OCR
Oxford Cambridge and RSA

GCSE (9-1)

Combined Science A (Gateway)

Unit **J250/07**: 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

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			C ✓	**1**	1.1	
2			D ✓	**1**	2.1	
3			D ✓	**1**	2.1	
4			B ✓	**1**	1.1	
5			B ✓	**1**	2.2	
6			D ✓	**1**	2.2	
7			B ✓	**1**	1.1	
8			A ✓	**1**	1.1	
9			B ✓	**1**	1.1	
10			D ✓	**1**	2.1	

Question			Answer	Marks	AO element	Guidance
11	(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	**BLANK PAGES MUST BE ANNOTATED TO SHOW THEY HAVE BEEN SEEN** **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
12	(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) <u>bases</u> ✓ 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

Question			Answer	Marks	AO element	Guidance
13	(a)		**alternative wording** convert length of **X** in the picture to µm / convert actual length to mm / idea that image and actual length should have the same units ✓ divide image size by actual size **or** magnification = image size / actual size ✓	**2**	2x1.2	**MAXIMUM 1 MARK FOR CORRECT ANSWER WITH NO EXPLANATION e.g. 640, 653, 667** ✓ **ALLOW** convert actual length to cm and length measured is in cm **DO NOT ALLOW** incorrect conversion calculations e.g. 5000/75 or 0.05/75 **IGNORE** triangle style equation without equal sign **ALLOW** correct equation showing conversion and division for two marks e.g**.** 48/0.075 or 48 000/75✓✓ **ALLOW** measurements in range 48-50mm used in calculation

Question	Answer	Marks	AO element	Guidance
(b)	there would be a higher **resolution** ✓	3	1.2	**ALLOW** there would be a better **resolution** ✓ **ALLOW** the distance between two points that can been seen as separate points is shorter ✓ **IGNORE** reference to power or magnification **IGNORE** clearer image
	then **any two from:**		2x2.2	
	smaller/more/different/other structures/organelles become visible ✓			**ALLOW smaller/more/different/other** sub-cellular structures become visible ✓ **IGNORE** just 'more detail' / intermolecular cells
	states a named organelle that will become visible ✓			e.g. mitochondria / ER / ribosomes / plasmids (in bacteria) ✓ **IGNORE** DNA / nucleus / chloroplasts / cell membrane / cell wall
	internal structure of organelles can be seen ✓			**ALLOW** internal structure of chloroplasts or cell wall or membrane can be seen ✓ **BUT ALLOW** internal structure of other named organelles can be seen e.g. internal structure of mitochondria can be seen ✓✓
	example of an effect on the whole image ✓			e.g. 3D or surface image possible / image may be in black and white / not in colour false colour is added / dehydrated specimen may affect shape ✓ **IGNORE** just 'specimen is dead' / references to stains

Question			Answer	Marks	AO element	Guidance
	(c)	(i)	**any three from:** leaf placed in boiling water (before or after going in ethanol) ✓ leaf is then placed in boiling ethanol or boiling alcohol ✓ spread out (flat) ✓ use of iodine (solution) ✓ blue-black (colour) indicated the presence of starch / positive result would be blue-black (colour) ✓	**3**	3x1.2	**ALLOW** leaf placed in hot water (before or after going in ethanol) ✓ **ALLOW** leaf is then placed in hot ethanol or hot alcohol ✓ **ONLY AWARD THIS MARK IF IODINE (SOLUTION) IS USED** e.g. universal indicator turns blue-black is incorrect **ALLOW** black-blue or black is the positive colour ✓ **but IGNORE** just 'blue'

