OCR
Oxford Cambridge and RSA

GCSE (9-1)

Combined Science B (Twenty First Century)

Unit **J260/01**: Biology

General Certificate of Secondary Education

Mark Scheme for June 2018

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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 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

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.

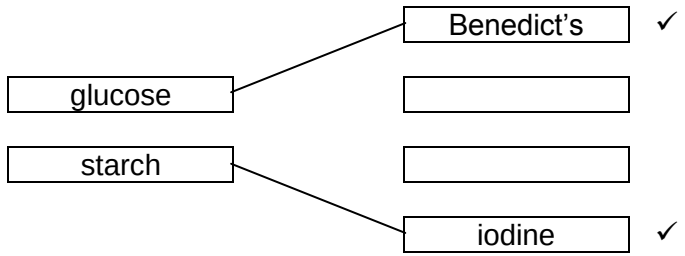
Question			Answer	Marks	AO element	Guidance
1			animal ✓ bacterial ✓ plant ✓	3	3 x 1.1	
2	(a)		stimuli ✓ glands ✓ blood ✓ receptors ✓ response ✓	5	5 x 1.1	
	(b)		**Any three from:** Oestrogen, FSH and LH levels drop ✓ Then oestrogen level increases (to a lower peak, around day 25) and then decreases (to a low, at day 28) ✓ After decreasing, FSH level begins to increase again (from around day 23) ✓ After decreasing, LH level stays constant/low ✓ Idea that all hormones return to their day 0 levels by day 28 ✓ Progesterone level increases and then decreases ✓	3	3 x 3.1a	**IGNORE** all hormone levels drop
	(c)	(i)	The hormones prevent ovulation. ✓	1	1.1	
		(ii)	hormone pills do not reduce risk of spreading STIs ✓	1	1.1	**ALLOW** named STI **ALLOW** idea of forgetting to take the pill **IGNORE** not 100% effective

Question			Answer	Marks	AO element	Guidance
3	(a)	(i)	The genome is the entire genetic material of an organism. ✓ In most organisms, the genome is packaged into chromosomes. ✓	2	2 x 1.1	
		(ii)	3 ✓ 5 ✓	2	2 x 1.1	**ALLOW** in either order
		(iii)	10^6 ✓	1	2.2	
	(b)	(i)	Jack ✓	1	2.1	
		(ii)	Kai ✓	1	2.1	
		(iii)	Nina ✓	1	2.1	
4	(a)		measuring cylinder ✓	1	2.2	**ALLOW any clear indication of correct choice**
	(b)	(i)	carbon dioxide ✓	1	1.1	
		(ii)	bubbles may be too quick to count/bubbles not all the same size ✓ using syringe/measuring volume increases the accuracy of the data ✓	2	1.2 3.3b	**ALLOW** bubbles may be missed **ALLOW** increases the precision
	(c)	(i)	Yeast respires fastest using glucose ✓	1	3.2b	
		(ii)	30 (cm^3) ✓	1	2.1	

Question			Answer	Marks	AO element	Guidance
	(c)	(iii)	The yeast has used up all the glucose ✓ No more gas is being made by anaerobic respiration. ✓	2	2 x 2.1	
	(d)		Boil the yeast to kill it before adding the sugar. ✓	1	3.3a	
	(e)		glucose ✓ lactic acid ✓	2	2 x 1.1	**Answers must be in the correct order** **ALLOW any clear indication of correct choice**
	(f)		active transport ✓	1	1.1	
5	(a)	(i)	dissolved food molecules ✓ oxygen ✓	2	2 x 2.1	**ALLOW any clear indication of correct choice**
		(ii)	these substances are needed for **aerobic** respiration ✓ any idea that (aerobic) respiration takes place in mitochondria ✓	2	2 x 1.1	**ALLOW** idea that cell A does more work or needs more ATP/energy **IGNORE** the cell has more mitochondria
	(b)	(i)	**X**/artery has thicker walls / **Y**/vein has thinner walls ✓	1	2.1	**ALLOW** X has thicker muscle / Y has thinner muscle X has a smaller lumen/ Y has a larger lumen **ALLOW** the correct comparison **DO NOT ALLOW** X has a thicker cell wall
		(ii)	valve(s) ✓	1	1.1	
		(iii)	(x) 400 ✓	1	2.2	

