

# Foundation

# GCSE

# **Combined Science B Twenty First Century Science**

# J260/04: Combined science (Foundation Tier)

General Certificate of Secondary Education

# Mark Scheme for June 2022

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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.

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#### 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. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. (*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 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.

June 2022

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 is 4b

#### 11. Annotations available in RM Assessor

Annotation	Meaning
$\checkmark$	Correct response
×	Incorrect response
<b>^</b>	Omission mark
BOD	Benefit of doubt given
CON	Contradiction
RE	Rounding error
SF	Error in number of significant figures
ECF	Error carried forward
L1	Level 1
L2	Level 2
L3	Level 3
NBOD	Benefit of doubt not given
SEEN	Noted but no credit given
I	Ignore

12. Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
1	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

June 2022

#### 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:

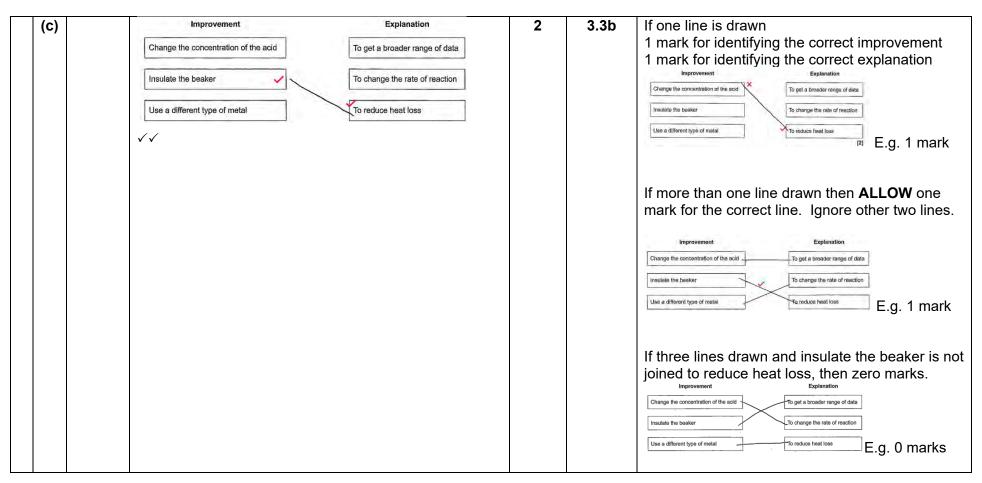
	Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	Apply knowledge 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)		Biofuel	$\checkmark$		2	2.1	
			Fossil fuels	$\checkmark$				
			Hydroelectricity					
			Nuclear fuel					
			The Sun					
			Wind		✓			
	(b)		gas ✓ water ✓ turbine ✓			3	1.1	
	(c)		Boiler to make steam Nuclear ✓ power	o Turbine turns to operate generator √	Does not release CO₂ gas	3	1.1	1 mark for each correct row.
			The Sun       Wind       √√√	✓ ✓	$\checkmark$			

10

PMT

	Question		Answer	Marks	AO element	Guidance
2	(a)	(i)	Any one from:	1	2.2	IGNORE mean / average / accurate / valid / fair / reliable / reproducible / more evidence alone / precision
			(to ensure his results are) repeatable $\checkmark$			ALLOW to check the results / see if they are similar / different IGNORE compare without qualification
			Identify odd/anomalous results / outliers ✓			
		(ii)	FIRST CHECK THE ANSWER ON THE LINE If answer = 5 award 3 marks	3		If no other marks awarded, an incorrect number correctly rounded = 1 mark
			$5 + 6 + 7 + 5 + 4 = 27 \checkmark$ 27/5 or 5.4 $\checkmark$ 5 $\checkmark$		2 x 2.2 1.2	ALLOW sight of 27
	(b)	(i)	Combustion	1	3.2b	
			Endothermic			
			Exothermic 🗸			
			Neutralisation			
		(ii)		1	2.1	
		(ii)	Neutralisation       ✓       C ✓	1	2.1	