Question			Answer	Marks	AO element	Guidance
		(ii)		3	3x3.2a	**CHECK DIAGRAM FOR ANSWERS** **ALLOW** soda lime for **A** and alkaline pyrogallol for **B** or black cover for **D**
			A has no starch/little starch because no carbon dioxide ✓			**ALLOW A** has no starch/little starch because carbon dioxide is a limiting factor / **A** has no starch/little starch because it has low(er) amounts of carbon dioxide ✓ **IGNORE JUST** carbon dioxide is needed for photosynthesis **BUT ALLOW** plant **A** will not make starch as carbon dioxide is needed for photosynthesis ✓ **DO NOT ALLOW A** has no light
			B or **C** has starch/more starch because it has the conditions needed/has carbon dioxide and light (for photosynthesis) ✓			**ALLOW C** has starch because it is the control ✓ **IGNORE B** and **C** give the best results **IGNORE B** and **C** has no factors affecting it **DO NOT ALLOW** oxygen as one of the conditions needed for **B** and **C**
			D has no starch/little starch because no light ✓			**ALLOW D** has no starch/little starch because light is a limiting factor ✓ **IGNORE JUST** light is needed for photosynthesis **BUT ALLOW D** has no starch/little starch because light is needed for photosynthesis ✓ **DO NOT ALLOW D** has no carbon dioxide **IF NO OTHER MARKS AWARDED ALLOW** leaves from plants **B and C** have starch/more starch **OR** leaves from plants **A and D** have little/no starch ✓

Question			Answer	Marks	AO element	Guidance
14	(a)		**any two from:** glucose is a monomer **BUT** sucrose is not ✓ formula of glucose is, $C_6H_{12}O_6$ **AND** sucrose is $C_{12}H_{22}O_{11}$ ✓ sucrose contains a different number of carbon (atoms) / sucrose contains a different number of bonds ✓ both contain hydrogen, carbon and oxygen / both contain the same elements ✓ both contain carbon rings ✓	**2**	2x2.1	**ALLOW** glucose is a monosaccharide **AND** sucrose is a disaccharide ✓ **ALLOW** sucrose is made from two glucose molecules ✓ **ALLOW** sucrose contains glucose and fructose ✓ **DO NOT ALLOW** sucrose is a polymer/repeat monomer **IGNORE** glucose is a single and sucrose is a double molecule **IGNORE** references to size **ALLOW** sucrose contains a different number of hydrogen or oxygen (atoms) ✓ **ALLOW** sucrose contains a different number of atoms ✓ **IGNORE** sucrose contains more C or H or O or OH or H_2O or CH_2OH **IGNORE** both made up of O H and C
	(b)	**(i)**	(temperature will increase because) it is an exothermic reaction ✓ use a water bath (to maintain the temperature) ✓	**2**	1.1 3.1b	**ALLOW** descriptions of exothermic e.g. heat is released/given out/produced ✓ **IGNORE** heats up **DO NOT ALLOW** endothermic reaction **IGNORE** insulation / fridge / ice bath / oven

Question			Answer	Marks	AO element	Guidance
		(ii)*	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)** applies knowledge to state that increase in volume for either sugar is due to the production of carbon dioxide during (anaerobic) respiration **OR** that the volume produced by glucose is greater as glucose is used in (anaerobic) respiration **AND** makes an interpretation to explain the shape of **each** graph **AND** analyses information to conclude that sucrose is converted to glucose *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)** applies knowledge to state that increase in volume for either sugar is due to the production of carbon dioxide during (anaerobic) respiration **OR** that the volume produced by glucose is greater as glucose is used in (anaerobic) respiration **AND** makes an interpretation to explain the shape of **either** graph	**6**	2x2.1 2x3.2b 2x3.1a	**AO2.1. Apply knowledge and understanding of scientific ideas about anaerobic respiration.** • greater volume of gas produced with glucose as glucose used in (anaerobic) respiration • volume of gas increases over time as carbon dioxide is produced **AO3.2b Analyse information and ideas to draw conclusions to explain the differences in the graphs.** • rate of (anaerobic) respiration is slower with sucrose as sucrose has to be converted to glucose before it can be used • rate is zero between 0 and 5 minute for sucrose as time need to convert it to glucose • rate of reaction is slower with sucrose as only glucose fits into active site of enzymes used in respiration **AO3.1a Analyse information and ideas to interpret the shape of the graphs WITH AN EXPLANATION.** **glucose graph** • graph for glucose levels off as all the glucose is used up/broken down • rate faster over first 20 minute (for glucose) as higher concentrations of glucose **sucrose graph** • sucrose steady rate as concentration does not change as quickly • sucrose not used up as graph does not level off **either sucrose or glucose** • initial rate slow (for both) as takes time for yeast to become active

