OCR
Oxford Cambridge and RSA

GCSE (9-1)

Combined Science B (Twenty First Century)

Unit **J260/05**: 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
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

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

Annotation	Meaning
I	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.

<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></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 ✓

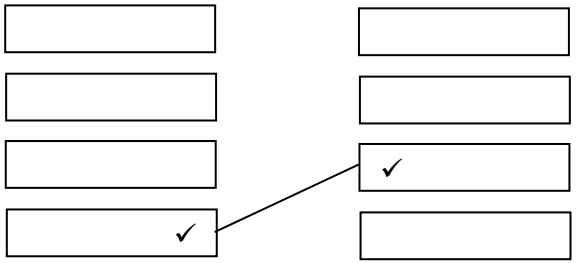
Therefore would expect half/50% of births to be males / 1:1 ratio of boys and girls/ probability of each genotype is 0.5✓</td><td>5</td><td>1.1
1.1
2.1

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></td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
2	(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

Question			Answer	Marks	AO element	Guidance
3	(a)	(i)	(day) 15 ✓ (because) LH peaked/was at its highest ✓	2	2 x 2.1	**ALLOW** 14-16 **IGNORE** references to other hormones
		(ii)	progesterone levels did not decrease ✓ *joined to* the thickened uterus wall did not break down ✓	2	2.1 1.1	
	(b)		FSH/Follicle Stimulating Hormone causes follicle(s)egg to mature/develop ✓ **Plus any one from:** idea that the treatment/injections will increase likelihood of ovulation/releasing egg(s) ✓ could be used to produce/collect many eggs for IVF ✓	2	1.1 2.1	
	(c)		**Any four from:** thyroxine increases rate of chemical reactions/ controls metabolic rate ✓ thyroxine stimulates/regulates growth ✓ Idea that: thyroxine switches off its own production ✓ thyroxine causes pituitary gland to stop secreting thyroid stimulating hormone/TSH ✓ thyroid gland stops secreting thyroxine ✓ negative feedback ✓	4	4 x 1.1	**ALLOW** Digestion/ Brain activity

Question			Answer	Marks	AO element	Guidance
4	(a)		**Any three from**: caused by a fungus ✓ spread by spores✓ carried by wind ✓ spread by movement of contaminated plant material ✓	3	3 x 1.1	**ALLOW** air **ALLOW** examples of movement eg tyres.
	(b)	(i)	**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 265 award 3 marks** 134 / 0.506 ✓ 264.8 ✓ = 265 (3 sig. figs) ✓	3	3 x 2.2	
		(ii)	**Any three from**: different numbers of ash trees in the two countries ✓ different environmental conditions eg temperature, moisture, differences in wind speed✓ ash trees are further apart / ash trees less densely populated / ash trees present in fewer squares in Scotland ✓ More resistant trees ✓ (uncertainty due to) sampling error ✓ less movement of contaminated plant material in Scotland ✓ efforts to control the pathogen ✓	3	3 x 3.2a	

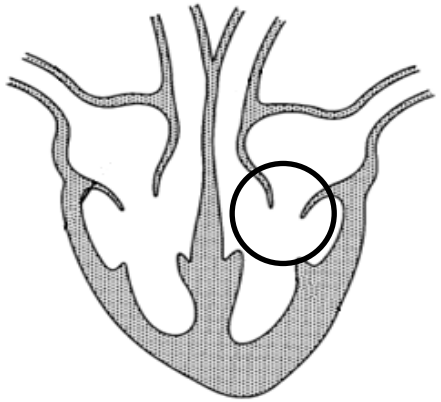
Question			Answer	Marks	AO element	Guidance
	(c)		**Any three from:** identify (two) ash trees that have survived/show resistance to ash dieback ✓ use genetic testing/sequencing to identify (two) ash trees that have resistance alleles/variants/genes ✓ Breed the (resistant) trees together ✓ Select/choose (most) dieback-resistant offspring (from each generation and repeat) ✓	**3**	**3 x 2.1**	
	(d)	**(i)**	gene ✓ enzyme ✓ gene ✓ plasmid ✓ genome ✓	**5**	**5 x 1.1**	
		(ii)	gene/genetic material that codes for toxins may be passed to other organisms ✓ toxins could kill/harm other organisms / could be passed along the food chain ✓	**2**	**2 x 2.1**	**ALLOW** risk of protests / destruction/vandalism of genetically engineered corn fields **ALLOW** Side effects in humans e.g. allergies

