OCR
Oxford Cambridge and RSA

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GCSE (9–1)

Combined Science B (Twenty First Century Science)

J260/04: Combined Science (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.

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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.

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 Allowable 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 Allowed
( )	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 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.

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td>(i)</td><td>All electromagnetic waves are transverse - TRUE

Light is an electromagnetic wave - TRUE

Sound is a transverse wave – FALSE
✓✓</td><td>2</td><td>1.1</td><td>All 3 correct = 2 marks
2 or 1 correct = 1 mark</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>amplitude
wavelength
frequency
✓✓</td><td>2</td><td>1.1</td><td>All 3 correct = 2 marks
2 or 1 correct = 1 mark</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>D A B C ✓✓✓</td><td>3</td><td>1.2</td><td>D before A = 1 mark
A before B = 1 mark
B before C = 1 mark</td></tr>
<tr><td></td><td></td><td>(ii)</td><td><table><tr><th>Incident ray angle (degrees)</th><th>Reflected ray angle (degrees)</th></tr><tr><td>20</td><td>21</td></tr><tr><td>30</td><td>29</td></tr><tr><td>40</td><td>40</td></tr><tr><td>50</td><td>51</td></tr><tr><td>60</td><td>55</td></tr><tr><td>70</td><td>69</td></tr></table>✓</td><td>1</td><td>3.2a</td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td>Approximately equal to ✓</td><td>1</td><td>3.2b</td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td>direction ✓

slows down ✓</td><td>2</td><td>2.1</td><td></td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	aluminium **glass** plastic steel ✓	1	3.1a	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 46.2 award 3 marks** 1044/2260 x 100 ✓ = 46.19(469) ✓ = 46.2 (1dp) ✓	3	**2 x 2.2** **1.2**	
	(b)	(i)	Steel and idea of highest percentage recycled ✓ recycling rate is 27.1% above the target / recycling rate is the highest above the target ✓	2	3.2b	
		(ii)	Use magnets / steel is magnetic / aluminium is not magnetic ✓	1	2.1	
		(iii)	**Any two from:** idea of finite raw materials ✓ lower transport costs ✓ lower environmental impact ✓ idea of profit ✓	2	1.1	**ALLOW** any sensible suggestion

Question			Answer	Marks	AO element	Guidance
3	(a)		**Any three from:** describes method to determine pulse rate, e.g. counting pulse with fingers for a minute ✓ exercises for set time and takes pulse rate ✓ let pulse rate return to normal ✓ (repeats technique for) different types of exercise ✓ compares pulse rates ✓	3	2.2	**ALLOW** find your number of beats per minute / beats in 30 seconds x 2
	(b)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer is between 1 min 35 s to 1 min 55 s award 3 marks** 240 and 135 ✓ 240-135 = 105 ✓ 105 seconds = 1 minute and 45 seconds ✓	3	 3.1a 2.2 1.2	**ALLOW** ECF throughout for incorrect reading from graph **ALLOW** values between 235-245 and 130-140 ✓ **ALLOW** 95-115 ✓ **ALLOW** 1 min 35 s to 1 min 55 s ✓
	(c)	(i)	**(Yes because)** It takes 5 minutes for the unfit persons pulse rate to return to normal ✓ The time it takes for the recovery rate to return to normal for the unfit person is greater / is 1 minute longer ✓	2	3.1b	**ALLOW ORA**
		(ii)	**Any one from:** Repeat test (with more people) ✓ Use different exercise tests ✓ Exercise for different lengths of time ✓	1	3.3b	

Question			Answer	Marks	AO element	Guidance
4	(a)		**Any one from:** As a persons weight increases; the incidence of heart failure increases ✓ the incidence of CHD increases ✓ the incidence of stroke incresases ✓ the incidence of heart failure/CHD/stroke incresases ✓	1	3.1a	**ALLOW** any correct conclusion **ALLOW** reverse argument
	(b)		**(Patient 2 because)** they have more risk factors for CVD / lists risk factors ✓ dicsusses differences in risk factors e.g drinks more alcohol / is obese / weight is greater ✓ family history suggests a genetic factor owtte ✓	3	3.2a	
	(c)		**Any one from:** How many cigarettes do you smoke? ✓ How often do you drink alcohol? ✓ Do you exercise? / How often do you exercise? ✓ Do you have a stressful job? ✓ Do you have a balanced diet? ✓ Any underlying health conditions? E.g diabetes, high cholesterol etc ✓	1	2.1	**ALLOW** any question that would allow a doctor to gain a better picture of the patients risk

