from: creates an airtight seal / prevents loss of water by evaporation✓ (timer) to enable rate to be calculates ✓	1	3.3a	**ALLOW** water is lost from the potometer rather than the leaves affecting the results
	(b)	(i)	Idea of a (higher temperature) increases transpiration ✓	1	3.2b	**ALLOW** evaporation
		(ii)	Any **two** from: increase light intensity ✓ use a fan /place in wind ✓ decrease humidity ✓	2	3.2b	**ALLOW** increase air movement
	(c)		(Experiment) 1 ✓ Less transpiration takes place / less water has been taken up by the plant ✓	2	3.1a 2.1	**ALLOW** idea that less water is lost through the stomata as they are closed. **ALLOW** distance moved by the bubble is the smallest.
	(d)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer is 0.36, award 3 marks** Volume of water taken up = 0.8 x 9 ✓ = 7.2 (mm^3)✓ 7.2/20 = 0.36 (mm^3 / min) ✓	3	2.2	

	(e)		Any **two** from: Control variables: Temperature / light intensity / air flow / where you take the leaf from on the plant / humidity ✓✓ **AND one** from; (dependent variable) measure transpiration rate / volume of water/distance travelled by bubble over a set time period ✓ **AND one** method of making a valid comparison from: Describes how you calculate rate of loss per unit area of 2 different sized leaves / keeps the size/area of the leaf the same ✓	**4**	**3.3a**	**IGNORE** "keep conditions the same" **ALLOW** same size leafy shoot

Question			Answer	Marks	AO element	Guidance
3	(a)		 All 4 symbols correct ✓✓ ammeter in series voltmeter in parallel ✓	3	1.1	1 mark for 2/3 symbols correct **ALLOW** single cell symbol for battery. **DO NOT ALLOW** opposing cells in a battery. **IGNORE** more than one resistor
	(b)		(No) because Idea that in series the total resistance is the sum of the resistors Idea that in parallel the total resistance is less than that of one resistor ✓ In the series circuit the charge carrier move through both resistors but in parallel the charge carriers move through only one resistor so the total resistance is less. ✓	2	2.1	
	(c)	(i)	200 (Ω) ✓	1	2.1	
		(ii)	50 (Ω) ✓	1	2.1	**ALLOW** value between 1 and 99 Ω.
	(d)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer is 12 Ω, award 3 marks** Recall R = V/I ✓ 12/0.75 = 16 Ω ✓ 16-4 = 12 (Ω) ✓	3	 1.2 2.1 3.2b	 **ALLOW** correct rearrangement of the equation or words

Question			Answer	Marks	AO element	Guidance
4	(a)		$2Na (s) + Cl_2 (g) \rightarrow 2NaCl (s)$ ✓✓✓	3	2.2	$2Na + Cl_2$ = 1 mark $2NaCl$ = 1 mark State symbols = 1 mark
	(b)	(i)	Reacts vigorously with cold water✓ AW	1	3.2a	Check Table 4.1 if no writing on answer line
	(b)	(ii)	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)** Describe the trend in melting point of group 2 oxides AND Explains the trend using data and ideas about ionic bonding *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)** Describe the trend in melting point of group 2 oxides AND Explains the trend using data OR ideas about ionic bonding *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)** Describe the trend in melting point of group 2 oxides *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	4 x 3.1a 2 x 2.1	**AO3.1a Analyse information and ideas to interpret**. • Gp 2 decrease in melting pt down the group • Gp 2 ionic radius increase in size down the group • Melting point decreases as increase in ionic radius increases **AO 2.1 Apply knowledge and understanding of scientific ideas.** • Gp 2 ions have extra shells as you go down the group • A larger ionic radius has electrons further away from the nucleus • A larger ionic radius increases the reactivity of group 2 elements • Electrons that are further away from the nucleus are more easily transferred to the oxygen. • The attraction between the positive and negative ions is greater at the top of the group so the melting point is higher. • Stronger attraction between oxide ion and magnesium ion than with barium ion