Q	Question		Answer	Marks	AO element	Guidance
3	(a)		Circuit diagram A ✓ Because the number of cells has been increased / more cells ✓	2	3.2b	If A not chosen then 0 marks <b>ALLOW</b> explanation of why B and C are incorrect only if A is correct <b>ALLOW</b> batteries instead of cells <b>ALLOW</b> 2 cells <b>IGNORE</b> current / energy / power / volts / potential difference
	(b)		The current is the same in all parts of the circuit ✓ it's a series circuit / there is only one route or pathway / single closed loop / all the electrons have to flow through all the components√	2	3.1b 2.1	ALLOW ammeters show the same reading IGNORE energy / electricity / power / voltage / volts IGNORE there is only one circuit
	(c)	(i)	current amps potential difference ohms resistance volts	2	1.1	3 correct = 2 marks 2 or 1 correct = 1 mark
		(ii)	FIRST CHECK THE ANSWER ON THE ANSWER LINE If answer = 0.125 award 2 marks 3 / 24 ✓ = 0.125 ✓	2	2.1	

# Mark Scheme

	Question	Answer		Marks	AO element	Guidance
4	(a)	Alleles	Only one copy of this genetic variant is needed to have the feature it produces.	3	1.1	4 correct = 3 marks 3 or 2 correct = 2 marks 1 correct = 1 mark
		Dominant	The entire genetic material of an organism.			
		Gamete	The two versions of a gene in a pair of chromosomes.			
		Genome	A sex cell used in sexual reproduction.			

June 2	2022
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<ul> <li>(b) *</li> <li>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</li> <li>Level 3 (5–6 marks)</li> <li>A correct Punnet square</li> <li>AND</li> <li>A detailed explanation of why Sara is right using information from the Punnet square to support the conclusion.</li> <li>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</li> <li>Level 2 (3–4 marks)</li> <li>A correct Punnet square</li> <li>AND</li> <li>A basic explanation of why Sara is right alone</li> <li>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</li> <li>Level 1 (1–2 marks)</li> <li>An attempt at a Punnet square but there are inaccuracies</li> <li>OR</li> <li>A basic explanation of why Sara is right</li> <li>There is an attempt at a logical structure with a line of reasoning. The is on response worthy of credit.</li> </ul>	6	3 x 3.2a 3 x 2.1	<ul> <li>AO 3.2a Analyse genetic diagrams to make judgements</li> <li>The albino allele b is recessive</li> <li>The brown allele B is dominant</li> <li>Genotype Bb or bB or BB will be brown</li> <li>Genotype bb / homozygous recessive alleles will cause albino offspring</li> <li>Each parent rat has a recessive allele</li> <li>Gametes / egg / sperm produced could have the recessive allele b</li> <li>50% of the offspring's genes come from each / a / one parent</li> <li>If each parent passes on the recessive allele / If a sperm has b and an egg has b then the offspring will have the genotype bb / be albino</li> <li>There is a 25% chance of an albino offspring</li> <li>There is a 75% chance of a brown offspring</li> <li>Punnet square clearly annotated to show albino phenotype</li> <li>ALLOW white for albino throughout</li> <li>AO 2.1 Application of ideas about genetic diagrams</li> <li>Punnet square contains appropriate alleles (B &amp; b)</li> <li>Gametes correctly filled in (one allele in each box)</li> </ul>
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J260/04
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		<ul> <li>Punnet square completed correctly to show possible genotypes</li> <li>Understanding that this shows the probability of offspring genotype</li> </ul>

	Question		Answer	Marks	AO element	Guidance
5	(a)		<pre>(RFM of glucose + fructose =) 180 + 180 = 360√ (sucrose + water =) 342+18 = 360 √ idea of the mass of reactants is equal to the mass of products √</pre>	3	3.1b	<ul> <li>ALLOW sight of 360</li> <li>ALLOW 360 – 342 = 18</li> <li>ALLOW no mass lost / reactants and products are both 360 / mass not lost or gained / mass stays the same / mass cannot be created nor destroyed</li> </ul>
	(b)		chloroplast mitochondria nucleus ribosome	1	1.1	
	(c)		FIRST CHECK THE ANSWER ON THE ANSWER LINE If answer = 40 (%) award 4 marksSight of 16 x 3 or 48 $\checkmark$ Working to get 100 or 12 + 40 + 48 / (RFM) CaCO3 = 100 $\checkmark$	4	2.2	<ul> <li>IGNORE 40 alone (without %) in the working out space rather than the answer line</li> <li>ALLOW maximum 3 marks the use of 68 as RFM</li> <li>(RFM) CaCO<sub>(3)</sub> = 68 / sight of 68 ✓</li> </ul>