Question			Answer	Marks	AO element	Guidance
5	(a)	(i)	**Any three from:** idea of measuring the length of the (unstretched) spring ✓ place the mass on the spring and measure the length of the spring ✓ calculatate the extension of the spring ✓ add different masses ✓ take several/ at least 3 extension measurements with each mass/force ✓	3	1.2	.
		(ii)	Attach a pointer to the bottom of the spring to help read the measurement on the metre rule. ✓ Use a balance to check the exact mass applied to the spring. ✓	2	3.3b	
	(b)	(i)	All 5 points plotted correctly ✓ Line of best fit ✓	2	2.2	
		(ii)	As the force increases, the extension increases. ✓	1	3.2b	

Question			Answer	Marks	AO element	Guidance
6	(a)		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 and explains effect of deforestation on rainforest with several reasons why number of species groups may fall *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 an effect of deforestation on the rainforest **AND** Explains an effect of deforestation on species groups *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)** Describes an effect of deforestation on the rainforest **OR** Explains an effect of deforestation on species groups *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 2.1 3 x 3.1b	**AO3.1b Analyse information and ideas to evaluate** Effect of deforestation: • deforestation affects all groups of species found in the rainforest. • Numbers for all/any named species groups fall. • Biggest impact/decrease is on plant species • Correct comparison of biodiversity data (Allow calculations. Eg Mammals reduced to 1.8%, Birds reduced to 1.87%, Reptiles reduced to 1.068%, Plants reduced to 0.067%, Total reduction of 99.8% **NB** question does not ask for calculations so they are not necessary but can be accepted.) **AO2.1 Apply knowledge and understanding of scientific ideas** Explains the effect of deforestation on species groups • cutting down trees removes habitats • cutting down trees removes shelter • cutting down trees removes materials that species may need to use, e.g. for nests. • cutting down trees will result in the loss of species that could be food for other species • idea that species are interdependent
	(b)		It prevents rainforest species from becoming extinct. ✓ Rainforest plants could be a source of new medicines. ✓	2	2.1	

Question			Answer	Marks	AO element	Guidance
7	(a)		It is a gas at room temperature ✓ It has a low melting point ✓	2	2.1	
	(b)		(rubidium melting point) 32 – 55 inclusive ✓ (caesium reaction with water) highly explosive / idea that it is more explosive or more reactive than Rb ✓	2	2.1	
	(c)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 94.2 award 3 marks** Sight of (K =) 39.1 and (O =) 16 ✓ 2 x 39.1 + 16.0 ✓ 94.2 ✓	3	2.2	**ALLOW** ECF for 2 marks from incorrect relative atomic masses **ALLOW** 39.1 + 39.1 + 16
	(d)		12 neutrons ✓ 11 protons AND 10 electrons ✓	2	2.2	
	(e)		Mendeleev ✓	1	1.1	

Question			Answer	Marks	AO element	Guidance
8	(a)		**Any four from:** She should use a quadrat ✓ placed randomly in the garden / use a transect ✓ Count the number of buttercup plants (in the quadrat) ✓ Take more samples✓ Find the mean number of plants✓	4	3.3b	**IGNORE** the idea of counting all the plants
	(b)		✓✓ Shade from trees → Less sunlight is available for photosynthesis Waterlogged soil → Less oxygen available for respiration in root cells More slugs to eat plants → Fewer leaves to absorb light	2	2.1	All 3 correct scores 2 marks 2 or 1 correct scores 1 mark
	(c)	(i)	260 ✓	1	3.1a	
		(ii)	75(th) ✓	1	3.1a	

Question			Answer	Marks	AO element	Guidance
9	(a)		Equipment B **AND** water will evaporate and then condense✓ Equipment A won't filter sea water as salt is dissolved ✓ Equipment C will boil the water away and just leave salt / crystals ✓	3	3.2a	
	(b)	(i)	petrol (top) kerosene diesel (oil) (bottom) ✓✓	2	3.1b	All 3 correct scores 2 marks 2 or 1 correct scores 1 mark **ALLOW** alternative wording for petrol e.g gasoline
		(ii)	**Any one from:** fractionating tower is hottest at the bottom and coolest at the top ✓ Naphtha has a lower boiling point (than fuel oil) ✓ **AND any one from:** Naphtha molecules are smaller/ have fewer C atoms/ shorter C chain (than fuel oil) ✓ Naphtha molecules have weaker intermolecular forces (than fuel oil) ✓ Naphtha molecules condense at a lower temperature (than fuel oil) ✓	2	2.1	Assume 'it' refers to naphtha