						• The stronger the attraction between the metal ion and the oxide ion, the higher melting point

Question			Answer	Marks	AO element	Guidance
5	(a)		**Any two from;** EM has higher magnification (than LM) ✓ Greater magnification allows you to see the cell in greater detail / see the (internal) structure of cells / sub cellular structures / named organelles ✓ EM has better resolution / ability to distinguish between two points that are close together AW ✓ Increased depth of field/ can produce 3D images✓	**2**	**1.1**	
	(b)	**(i)**	A ✓	**1**	**2.2**	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 1.20 x 10^4 award 4 marks** Measurement P to Q = 70mm ✓ Conversion mark 70mm = 70,000 µm ✓ Substitution into the equation 70,000/5.83 = 12006 ✓ Standard form value 1.2(006) x 10^4 ✓	**4** **2.1** **1.2** **2.1** **1.2**		**ALLOW** +/- 1mm for measurement **ALLOW** ECF for incorrect measurement **ALLOW** conversion of 5.83 µm into mm = 0.00583mm **ALLOW** 70/0.00583 **ALLOW** a given value correctly converted into standard form
	(c)		Cellular respiration is exothermic - TRUE Cellular respiration releases water in both the mitochondria and cytoplasm - FALSE Lactic acid is only made by cellular respiration that takes place in the cytoplasm - TRUE Oxygen is used for cellular respiration in the cytoplasm – FALSE ✓✓✓	**3**	**1.1**	All four correct = 3 marks Any three correct = 2 marks Any two correct = 1 mark

	(d)		Describe how the number of mitochondria differs in each type of cell ✓ More mitochondria in cells that produce more ATP / Links the number of mitochondria to the cells need for ATP ✓	**2**	**3.1a** **3.2b**	**ALLOW** Describe the cells need for ATP e.g. Heart is a muscle in constant use so highest demand for ATP ✓ Leg muscle is needed to move the body/ do work so has a high demand for ATP

Question			Answer	Marks	AO element	Guidance
6	(a)		Stage 1 (Improvement -) Use pipette rather than measuring cylinder ✓ (Explanation -) (Makes the volume of vinegar) more accurate/ less error in measurement ✓ Stage 2 (Improvement -) Use a different indicator/litmus/phenolphthalein ✓ (Explanation -) With a definite colour change at the end point ✓	4	**3.3b** **2.2** **3.3b** **2.2**	**DO NOT ALLOW** precision reference in place of accuracy (refer to ASE language of measurement for guidance on definitions)
	(b)		Any **three** from: Repeat to obtain three/four/several results✓ Use the rough titration to decide as a guide to the end point✓ (When near the end point) add the alkali one drop at a time ✓ Select the results that are close together / narrow range ✓	3	**3.3a**	
	(c)		Select the values that are in close agreement (to calculate the mean) ✓ Use titrations 2,3,5 and 6 OR 3,5 and 6✓ Titrations 1 and 4 are not included as they are not in close agreement or within a narrow range ✓ **OR** Select the values that are in close agreement (to calculate the mean) ✓ Use titrations 3 and 6✓ Titrations 3 and 6 are the same value / all other values are not included as they are different ✓	3	**3.1b** **3.1b** **3.2a**	**ALLOW** titration 4 is an outlier

	(d)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 5.942857143 or 5.96 (%) and comparison for fourth mark is shown, award 4 marks** Mass of ethanoic acid = 0.026 x 60.0 = 1.56g ✓ Volume of ethanoic acid = 1.56 / 1.05 = 1.485714286 ✓ (1.485714286/25)*100 = 5.942857143% ✓ 5.94 / 5,96 is rounded to 6 therefore this is correct✓	**4**	**2.2**	**ALLOW** early rounding of volume of ethanoic acid =1.49 which leads to 5.9%. **ALLOW** early rounding of volume of ethanoic acid = 1.50 or 1.5cm^3 for 3 marks. If students use 1.5, then they can't get the 4th mark, as there's no comparison to make. The justification for this is they should not round numbers part way through a calculation.

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