Question			Answer	Marks	AO element	Guidance
5	(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/interprets the results using knowledge and understanding of natural selection. **AND** Applies this knowledge and understanding to explain how/why the isolated populations of flies have become separate species. *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/interprets the results using knowledge and understanding of natural selection. **OR** Explains how/why the isolated populations of flies have become separate species. **OR** Suggests that the isolated populations have become separate species because they cannot mate with each other to produce fertile offspring, but does **NOT** describe the process of 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)** Correctly describes/interprets the pattern in the results. **OR** Attempts to describe/interpret the pattern in the results **AND** Attempts to link the results to an explanation of natural selection. *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	2 x 3.1a 2 x 1.1 2 x 2.1	**AO3.1a Interpreting the results** For example: • fertile offspring produced when mating male and female were from the same tank / were fed on the same food • no fertile offspring produced when male and female were in separate tanks / were fed on different foods **AO1.1 Demonstrating knowledge and understanding of natural selection/speciation** For example: • there is competition to survive and reproduce • individuals with phenotypes/features that are beneficial/advantageous are more likely to survive and reproduce • this is natural selection • the features/genetic variants of these individuals become more common in later generations • so the population becomes (better) adapted to its environment • when isolated populations change/adapt/evolve over many generations new species may be formed **AO2.1 Application of knowledge and understanding in this context** For example: • two populations of flies are (reproductively) isolated • conditions/environment different in each tank • there is (genetic) variation within each fly population • some flies in each tank will be better able to survive (on the available food) than others • these flies are more likely to reproduce and pass on their features/genetic variants • after many generations the population in each tank has changes/adapted/evolved differently • The flies in tank A and tank B are now different species.

Question			Answer	Marks	AO element	Guidance
	(b)		**Any two from:** (evidence of) similarities/ differences/ comparison between fossils and living organisms ✓ fossils/evidence of transitional species ✓ fossils/evidence of common ancestor(s) of modern species ✓	**2**	**2 x 1.1**	**DO NOT ALLOW** 'the fossil record' unqualified **ALLOW** example of transitional species (e.g. *Archaeopteryx*)
	(c)		eukaryote(s) ✓	**1**	**1.1**	**ALLOW** eukaryotic

Question			Answer	Marks	AO element	Guidance
6	(a)	(i)	first/light-dependent stage ✓	1	1.1	
		(ii)	**Any two from:** surface area/size of pondweed ✓ Intensity of the light ✓ concentration of carbon dioxide ✓ Same type/species of pond weed✓	2	2 x 3.3a	**DO NOT ALLOW** amount **ALLOW** distance of lamp from pondweed
		(iii)	measure volume of gas produced using gas syringe ✓ more accurate than counting bubbles✓ because bubbles may not be the same size/volume ✓	2	3.3b 2.2	**DO NOT ALLOW** accurate unqualified
	(b)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 6.6 (bubbles per minute) award 2 marks** highest rate = 33 bubbles in 5 minutes ✓ = 6.6 (bubbles per minute) ✓	2	2 x 2.2	**ALLOW** 6, 6.6 or 7 bubbles per minute (2 marks)
		(ii)	some other factor / carbon dioxide ✓ limiting ✓	2	2.1 1.1	
		(iii)	line the same shape as that of original data up to 30 °C ✓ then continues to rise without a plateau **OR** plateaus higher than original data ✓	2	2 x 1.2	
	(c)		**Any two from:** (there will be) fewer bubbles ✓ Lower rate/ less of photosynthesis ✓ enzymes denatured/active site changed shape ✓	2	2.2 2.1	**ALLOW** any indication of fewer bubbles or less gas produced **ALLOW** enzyme stops working.
	(d)		Benedict's (solution) ✓	1	1.2	

Question			Answer	Marks	AO element	Guidance
7	(a)	(i)	B ✓ it has no nucleus / it has plasmid(s) / it has circular DNA/circular chromosome/ has flagellum ✓	2	2.1 1.1	
		(ii)	A ✓ has nucleus/ no plasmid **and** has no chloroplast/ no vacuole✓	2	2.1 1.1	
		(iii)	mitochondrion/mitochondria ✓ A and C ✓	2	1.1 2.1	 Both needed, in any order
	(b)		aerobic ✓ lactic acid ✓ carbon dioxide + ethanol/alcohol ✓	3	3 x 1.1	**IGNORE** references to ATP/energy throughout **ALLOW** CO_2
	(c)	(i)	**Any two from:** (published in a scientific journal so) it has been checked by other scientists ✓ investigation repeated by other scientists/results compared with other scientists ✓ peer review ✓	2	2 x 1.1	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 1:19 award 2 marks** 2 + 36 = 38 ✓ 2:38 = 1:19 ✓	2	2 x 2.2	**1 mark max. if ratio expressed as 2:38**
		(iii)	Anaerobic respiration has a faster rate of reaction. ✓ Anaerobic respiration produces ATP more quickly. ✓	2	2 x 2.1	

Question			Answer	Marks	AO element	Guidance
8	(a)			1	1.1	
	(b)		**Function of heart valves**: stop back flow of blood to atria from ventricles ✓ **Tired and breathless** **Any two from:** delivery of oxygenated blood to body less efficient OWTHE ✓ less oxygen for (cellular) respiration ✓ Jim must breathe deeper/faster to get enough oxygen ✓	3	1.1 2 x 2.1	
	(c)		vein(s) ✓	1	1.1	
	(d)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 6.08 (litres) award 4 marks** (90/100) x 80 = 72 (bpm) ✓ (80 + 72) x 40 ✓ = 6080 (cm^3) ✓ = 6.08 (litres) ✓	4	3 x 2.2 1.2	**ALLOW** 72 **ALLOW** 152 x 40

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