GCSE (9–1) F

Combined Science B (Twenty First Century Science)

J260/01: Biology (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2019

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.

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.

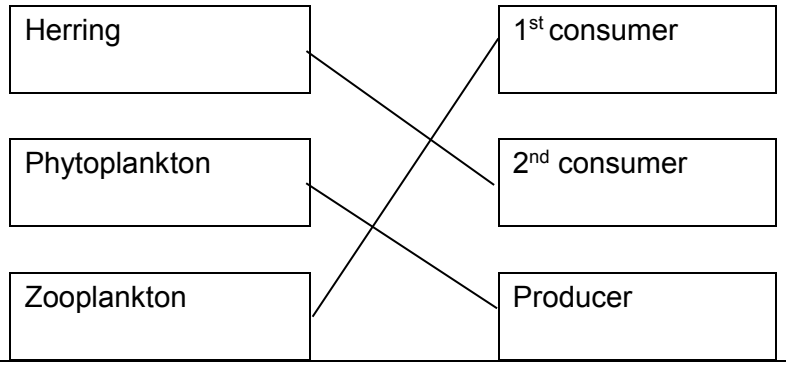
You should ensure that you have copies of these materials.

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:

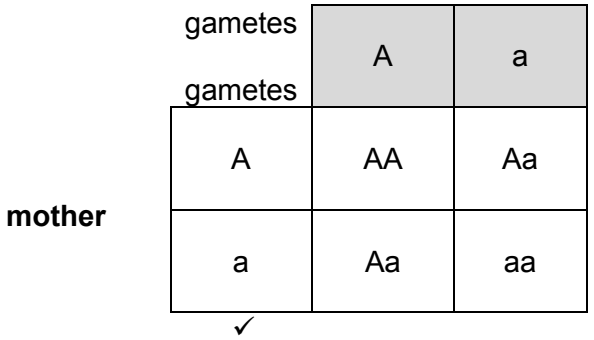
	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge 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	(a)	(i)		2	2x3.2a	All three correct = two marks One or two correct = one mark
		(ii)	Salmon ✓ Seal ✓ Human ✓	2	2x2.1	All three correct = two marks One or two correct = one mark Answers can be in any order
	(b)	(i)	Water ✓ Glucose ✓	2	2x1.1	**ALLOW** correct formula **ALLOW** correct formula
		(ii)	First ✓ Endothermic ✓	2	2x1.1	

<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>(c)</td><td></td><td>
<table>
<tr><th>Statement</th><th>True</th><th>False</th></tr>
<tr><td>Catches of over 0.8 million tonnes are recorded for 4 years</td><td>✓</td><td></td></tr>
<tr><td>No herring were caught between 1978 and 1983.</td><td>✓</td><td></td></tr>
<tr><td>Recorded catches are always between 0.2 and 1.0 million tonnes.</td><td></td><td>✓</td></tr>
</table>
</td><td>3</td><td>3x2.2</td><td></td></tr>
<tr><td></td><td>(d)</td><td></td><td>Future generations could continue fishing without wiping out the herring population ✓

The herring reproduce fast enough to replace all the herring that are caught ✓</td><td>2</td><td>2x2.1</td><td></td></tr>
</table>

Question			Answer	Marks	AO element	Guidance
2	(a)		3 ✓	1	1.2	
	(b)	(i)	Eyepiece lens = x15 and Objective lens =x40 ✓	1	1.2	**ALLOW** any x15 from the left column and any x40 in the right column circled
		(ii)	Eyepiece lens = x10 and Objective lens = x20 ✓	1	1.2	**ALLOW** any x10 from the left column and any x20 in the right column circled
		(iii)	to stain/make visible the nucleus/chromosomes/DNA/genetic material ✓	1	1.2	
	(c)	(i)	**Any two from**: rich/good blood supply/ it has lots of blood vessels ✓ large surface area ✓ idea that it/the gas exchange surface/the membrane is partially-permeable/thin/single✓	2	2x2.1	
		(ii)	Ben ✓	1	1.1	

