OCR
Oxford Cambridge and RSA

GCSE (9-1)

Combined Science A (Gateway)

Unit **J250/01**: 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.

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 **15b**

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

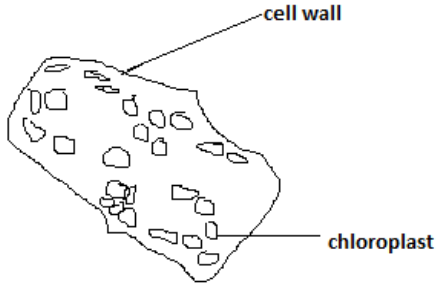
The breakdown of Assessment Objectives:

	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.

For answers to section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

Question			Answer	Marks	AO element	Guidance
1			D ✓	**1**	1.1	
2			C ✓	**1**	1.1	**ALLOW** B.
3			A ✓	**1**	1.1	
4			C ✓	**1**	1.1	
5			C ✓	**1**	2.2	
6			B ✓	**1**	2.2	
7			B ✓	**1**	2.2	
8			C ✓	**1**	2.1	
9			B ✓	**1**	2.2	
10			C ✓	**1**	1.1	

Question			Answer	Marks	AO element	Guidance
11	(a)		shape drawn must **resemble** cell X with similar distribution of chloroplasts ✓	3	2x 2.2	**BLANK PAGES MUST BE ANNOTATED TO SHOW THEY HAVE BEEN SEEN.** **DO NOT ALLOW** sketching/overlapping lines/double lines / gaps **DO NOT ALLOW** drawing of a 'textbook' cell / presence of a vacuole **IGNORE** nucleus **ALLOW** imperfect number and shape to chloroplasts
			drawing (ignoring labels) must take up at least one half of the height or width of the space provided but not overlap with wording of question ✓		2.1	Available space should not include margins.
			cell wall **AND** chloroplast(s) correctly labelled ✓			**ALLOW** correct labelling of cell wall and chloroplast(s) on a 'textbook' cell diagram ✓ label lines must be touching correct structure (each structure must be in the correct position in the cell, even if they do not resemble the structures in the image) **IGNORE** other labels **IGNORE** arrow heads



Question			Answer	Marks	AO element	Guidance
	(b)		(idea that) root cells would not have chloroplasts / chlorophyll ✓	**2**	1.1	**ALLOW** it/the cell has chloroplasts / chlorophyll ✓ **DO NOT ALLOW** would not have vacuole / cell wall / cell membrane / nucleus / mitochondrion **IGNORE** reference to root hairs
			(because) no light available (underground) for photosynthesis ✓		2.1	**ALLOW** root cells cannot photosynthesise ✓ **ALLOW** photosynthesis happens in the leaves ✓
	(c)	**(i)**	Iron ✓	**1**	3.1a	
		(ii)	**any two from:** (availability of) magnesium is low / magnesium decreased / magnesium in short supply ✓ (idea that low Mg) causes **less / no** photosynthesis ✓ reduced photosynthesis results in less biomass / glucose (production) ✓	**2**	2x 3.2a	**ALLOW** not enough magnesium ✓ **ALLOW** 'it' to refer to magnesium **ALLOW** Magnesium bar is thinner ✓ **IGNORE** reference to other mineral ions (e.g. N, P, K, S, Ca, Fe) **IGNORE** Plants require Mg to photosynthesise **ALLOW** higher level responses: magnesium needed to make chlorophyll ✓
	(c)	**(iii)**	(Root) hairs ✓ Increased / large surface <u>area</u> (for uptake of minerals) ✓	**2**	2x1.1	**ALLOW** hair-like structures ✓ **IGNORE** more space (for uptake of minerals) **IGNORE** reference to water

Question			Answer	Marks	AO element	Guidance
12	(a)		1 dendrite / cell membrane ✓ 2 cell body / cytoplasm ✓	2	2x 1.1	
	(b)	(i)	(Idea that) larger the diameter the faster the impulse **ORA** ✓	1	2.2	**ALLOW** positive correlation / both increase (together) ✓ **IGNORE** positive relationship **ALLOW** signal instead of impulse
		(ii)	(most of the) points / data are close to the line (of best fit) / **no** anomalous results ✓	1	3.1b	**IGNORE** able to put straight line through data collected

Question			Answer	Marks	AO element	Guidance
13	(a)		childhood / adolescence / teenage / young ✓	1	1.1	**ALLOW** baby ✓ **DO NOT ALLOW** at birth / young adult **ALLOW** stated age, between 1-20 yrs ✓
	(b)		Pancreas ✓	1	1.1	
	(c)		**type 1** (normally) requires **insulin** ✓ **AND** any **two** from the following idea that **type 2** can (normally be controlled by) diet ✓ idea that **type 2** (may) require weight **loss** ✓ idea that **type 2** (may) require **insulin** / drugs to stimulate **insulin** production ✓	3	3x1.1	**Type of diabetes must be clearly linked to method of treatment** **If neither insulin mark scored, ALLOW requires insulin, even if not linked to type 1 or type 2** ✓ **IGNORE** check blood sugar levels **IGNORE** tablets **ALLOW** idea of healthy eating ✓ **ALLOW** reduce / control sugar / fat in diet ✓ **IGNORE** don't eat fatty / sugary food **IGNORE** references to junk food **IGNORE** unqualified references to weight **ALLOW** (more) exercise ✓

