



H

...day June 20XX – Morning/Afternoon

GCSE (9–1) Combined Science B (Twenty First Century Science)

J260/05 Biology (Higher Tier)

SAMPLE MARK SCHEME

Duration: 1 hour 45 minutes

MAXIMUM MARK 95

DRAFT

This document consists of 24 pages

MARKING INSTRUCTIONS**PREPARATION FOR MARKING****SCORIS**

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris 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 posted on the RM Cambridge Assessment Support Portal <http://www.rm.com/support/ca>
3. Log-in to scoris and mark the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

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 scoris 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 scoris 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 scoris **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 scoris 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 **2(a)**.

11. Annotations

Annotation	Meaning
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

12. 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)	Chloroplast ✓	1	1.1	
	(b)	The closer the light the faster photosynthesis / more bubbles produced ✓ No further increase in photosynthesis / number of bubbles from 25 to 12.5 cm ✓	2	3.1a	ALLOW more oxygen produced
	(c) (i)	Repeat the reading for 12.5 cm ✓ If the number of bubbles is close to 105 then she can be more certain it is the true value ✓	2	3.3b	ALLOW repeat for all distanced and calculate a mean
	(ii)	Any two from Use a heat source to vary the temperature e.g. a water bath ✓ Use a thermometer to measure the temperature ✓ Count the number of bubbles (of oxygen) given off (at each temperature) ✓	2	3.3a	

J260/05

Mark Scheme

June 20XX

Question		Answer	Marks	AO element	Guidance	
	(d)	(i)	Transpiration ✓	1	1.1	
		(ii)	C: mean 9.46 ✓ C: rate of water uptake 0.32 ✓	2	1.2	
		(iii)	Stomata let in gas / carbon dioxide needed for photosynthesis ✓ Stomata open when it is light / during the day ✓	2	1.1	ALLOW idea that more stomata are open for one mark
		(iv)	Any two from 1. Water may be lost from parts of the apparatus that are not sealed ✓ 2. Some water is used for photosynthesis ✓ 3. If the plant is wilting, the plant will use water to restore turgidity ✓	2	1.2 1.1	MP2 DO NOT ALLOW incorrect use of water e.g. respiration
	(e)		Will be unable to exchange gases / take in carbon dioxide ✓ So rate of photosynthesis will decrease / go down ✓	2	2.1	

J260/05

Mark Scheme

June 20XX

Question		Answer	Marks	AO element	Guidance
2	(a)*	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Correctly explains in detail how to use all four pieces of apparatus to carry out a transect from the tree to the middle of the field. AND Provides a complete description as to how results will be processed.</p> <p><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>Level 2 (3–4 marks) Correctly explains in detail how to use two or three pieces of apparatus to carry out a transect from the tree to the middle of the field. AND Provides a partial description as to how results will be processed.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks) Correctly explains how to use one piece of apparatus to carry out a transect from the tree to the middle of the field. AND Provides a simple description as to how results will be processed.</p>	6	2.1 ×4 3.1a ×2	<p>AO2.1 Application of knowledge of apparatus to carry out sampling to this example</p> <p>Tape measure:</p> <ul style="list-style-type: none"> • Spread tape measure out from tree to middle of field • Mark regular intervals to place quadrat e.g. every other metre • Take regular readings along the transect <p>Quadrat</p> <ul style="list-style-type: none"> • A quadrat is a square frame • Place quadrat on the ground • At the intervals indicated by the tape measure being used to mark out the transect • Estimate percentage cover of plants. <p>Identification key:</p> <ul style="list-style-type: none"> • Compare plants observed to images / descriptions • Use to find names / species of plants • In each quadrat • Dichotomous choices within the key. <p>Light meter:</p> <ul style="list-style-type: none"> • Measure light levels / light intensities • Hold equipment at ground level • Equipment should be held at the same angle each time

J260/05

Mark Scheme

June 20XX

Question		Answer	Marks	AO element	Guidance									
		<p><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>0 marks <i>No response or no response worthy of credit.</i></p>			<ul style="list-style-type: none"> Take a reading for each quadrat along the transect <p>AO3.1a Description of the processing of results</p> <ul style="list-style-type: none"> Consider the types of plants in relation to the light readings Compare the light levels along the transect Compare plant types / species / percentage cover along the transect Draw a table to show percentage cover in each quadrat along the quadrat Possible graphical representation of results e.g. bar chart / kite diagram. 									
	(b)	<table border="1"> <tbody> <tr> <td>Number of species</td> <td>20</td> <td>20</td> </tr> <tr> <td>Total number of plants</td> <td>2</td> <td>3</td> </tr> <tr> <td>Biodiversity index</td> <td>0.1</td> <td>0.15</td> </tr> </tbody> </table>	Number of species	20	20	Total number of plants	2	3	Biodiversity index	0.1	0.15	1	2.2	All values need to be correct to award the mark
Number of species	20	20												
Total number of plants	2	3												
Biodiversity index	0.1	0.15												