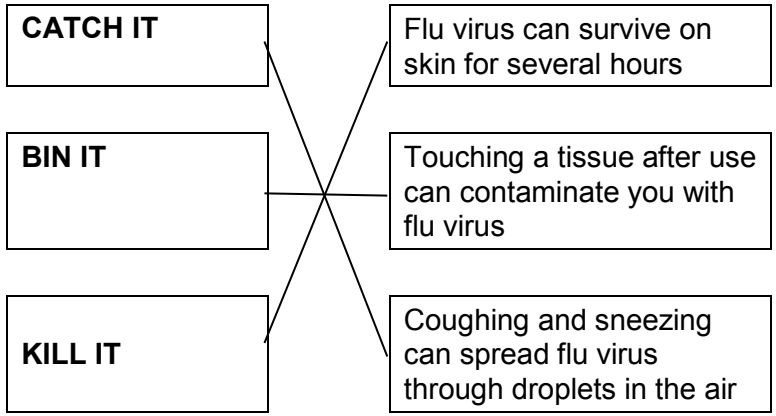
Question			Answer	Marks	AO element	Guidance
3	(a)	(i)		2	2x2.1	Mother Aa **ALLOW** aA **DO NOT ALLOW** any other letters Correct genotypes for fertilised eggs **ALLOW ECF** from incorrect mother's genotype/incorrect letters
		(ii)	Ring round either or both Aa fertilised eggs in the punnet square ✓	1	1.1	
		(iii)	0.25 ✓	1	1.2	
	(b)	(i)	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 of the adaptations of red blood cells. **AND** Differences between sickle cell disease blood and normal blood **AND** Suggests how these differences are related to need for extra oxygen. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.*	6	3 x 1.1 2 x 3.1a 1 x 2.1	**AO1.1 – demonstrating understanding of how red blood cells are adapted to their function** • Red blood cells contain protein / haemoglobin • Haemoglobin binds to oxygen • Red blood cells have no nucleus to give more room (for haemoglobin/oxygen) • Biconcave shape gives a large surface area for rapid diffusion of oxygen • Lots of RBCs to carry lots of oxygen **AO3.1a – interpreting the images to identify differences in RBCs from person with sickle cell disease** • Fewer red blood cells in people with sickle cell disease/more RBCs in normal blood • Some sickle shaped /misshapen cells

Question			Answer	Marks	AO element	Guidance
			Level 2 (3–4 marks) Outline explanation of the adaptations of red blood cells. **AND** Differences between sickle cell disease blood and normal blood. **OR** Differences between sickle cell disease blood and normal blood. **AND** Suggests how these differences are related to need for extra oxygen. *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)** Outline explanation of the adaptations of red blood cells. **OR** Differences between sickle cell disease blood and normal blood. *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.*			• Some cells have nuclei **AO2.1 – applying understanding to suggest why people with sickle cell disease need to be given extra oxygen** • Fewer RBCs/presence of nuclei/misshapen cells mean less oxygen can be carried. • Not enough oxygen for respiration (to provide (sufficient) ATP/energy for life processes)
		(ii)	Protein ✓ Genes ✓ Amino acids ✓ Switched off ✓	**4**	**4x1.1**	

Question			Answer	Marks	AO element	Guidance
	(c)	(i)	They are adult stem cells ✓	1	2.1	
		(ii)	Other scientists can copy the methods described to reproduce similar results ✓ Other scientists have checked the work before it is published ✓	2	2x2.1	

Question			Answer	Marks	AO element	Guidance
4	(a)		B(A)DC ✓✓	2	2x2.1	B before D or D before C for one mark
	(b)		1. oxygen ✓ 2. carbon dioxide ✓ 3. food ✓	3	3x1.1	
	(c)	(i)	There is a pulse in the thumb ✓	1	1.2	
		(ii)	Multiply by 6 ✓	1	3.3a	
		(iii)	find the time taken to recover/return to the resting pulse rate ✓	1	3.3a	
	(d)	(i)	All points correctly plotted ✓ Smooth curve through points ✓	2	2x2.2	Independent marking points **ALLOW** ± error of half a square
		(ii)	Fair ✓	1	3.2b	
		(iii)	(Not very confident): 90s is just under the time that would give her a poor rating ✓ **OR** repeats would increase confidence/they've only done it once ✓	1	3.1b	No mark for judgement; mark for explanation. **ALLOW** 90s sits below/on the boundary for poor

Question			Answer	Marks	AO element	Guidance
5	(a)		inherited ✓ natural selection ✓	2	2x1.1	
	(b)		**Statement** / **True** / **False** Evidence for the evolutionary relationships of dinosaurs... — True: ✓ — False: The common ancestor of all animals with backbones lived... — True: — False: ✓ The DNA of birds will be most similar to that of dinosaurs... — True: ✓ — False:	2	2x3.1a	Three correct = two marks One or two correct = one mark
	(c)		(mules) offspring are not fertile/cannot breed successfully ✓	1	1.1	**IGNORE** offspring cannot reproduce