Question			Answer	Marks	AO element	Guidance
	(c)	(i)	**any one from:** coronary artery/blood vessel is blocked ✓ blood/oxygen is not reaching part of the heart / cardiac muscle ✓ **plus:** the idea of an alternative route for the blood/oxygen that avoids the blockage ✓	**2**	**2 x 2.1**	**IGNORE** named parts of the heart **IGNORE** named parts of the heart
		(ii)	idea that an operation carries a higher risk than a lifestyle change/ an operation has a higher risk ✓ example of the risk/disadvantage of operation (e.g. death during surgery / infection / pain) ✓	**2**	**2 x 1.1**	**DO NOT ALLOW** ideas about benefits for the health service (e.g. cheaper), as the question asks about benefits for Kareem **IGNORE** general statements referring to a heart attack
6	**(a)**	**(i)**	fungus ✓	**1**	**1.1**	**ALLOW any clear indication of correct choice**
		(ii)	Movement of contaminated plant material✓ Wind-blown spores✓	**2**	**2 x 1.1**	
	(b)	**(i)**	two bars correctly plotted (at 200 and 380)✓ x-axis labelled correctly (years from 2012 to 2016 labelled in the centre of the bars**, and** title “year”) ✓	**2**	**2 x 2.2**	**ALLOW** +/- half a square at the top of the bar
		(ii)	2013 ✓	**1**	**3.1a**	**If no answer ringed check for ring drawn on the graph/table**
		(iii)	**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 50.6(%) award 2 marks** (134 ÷ 265) × 100 ✓ = 50.6 (%) ✓	**2**	**2 x 2.2**	**DO NOT ALLOW** answer if not given to 1 d.p.

Question			Answer	Marks	AO element	Guidance
		(iv)	ash trees are harmed/killed ✓ idea (the fungus) is spreading (quickly) ✓	2	2.1 3.1b	**ALLOW** ideas of reducing biodiversity/loss of habitats for 1 mark
7	(a)	(i)	idea of how to reduce the temperature using ice (to get $0^{o}C$) ✓ idea of how to increase the temperature using a hot plate/water bath (for temperatures above $20^{o}C$) ✓	2	2 x 1.2	
		(ii)	The brightness of the lamp. ✓ The level of carbon dioxide in the pond water. ✓	2	2 x 1.2	
	(b)	(i)	9 ✓	1	2.2	**ALLOW** 25 to 34 / 25–34
		(ii)	29.5 ✓	1	2.2	**ALLOW** 29/30
	(b)	(iii)	as temperature increases the number of bubbles increases/idea of positive correlation ✓ the bubbles are oxygen gas made by photosynthesis / idea that number of bubbles indicates rate of photosynthesis ✓ enzymes used in photosynthesis ✓ idea that as temperature increases so does the rate of (enzymatic) reaction (up to the optimum temperature) ✓	4	2.1 2.1 1.1 1.1	this mark is for link between temperature and number of bubbles this mark is for link between bubbles and photosynthesis this mark is for link between temperature and rate of photosynthesis **ALLOW** increased kinetic energy so more collisions/ increase number of enzyme-substrate complexes

Question			Answer	Marks	AO element	Guidance
		(iv)	**Any two from:** Enzymes denatured ✓ Substrate doesn't fit into active site(s) ✓ So less oxygen is produced ✓ fewer enzyme substrate complexes made ✓	**2**	**2 x 2.1**	**ALLOW** active site changes shape
	(c)		 ✓ ✓	**2**	**2 x 2.2**	
8	**(a)**		**Any two from:** Idea that male peacocks are very visible to predators/not well camouflaged ✓ Male peacocks are more likely to be eaten ✓	**2**	**2 x 2.1**	**ALLOW** ideas that their feathers may be desirable to humans/taken for decoration for 1 mark