Question			Answer	Marks	AO element	Guidance
14	(a)		histidine ✓	1	2.1	**ALLOW** answer in table if answer line is blank ✓
	(b)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 88 (%) award 2 marks** (2.2 ÷ 2.5) × 100 ✓ 88 (%) ✓	2	 1.2 2.2	**ALLOW** answer in table if answer line is blank ✓
		(ii)	If answer to b(i) is under 100%: less than the recommended amount / RDA✓ idea that he will not be able to **make** (correct) proteins✓ **BUT ECF** If answer to b(i) is higher than 100%: more than the recommended amount / RDA✓	2	3.2b	 **ALLOW** idea of not enough / low ✓ **ALLOW** enzymes instead of proteins **ALLOW** idea of too much / high ✓

Question			Answer	Marks	AO element	Guidance
15	(a)		carbon dioxide ✓	1	1.2	**ALLOW** correct formula CO_2 ✓ **IGNORE** incorrect formula e.g. CO^2/CO2/Co2
	(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)** Describes at least one way the method needs improving for **precision and repeatability.** **AND** Explains why **both** improvements are needed. *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 at least one way the method needs improving. **AND** Explains why this improvement is needed *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)** Describes at least one way the method needs improving, or gives a free-standing explanation. *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	3x 3.1b 3x 3.3b	**AO3.1b. Analyse information and ideas to evaluate the method by identifying where it needs improving** **Precise** • Measure the volume / mass / amount of gas produced (or reference to method e.g. gas syringe) instead of number of bubbles OR allow example of technology (e.g. Datalogger / use of video) to help count the bubbles • Use an electronic water bath / constantly monitor and adjust temperature • Read the thermometer at eye level **Repeatable** • use a set volume / amount of (yeast OR sugar) solution • use the same type of yeast • leave the (yeast OR sugar) solution to get to temperature before counting • use fresh (yeast OR sugar) solution each time **AO3.3b Analyse information and ideas to improve experimental procedures to explain the need for improvements related to precision and repeatability**

Question	Answer	Marks	AO element	Guidance
				Precise • Measure the volume / mass / amount of gas produced (or reference to method e.g. gas syringe) instead of number of bubbles OR allow example of technology (e.g. datalogger / use of video) to help count the bubbles, as bubbles vary in size / are difficult to count/may miss bubbles • Use an electronic water bath / constantly monitor and adjust temperature, as temperature may fluctuate in beaker of water / temperature needs to keep same • Read the thermometer at eye level, as reading thermometer at an angle gives the wrong reading **Repeatable** • use a set volume/amount of (yeast OR sugar) solution, otherwise (idea that) rate of reaction / number of bubbles will change • use the same type of yeast, as different types of yeast may respire / work at different speeds • leave the (yeast OR sugar) solution to get to temperature before counting, as enzymes need to be at correct temperature • use fresh (yeast OR sugar) solution each time, as concentration of sugar will decrease / sugar will be used up as the reaction takes place

Question			Answer	Marks	AO element	Guidance
	(c)	(i)	suitable scale on correct axes ✓ plotting accurate ✓	2	2x 2.2	Scales on X and Y axis should use at least half of the available axis **ALLOW** +/- half a square Temperature / Bubbles per minute 10 3 20 6 30 11 40 5 50 2 60 1
		(ii)	suitable line of best fit ✓	1	2.2	**DO NOT ALLOW** dot to dot straight lines **DO NOT ALLOW** single straight line **DO NOT ALLOW** overlapping lines **DO NOT ALLOW** a **sharp** peak at 30,11 **IGNORE** extrapolation beyond first or last points on line
	(d)		**Any four from:** Reaction rate / number of bubbles highest at 30 (°C) / optimum temperature at 30 (°C) ✓ reaction rate / number of bubbles increases as temperature increases, when temp is low / below optimum/between 10 - 30 (°C) ✓ reaction rate / number of bubbles decreases as temperature increases, when temp is (too) high / above	4	4x2.1	 **ALLOW** Ideal temp for enzymes is 30^0 / enzymes most active at 30^0 ✓ **ALLOW** references to enzymes working faster / better as equivalent to reaction rate **ALLOW** references to enzymes working more slowly / less well as equivalent to reaction rate

Question			Answer	Marks	AO element	Guidance
			optimum/above 30 (°C) ✓ (as temp increases) more (kinetic) energy / more movement (in enzymes and substrates) ✓ ORA (as temp increases) more collisions (between enzymes and substrates) ✓ ORA when temp is (too) **high** / above optimum / above 30 (°C) enzyme / active site denatures ✓			**ALLOW** at low temp, less energy/movement (in enzymes and substrates) ✓ **ALLOW** at high temp, more energy / movement (in enzymes and substrates) ✓ **IGNORE** heat / vibration **IGNORE** between enzyme and sugar **DO NOT ALLOW** between yeast and sugar **IGNORE** just temperature increasing, must say high **ALLOW** active site changes shape **ALLOW** substrate can no longer fit in active site **ALLOW** enzyme substrate complex cannot form **DO NOT ALLOW** yeast denatures / reaction stops **DO NOT ALLOW** enzymes die