Question		Answer	Marks	AO element	Guidance
	(c)	<p>Using wood rather than oil for fuel. <input type="checkbox"/></p> <p>Storing seeds in seed banks. <input checked="" type="checkbox"/></p> <p>Increasing the population of a common species. <input type="checkbox"/></p> <p>Decreasing the genetic variation within species. <input type="checkbox"/></p>	1	1.1	

SPECIMEN

Question		Answer	Marks	AO element	Guidance
3	(a)	Nucleotides / nitrogenous bases ✓ Genes / codons / base triplets ✓ Genomes ✓	3	1.1	
	(b)	Jane, Fiona, Phil ✓ Jenny ✓	2	2.1	ALLOW Jane, Fiona, and Phil in any order but all must be named for first marking point
	(c)	Any 2 from <i>Benefits</i> Child will not have mitochondrial disease ✓ In the future child cannot pass on mitochondrial disease ✓ Parents and family could not cope with a child with mitochondrial disease ✓ Cost benefits if don't have to treat affected child ✓	2	3.2b	
	(d) (i)	Isolate gene for phytase from a plant genome ✓ Vector inserts (phytase) gene to pig genome ✓ Use a vector e.g. a virus or plasmid to transfer the gene ✓	3	2.1 ×2 1.1	
	(ii)	Enzymes present in pig saliva are a different shape (from those in plants) ✓ Plant phosphorus will not fit into the <u>active site</u> ✓	2	2.1	

J260/05

Mark Scheme

June 20XX

Question			Answer	Marks	AO element	Guidance
4	(a)		<p style="text-align: center;">Defence</p> <p style="text-align: center;">Description</p> <ul style="list-style-type: none"> traps pathogens compete with pathogens breaks down pathogens barrier to pathogens contains an enzyme that kills pathogens recognises pathogen 	3	1.1	All 5 lines correct with no additional line(s) = 3 marks Subtract a mark off for each incorrect line
	(b)	(i)	<p>Any one from</p> <ul style="list-style-type: none"> Isolation of infected individuals ✓ No contact with vomit / faeces / blood from infected individuals ✓ People treating Ebola patients to wear protective clothing ✓ Protective clothing sterilised / incinerated ✓ 	1	2.1	

J260/05

Mark Scheme

June 20XX

Question		Answer	Marks	AO element	Guidance																								
	(ii)	<p>Any four from</p> <p>Receptors / membrane bound antibody on a white blood cell attaches to Ebola antigen ✓</p> <p>White blood cells clone / multiply / most produce antibody to Ebola antigen ✓</p> <p>Some of the white blood cell clones become memory cells ✓</p> <p>A second infection by Ebola triggers antibody production ✓</p> <p>Ebola destroyed before infected individual becomes ill ✓</p> <p>Massive number of antibodies produced in a short time ✓</p>	4	2.1																									
	(c)	<table border="1"> <thead> <tr> <th>Preclinical tests</th> <th>Safety</th> <th>Effectiveness</th> <th>Both</th> </tr> </thead> <tbody> <tr> <td>Cultured human cells</td> <td></td> <td></td> <td>✓</td> </tr> <tr> <td>Whole animals</td> <td></td> <td></td> <td>✓</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Clinical tests</th> <th>Safety</th> <th>Effectiveness</th> <th>Both</th> </tr> </thead> <tbody> <tr> <td>Healthy volunteers</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>Humans with the disease</td> <td></td> <td></td> <td>✓</td> </tr> </tbody> </table>	Preclinical tests	Safety	Effectiveness	Both	Cultured human cells			✓	Whole animals			✓	Clinical tests	Safety	Effectiveness	Both	Healthy volunteers	✓			Humans with the disease			✓	2	1.1	<p>Tick in correct box for mark.</p> <p>If more than one box is ticked in each empty row, do not award the mark even if the correct box is also ticked</p>
Preclinical tests	Safety	Effectiveness	Both																										
Cultured human cells			✓																										
Whole animals			✓																										
Clinical tests	Safety	Effectiveness	Both																										
Healthy volunteers	✓																												
Humans with the disease			✓																										
	(d)	<p>Any one from</p> <p>Ebola infection carries a very high risk ✓</p> <p>Worth taking the risk of (even serious) side effects ✓</p>	1	3.1a																									