Question	Answer	Marks	AO element	Guidance
(b) *	*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)** Detailed explanation at the genetic level of how the features evolved by natural selection. **AND** Explains why the bright feathers and large tail are still present. *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)** Explains how the features evolved by natural selection, but lacks reference to what happens to the genetic variants/alleles. **AND** Explains why the bright feathers and large tail are still present. **OR** Explanation at the genetic level of how the features evolved by natural selection. *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)** Explains how the features evolved by natural selection, but lacks reference to what happens to the genetic	**6**	**3 x 1.1** **3 x 2.1**	**AO1.1 Demonstrating knowledge and understanding of natural selection.** *how the features evolved by natural selection:* • new features/variation caused by a mutation/changes in the DNA • there is competition to survive and reproduce • individuals with phenotypes/features that are beneficial/advantageous are more likely to survive and reproduce • the beneficial/advantageous genetic variants/alleles are passed on • the beneficial/advantageous genetic variants/alleles become more common in the population over generations • so the feature(s) become more common over generations **AO2.1 Application of knowledge and understanding in this context** *why the disadvantageous features are still present:* • bright feathers/large tail help male peacocks to attract mates/peahens • therefore more likely to reproduce and pass on the genetic variants/alleles for these features • the (reproductive) advantage of having the features outweighs the disadvantage

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td></td><td></td><td></td><td>variants/alleles.
OR
Explains why the bright feathers and large tail are still present.

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.</td><td></td><td></td><td></td></tr>
<tr><td>9</td><td>(a)</td><td></td><td>Punnett square:
<table><tr><td></td><td>X</td><td>Y</td></tr><tr><td>X</td><td>XX</td><td>XY</td></tr><tr><td>X</td><td>XX</td><td>XY</td></tr></table>
Mother’s gametes X and X ✓
Father’s gametes X and Y ✓
Correct offspring genotypes ✓

Explanation:
Identifies males as XY / females as XX ✓

Therefore would expect half/50% of births to be males / 1:1 ratio of boys and girls/ probability of each genotype is 0.5✓</td><td>5</td><td>1.1
1.1
2.1

2.1

2.1</td><td>ALLOW the males/females identified on the Punnett square

ALLOW there is an equal chance of having a male/female</td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><td></td><td>Meiosis ✓</td><td>Mitosis ✓</td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td>4</td><td>2</td></tr><tr><td></td><td>2</td><td>1</td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td>23</td><td>46</td></tr></table>✓
✓
✓</td><td>5</td><td>5 x 1.1</td><td>Mark independently</td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
10	(a)	(i)	0.001 ✓	1	2.2	
		(ii)	it is (only) correct for Northern Europe / incorrect for Japan, Southern Europe and United States ✓ **Any two data uses from:** it is 3/4 for Japan 8/9 for Southern Europe; 11/12 for United States ✓✓	3	3.2a 2 x 3.1a	**ALLOW** a mean calculated using the correct data for both data marks **ALLOW** any mean between 9.25 -10 with no calculation for 1 data mark only
	(b)	(i)	**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 0.02 award 2 marks** (15 ÷ 1000 =) 0.015 ✓ = 0.02 (to 1 sig. fig.) ✓	2	 2.2 1.2	
		(ii)	7.15 (mmol / *l)*✓	1	2.2	
	(c)		**Any two from:** information on lifestyles of people in different countries or example of relevant lifestyle choice, e.g. smoking rates / diet / amount of exercise / stress levels ✓ body mass / weight ✓ pre-existing health conditions eg blood pressure ✓ genetic data (e.g. presence of variants/alleles that increase or decrease risk of heart disease) / family history ✓	2	2 x 3.3a	**ALLOW** ideas about obesity/hip to waist ratio

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