Question			Answer	Marks	AO element	Guidance
16	(a)	(i)	**Z** has a larg**er** lumen (than **X**) / **ORA** ✓ **Z** has **thinner** wall (than **X**) / **thinner** layer of muscle (than X) / **ORA**✓	**2**	2x2.1	**ANSWER MUST BE COMPARATIVE** **ALLOW** description of lumen e.g. larg**er** passage / hole / centre / space ✓ **ALLOW Z** has a large lumen compared to **X** ✓ **ALLOW Z** has large lumen **X** has small lumen✓ **ALLOW Z** has large lumen **X** does not / **ORA** ✓ **ALLOW Z** has a thin wall or muscle layer compared to **X**✓ **ALLOW Z** has thin wall **X** has thick wall ✓ **ALLOW Z** has thin wall **X** does not / **ORA** ✓ **ALLOW Z** has thin muscle layer **X** has thick muscle layer ✓ **IGNORE** just **Z** has less fibres / **ORA** **DO NOT ALLOW** thinner **cell** wall **IGNORE Z** has a smaller wall /X has a bigger wall **IGNORE** references to size, shape, name or role of each blood vessel / strength of wall **IGNORE** presence absence of valves / pressure of blood **IGNORE** references to **Y**
		(ii)	**wall** only one cell thick / thin **wall** / **semi** or **partially permeable wall** ✓ for quick(er) diffusion / short(er) diffusion distance / efficient diffusion ✓	**2**	2x1.1	**IGNORE** references to surface area **DO NOT ALLOW** (thin) muscular wall / (thin) cell wall **ALLOW** easy diffusion / better diffusion ✓ **DO NOT ALLOW** diffusion **of blood** **ALLOW** gas exchange or exchange of materials for diffusion **IGNORE** just 'diffusion' or 'gas exchange' or 'exchange of materials'

Question			Answer	Marks	AO element	Guidance
	(b)	(i)	**any one from** (heart has) three chambers / not four chambers ✓ (heart has) one ventricle / not two ventricles ✓ only one artery leaving (heart) ✓	**1**	2.1	**ASSUME ANSWER REFERS TO LUNGFISH UNLESS OTHERWISE STATED** **ALLOW** humans have four chambers / humans have two ventricles / humans have two arteries leaving (heart) **ALLOW** double circulatory system in humans / **ORA** ✓ **ALLOW** lungfish have single circulatory system / **ORA** ✓ **ALLOW** in humans' blood goes through heart twice / in lungfish blood goes through heart once ✓ **ALLOW** lung fish has only one lung / humans have two lungs ✓ **IGNORE** oxygenated and deoxygenated blood mixes (on leaving heart) **IGNORE** differences in pressure **IGNORE** references to names of blood vessels
		(ii)	(in humans) oxygenated and deoxygenated blood kept separate ✓ (so) more **oxygen** is carried around the body / more **oxygen** is supplied to the body cells ✓	**2**	2x2.1	**ALLOW ORA** if clear it is about lungfish **ALLOW** (in humans) oxygenated blood goes to body and deoxygenated blood goes to lungs ✓ **ALLOW** blood pressure (in humans) is greater / flow rate of blood is faster ✓ **ALLOW oxygen** delivered at a faster rate ✓ **ALLOW** more oxygenated blood ✓ **IGNORE** just 'circulatory system can work faster'

Question			Answer	Marks	AO element	Guidance
17	(a)	(i)	(chromosomes) separate / split / divide / pulled apart ✓ (chromatids) move to opposite ends / by spindle fibres ✓	2	2x1.1	**WHERE A CANDIDATE USES A DIAGRAM LOOK FOR THE CORRECT IDEAS LABELLED ON THE DIAGRAM** **IGNORE** just by fibres **ALLOW AS AN EXTRA MARKING POINT** (two) **new** nuclei form / membrane forms around them **/** nuclear envelope forms around them ✓ **IGNORE** cell membrane splits **IGNORE** references to DNA replication **IGNORE** cytokinesis / cell splitting
		(ii)	double helix ✓ polymer ✓	2	2x1.1	**IGNORE** references to amino acids **ALLOW** polynucleotide ✓✓ **ALLOW AS EXTRA MARKING POINTS** contains (four) bases ✓ reference to ATCG ✓ (made up of) nucleotides ✓ contains sugar / deoxyribose / phosphate group ✓ **IGNORE** deoxyribonucleic acid
	(b)		idea of (stem) cells becoming specialised ✓	1	1.1	**ALLOW** when (stem) cells turn into cells that do a particular job or task or role or shape ✓ **ALLOW** cells adapt to do a specific task or job or role or shape ✓ **IGNORE** just cells become adapted / cells change

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