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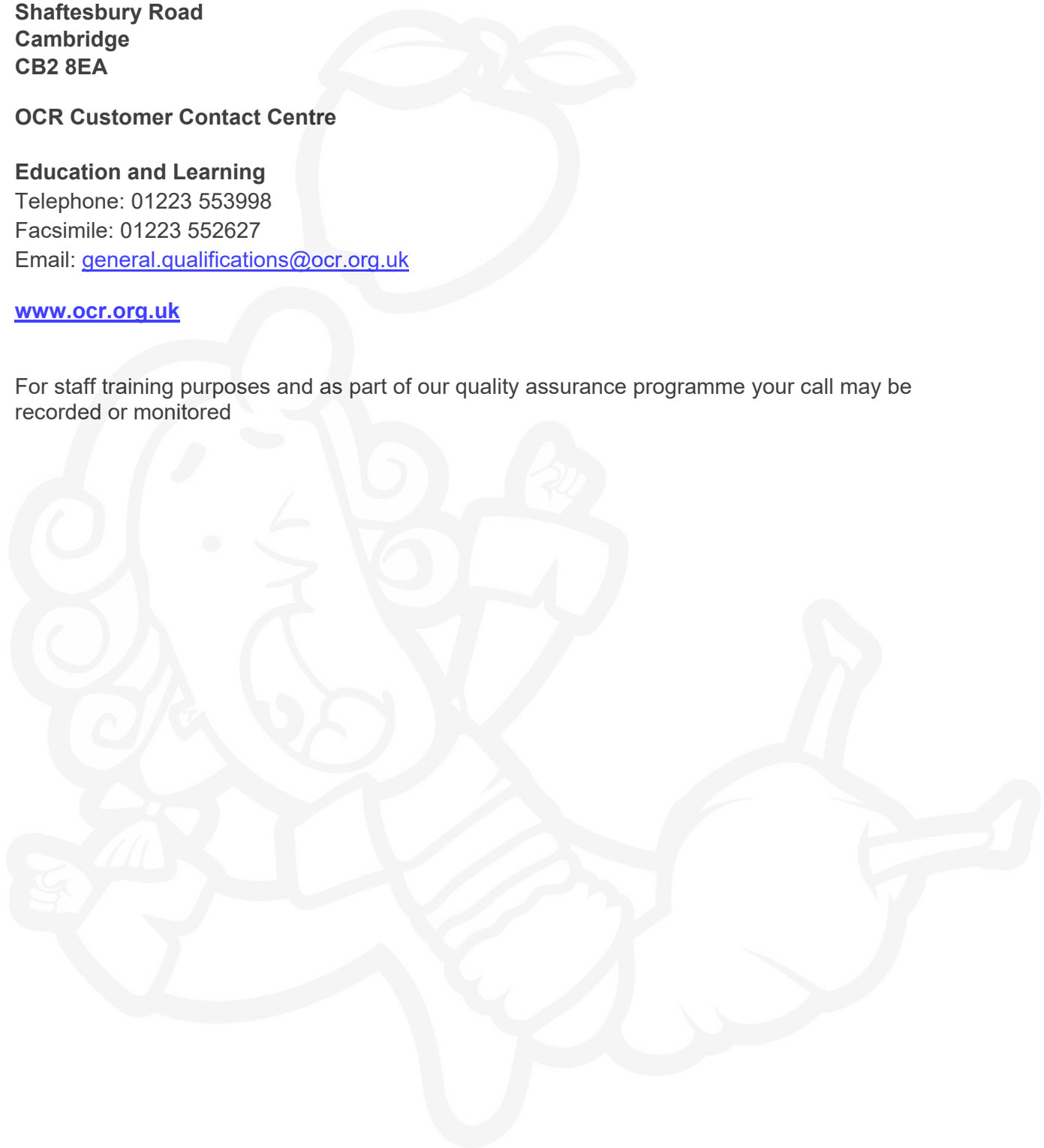

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