J260/05

Mark Scheme

June 20XX

Question		Answer	Marks	AO element	Guidance
5	(a)	<p>Statement</p> <p>The mean body mass increased in every year. <input checked="" type="checkbox"/></p> <p>The incidence of diabetes increased in every year. <input type="checkbox"/></p> <p>The biggest annual increase in diabetes was from 1996- 1997. <input checked="" type="checkbox"/></p> <p>The percentage incidence of diabetes increased by more than 2.5% from 1990 to 2000. <input type="checkbox"/></p> <p>The mean body mass increased by less than 6 Kg per person from 1990 to 2000. <input checked="" type="checkbox"/></p>	3	2.2	
	(b)	Mechanism / knowledge of how increasing body mass could affect cause diabetes ✓	1	2.1	
	(c)	<p>EITHER $3\,200\,000 - 320\,000 = 2\,880\,000$ ✓ $2\,880\,000 \times 100 / 3\,200\,000 = 90\%$ ✓</p> <p>OR $320\,000 \times 100 / 3\,200\,000 = 10\%$ ✓ $100 - 10 = 90\%$ ✓</p>	2	2.2	

Question		Answer	Marks	AO element	Guidance								
	(d)	<table border="1"> <thead> <tr> <th>Person</th> <th>Diagnosis</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>no diabetes</td> </tr> <tr> <td>2</td> <td>type 1 diabetes</td> </tr> <tr> <td>3</td> <td>type 2 diabetes</td> </tr> </tbody> </table>	Person	Diagnosis	1	no diabetes	2	type 1 diabetes	3	type 2 diabetes	2	3.2a	All three correct = 2 marks One or two correct = 1 mark
Person	Diagnosis												
1	no diabetes												
2	type 1 diabetes												
3	type 2 diabetes												
	(e)	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; width: 150px; text-align: center;">Cause</div> <div style="border: 1px solid black; padding: 5px; width: 150px; text-align: center;">Treatment</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 150px; text-align: center;">Pancreas makes too much insulin</div> <div style="border: 1px solid black; padding: 5px; width: 150px; text-align: center;">Type 1 diabetes</div> <div style="border: 1px solid black; padding: 5px; width: 150px; text-align: center;">Insulin injected into blood</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 150px; text-align: center;">Cells are unresponsive to insulin</div> <div style="border: 1px solid black; padding: 5px; width: 150px; text-align: center;">Change to diet high in sugar</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 150px; text-align: center;">Pancreas makes no insulin</div> <div style="border: 1px solid black; padding: 5px; width: 150px; text-align: center;">Insulin pills taken and digested</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 150px; text-align: center;">Change to diet high in complex carbohydrates</div> </div>	2	1.1	One mark for correct cause and one mark for correct treatment								

J260/05

Mark Scheme

June 20XX

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	A ✓	1	2.2	
		(ii)	FIRST CHECK THE ANSWER ON THE ANSWER LINE IF answer = 0.0125 mm award 2 marks 100 / 8 000 ✓ Answer = 0.0125 ✓	2	2.2	ALLOW 12.5µm
	(b)		✓ Bacterial cell	1	2.1	

SPECIMEN

J260/05

Mark Scheme

June 20XX

Question		Answer	Marks	AO element	Guidance												
7	(a)	Aerobic waste = carbon dioxide ✓ Anaerobic waste = lactic acid ✓	2	1.1	ALLOW water for aerobic waste												
	(b)	Any three from Flatworms have a very big surface area to volume ratio ✓ Idea that gas exchange is therefore rapid ✓ (Because of shape) no cell is far from the surface ✓ So diffusion is rapid enough to deliver oxygen and remove carbon dioxide ✓	3	2.1	Large surface area not enough for one mark												
	(c)	<table border="1"> <thead> <tr> <th>Model</th> <th>Surface area (cm²)</th> <th>Volume (cm³)</th> <th>Surface area:volume ratio</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>24</td> <td>8</td> <td>3:1</td> </tr> <tr> <td>B</td> <td>34</td> <td>8</td> <td>17:4</td> </tr> </tbody> </table> <p>First two columns correct ✓ Ratios correct ✓</p>	Model	Surface area (cm ²)	Volume (cm ³)	Surface area:volume ratio	A	24	8	3:1	B	34	8	17:4	2	2.2	
Model	Surface area (cm ²)	Volume (cm ³)	Surface area:volume ratio														
A	24	8	3:1														
B	34	8	17:4														