Question			Answer	Marks	AO element	Guidance
6	(a)			2	2x2.1	All three correct = two marks One or two correct = one mark
	(b)	(i)	Release chemicals that break pathogens down ✓ Take in and digest pathogens ✓	2	2x1.1	
		(ii)	Only people ill with the flu virus can pass it on. ✓ Unvaccinated people are more likely to get flu ✓	2	2x1.1	
	(c)		Idea that the virus/surface proteins have changed/are different shapes ✓ idea that a person who had the vaccine would make the wrong (shape) antibodies ✓ the antibodies will not recognise/attach/stick/bind/fit to the surface proteins/virus ✓	3	3.1a 2.1 2.1	**ALLOW** virus has mutated **ALLOW** new/different antibodies would need to be made

Question			Answer	Marks	AO element	Guidance
6	(d)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 0.7(%) award 3 marks** 170 000/25 000 000 = 0.0068 ✓ 0.0068 x 100 = 0.68 ✓ = 0.7 (%) (1dp) ✓	3	3x2.2	**ALLOW** 170 000/25 000 000 x 100 for 1 mark **ALLOW** 0.68(%) for 2 marks
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 264 award 2 marks** 4 x 66 ✓ = 264 ✓	2	2x2.2	**ALLOW** (4 x 66 000 000) ÷ 1 000 000 **OR** (4 ÷ 1 000 000) x 66 000 000
	(e)	(i)	A higher magnification is possible with electron microscopes ✓ Electron microscopes have a very high resolution ✓	2	2x1.1	
		(ii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 500 award 2 marks** 50/0.1 ✓ = 500 ✓	2	2x2.2	**ALLOW** 50 000/100
	(f)	(i)	80 (people per 100000) ✓	1	2.2	**ALLOW** any number between 70 and 90 inclusive
		(ii)	C ✓	1	2.1	If answer box is not ticked, check diagrams.

Question			Answer	Marks	AO element	Guidance
		(iii)	No, correlation doesn't equal cause ✓ No mechanism/caused by different microorganisms ✓	2	2x1.1	 **ALLOW** there could be other factors that cause pneumonia **ALLOW** not everyone that has pneumonia had the flu first/not everyone who has flu will get pneumonia

Question			Answer	Marks	AO element	Guidance
7	(a)		Cytoplasm ✓ Mitochondria ✓	2	2x1.1	
	(b)		Active transport ✓ Muscle contraction ✓	2	2x1.1	
	(c)		**Any three from:** comment on safety/hazards/ways to reduce risk ✓ how much mass of potato is used each time ✓ type/size/surface area of the paper ✓ how much/volume of water each time ✓ the volume/amount/concentration of H_2O_2/solution ✓ the temperature ✓ the size of the test tube ✓ start the timer at the same time e.g. when disc has sunk to the bottom of the test tube ✓	3	3x1.2	**ALLOW** weight/amount of potato used each time/how much potato extract / how much time to soak the disc in the potato extract
	(d)		**Any two from:** the reaction makes oxygen/gas ✓ more oxygen/bubbles formed when (rate of) reaction is faster ✓ more oxygen/bubbles means the disc will rise faster ✓	2	2x2.2	Candidates need to refer to more once for marking points 2 and 3

Question			Answer	Marks	AO element	Guidance
	(e)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 0.131 (s^{-1}) award 3 marks** 1 ÷ 7.66 ✓ = 0.1305483 ✓ = 0.131 (s^{-1}) (3sf) ✓	**3**	**3x2.2**	Check for answer written in/beside the table
	(e)	**(ii)**	Between 0.75% and 6.00% H_2O_2 the reaction rate increases by approximately 2.5 times ✓ The biggest difference in time taken for the paper disc to reach the surface is between 0.75 and 1.50% H_2O_2 ✓	**2**	**2x3.2b**	
	(f)		Idea of repeat readings ✓	**1**	**3.3b**	
	(g)		Hydrogen peroxide/H_2O_2 is the substrate/key ✓ Substrate fits into the active site/lock of the enzyme ✓ Idea that shapes of substrate and active site are complementary/substrate is the correct shape ✓ Idea that <u>only</u> H_2O_2 can fit into the active site of catalase ✓	**4**	**2.1** **1.1** **1.1** **1.1**	**ALLOW** labelled diagrams for mark points three and four.

OCR (Oxford Cambridge and RSA Examinations)
The Triangle Building
Shaftesbury Road
Cambridge
CB2 8EA

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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