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J260/04	4
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## Mark Scheme

40/100 or 0.4 ✓		40/68 or 0.59 or 0.588 ✓
40 (%) ✓		59 / 58.8 (%) 🗸

# Mark Scheme

June	2022
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(	Question		Answer		AO	Guidance
6	(a)	(i)	Any three from:	3	element 3.1a	IGNORE comments relating to after ovulation / day 14 IGNORE values for hormone levels unless zero IGNORE hormone unqualified
			Oestrogen is higher (than progesterone) / ORA $\checkmark$ oestrogen rises $\checkmark$			Answer must be comparative for first marking point
			oestrogen peaks at ovulation / day 14 $\checkmark$			<b>ALLOW</b> optimum / reaches a maximum / is highest for peak
			progesterone is low / zero / constant $\checkmark$ progesterone starts to rise the day before ovulation / at day 13 $\checkmark$			<b>DO NOT ALLOW</b> progesterone rises at ovulation
		(ii)	14√	1	3.2b	
		(iii)	17 ✓	1	3.2b	ALLOW 16
	(b)	(i)	Beth AND Sara ✓	1	2.1	Both names needed for the mark
		(ii)	Nina ✓	1	2.1	
		(iii)	Beth ✓	1	2.1	

C	Question		Answer	Marks	AO element			
7	(a)		Watt <b>OR</b> Joules per second ✓	1	1.1	ALLOW W or ALLOW kilowa	J/s itts / megawatts e	tc
	(b)		FIRST CHECK THE ANSWER ON THE ANSWER LINE If answer = 0.625 (A) award 3 marks $1.5 \times 2.5$ OR $3.75 \checkmark$ $3.75 / 6$ or $(1.5 \times 2.5) / 6$ seen $\checkmark$ $0.625 \checkmark$	3	2.2			
	(c)	(i)	4 correct points ✓✓	3	2.2		clearly and accu k for 3 correct poi	
			LOBF drawn with ruler for their points $\checkmark$		2.1	DO NOT ALLO	<b>W</b> for MP3 more	than one LOBF
						Primary	Secondary	
						0.5	1.0	
						2.0	4.0	
						6.0	12.5	
						10.0	20.0	
						12.0	23.0	
		(ii)	as primary (pd) increases, secondary (pd) increases ✓ linear ✓	2	3.2b	ALLOW positive ALLOW directle ALLOW for 2 in double the prin	y proportional <b>marks</b> the second	dary (pd) is almost
	(d)		decreases ✓ reduces √	2	3.2a			

June	2022
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C	Question		Answer	Marks	AO element	Guidance
8	(a)		Any one from: (wear) goggles / safety glasses ✓ Screen ✓ Lab coat/apron ✓ Gloves ✓	1	1.2	Glasses must be qualified <b>ALLOW</b> tweezers or tongs
	(b)	(i)	(B) C E A D ✓✓✓	3	3.1a	C before E = 1 mark E before A = 1 mark A before D = 1 mark
		(ii)	<ul> <li>(No)</li> <li>(to test for hydrogen, they need to) use a lighted/lit splint/do not blow out the splint ✓</li> <li>idea that the positive test for hydrogen will give a (squeaky) pop ✓</li> </ul>	2	3.3b	<b>ALLOW</b> a glowing splint is the test for oxygen <b>ALLOW</b> positive test for oxygen given (relights the glowing splints)
	(c)		2[Na] ✓ 2[HC <i>l</i> ] ✓ 2[NaC <i>l</i> ] ✓	3	2.1	

(	Questi	ion	Answer	Marks	AO element	Guidance
9	(a)	(i)	Greenfly Hedgehog ✓ Lettuce Owl	1	3.2b	Both required for the mark
			Rabbit Spider ✓ ✓			
		(ii)	Five ✓	1	3.1a	
		(iii)	<ul> <li>Either: Snails would increase ✓ Because less competition for food ✓</li> <li>Or: Snails would decrease ✓ Because hedgehogs would eat more snails ✓</li> </ul>	2	3.2b	ALLOW more lettuce / food (for them to eat) IGNORE blackbirds ALLOW stays the same with a suitable explanation of both ideas of increase and decrease
	(b)		FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.375 (kg) award 2 marks 37.5 / 10 = 3.75 ✓ 3.75 / 10 = 0.375 ✓	2	2.2	ALLOW 3.75 by other methods for 1 mark

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