J260/05

Mark Scheme

June 20XX

Question		Answer	Marks	AO element	Guidance
8	(a)	(Damage to fatty sheath) results in a decrease in speed of the nerve impulse ✓	1	1.1	ALLOW signal / information
	(b)	Detected by receptors in the skin ✓ Impulse is sent along the sensory neuron ✓ To spinal cord / CNS ✓ Impulse is sent along the motor neuron ✓ To (hand / arm) muscles / effectors ✓	5	1.1	DO NOT ALLOW brain

SPECIMEN

J260/05

Mark Scheme

June 20XX

Question		Answer	Marks	AO element	Guidance
9	(a)	<p>Any four from: Choose a bull from a high milk yield herd / mother with high milk yield ✓ Choose a cow from a high milk yield herd / mother with high milk yield ✓ Breed together ✓ From the next generation choose high yield cow ✓ Repeat over many generations ✓</p>	4	2.1	ALLOW genes for high milk yield increase / genes for low milk yield lost from population.
	(b)	<p>Any one from Better nutrition ✓ Use of antibiotics ✓ Use of pesticides ✓ Use of hormones ✓ Use of vaccinations ✓</p>	1	1.1	

J260/05

Mark Scheme

June 20XX

Question		Answer	Marks	AO element	Guidance										
10	(a)	<table border="1"> <thead> <tr> <th>Hormone</th> <th>Interaction</th> </tr> </thead> <tbody> <tr> <td>Oestrogen</td> <td>Causes the ovaries to develop a follicle containing an egg, which will then produce oestrogen</td> </tr> <tr> <td>FSH</td> <td>Causes the uterus lining to thicken</td> </tr> <tr> <td>Progesterone</td> <td>Causes the follicle to release an egg, the remaining corpus luteum produces progesterone</td> </tr> <tr> <td>LH</td> <td>Maintains the lining of the uterus</td> </tr> </tbody> </table>	Hormone	Interaction	Oestrogen	Causes the ovaries to develop a follicle containing an egg, which will then produce oestrogen	FSH	Causes the uterus lining to thicken	Progesterone	Causes the follicle to release an egg, the remaining corpus luteum produces progesterone	LH	Maintains the lining of the uterus	3	1.1	4 correct answers = 3 marks 3 correct answers = 2 marks 2 correct answers = 1 mark Mark each hormone separately
Hormone	Interaction														
Oestrogen	Causes the ovaries to develop a follicle containing an egg, which will then produce oestrogen														
FSH	Causes the uterus lining to thicken														
Progesterone	Causes the follicle to release an egg, the remaining corpus luteum produces progesterone														
LH	Maintains the lining of the uterus														
	(b) (i)	<p>Any one from After the age of 39 the likelihood of the IVF working decreases dramatically so it is not thought not to be worthwhile ✓ Eggs are poorer quality so less likely to work ✓</p>	1	3.1b											
	(ii)	90 / 387 = 23% ✓	1	1.2	ALLOW 23.3% / 23.26%										

J260/05

Mark Scheme

June 20XX

Question		Answer	Marks	AO element	Guidance	
11	(a)		3	1.1		
	(b)	<p>Any two from Water moves into the cell ✓ By osmosis ✓ Down a concentration gradient / from where there is more water to where there is less ✓ Cell does not burst because of the cell wall ✓</p>	2	2.1	DO NOT ALLOW along a concentration gradient	

J260/05

Mark Scheme

June 20XX

Question		Answer	Marks	AO element	Guidance
12	(a)	<p>FIRST CHECK THE ANSWER ON THE ANSWER LINE If the answer = 3.17 award 2 marks</p> <p>$(7 \div 221) \times 100 \checkmark$ 3.17 \checkmark</p>	2	1.2	
	(b)	<p>Cells are genetically identical / have the same DNA \checkmark</p> <p>So both (daughter) cells receive all of the genetic information / a full copy of the genetic material \checkmark</p>	2	1.1	<p>ALLOW in context of identical to each other or identical to parent ALLOW same genetic information / material</p> <p>ALLOW same / correct amount of DNA IGNORE 'new cells need genetic material' without ref to full amount</p>
	(c)	<p>Any two from Half the genetic information \checkmark Genetic information not identical / produces genetically different cells \checkmark 4 cells produced \checkmark</p>	2	1.1	<p>DO NOT ALLOW identical / not identical without genetic DO NOT ALLOW smaller cells</p>