Question	Answer	Marks	AO element	Guidance
	OR applies knowledge to state that increase in volume for either sugar is due to the production of carbon dioxide during (anaerobic) respiration **OR** that the volume produced by glucose is greater as glucose is used in (anaerobic) respiration **AND** analyses information to conclude that sucrose is converted to glucose *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)** attempts to interpret the graphs by comparing the shape of the two lines but makes **no** attempt to explain the shapes *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.*			**AO3.1a Analyse information and ideas to interpret the shape of the graphs with NO EXPLANATION.** • glucose produces **more** gas / **ORA** • glucose levels off but sucrose does not level off • glucose used up faster than sucrose • idea that rate of reaction is faster with glucose than with sucrose • glucose starts straight away sucrose take 5 minutes to start **IGNORE** references to limiting factors

Question			Answer	Marks	AO element	Guidance
15	(a)		water or sugar solution (on the outside) **adds** to mass or weight / to give more accurate results / to remove error ✓	1	3.3a	**ALLOW** the results are inaccurate if not dried ✓ **ALLOW** only want to measure the water that has entered (the cells of) the potato ✓ **IGNORE** just affects the mass **IGNORE** just 'to remove the water' **IGNORE** make fair comparison / fair test / reliable
	(b)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = -26.1(%) award 2 marks** $\frac{0.6}{2.3} \times 100$ ✓ -26.1 (%) ✓	2	2x2.2	**ALLOW** correct answer in table if answer line is blank but answer line takes precedence **ALLOW** 26.1 (%) or +26.1 (%) ✓ **ALLOW** correct answer calculated to more than one decimal place (e.g.) -26.09 (%) ✓ **ALLOW** -26.0 (%) or -26 (%) ✓

Question	Answer	Marks	AO element	Guidance
(c)		4	4x2.2	**place ticks and crosses on right hand side of grid**
	suitable scale on correctly chosen axes ✓			minimum 50% of grid used scale must be in ascending order **ALLOW** values for x axis on bottom line of grid
	both axis labelled with units ✓			labels are: concentration (of sugar solution) mol/dm^3 percentage change in mass or % change in mass
	plotting accurate ✓			**ALLOW** + or - half square **IGNORE** plot for 0.8 mol/dm^3 plots are: 0.0,+28.6 0.2,+4.5 0.4, -10.0 0.6, -20.0 (0.8, -26.1) 1.0, -27.3
	suitable line of best fit through most points ✓			**ALLOW** line of best fit for their plotting **IGNORE** any extrapolation of line

Question			Answer	Marks	AO element	Guidance
	(d)	**(i)**	0.24 – 0.30 (mol/dm^3) ✓	**1**	3.2a	**ALLOW** values between 0.24 and 0.30 inclusive **BUT** if outside this range check graph for point where line crosses axis at 0 % change in mass and **ALLOW** + or - half square
		(ii)	(chips) get bigger/gain mass when **water moves** in **OR** (chips) get smaller/loses mass when **water moves** out ✓	**3**	2.1	**IGNORE** general description of trends e.g. the **percentage change in mass** increases as the sugar concentration decreases **DO NOT ALLOW** solution or sugar molecules moves in or out
			and **any two from:**		2x3.2b	**ALLOW** correct explanations in terms of differences in **water** concentrations / dilute and concentrated (sugar) solutions
			chip in low(er) concentration (of solution) **or** 0 (mol/dm^3) **or** 0.2 (mol/dm^3) the water potential inside (cells) is **less** ✓			**ALLOW** chip in low(er) concentration (of solution) **or** 0 (mol/dm^3) **or** 0.2 (mol/dm^3) the water potential outside (cells) is **greater** ✓
			(so) water moves in when the water potential inside (cells) is **less** ✓			**ALLOW** water moves in when the water potential outside (cells) is **greater** ✓
			chip in high(er) concentration (of solution) **or** more than 0.2 mol/dm^3 the water potential inside (cells) is **greater** ✓			**ALLOW** chip in high(er) concentration (of solution) **or** more than 0.2 mol/dm^3 the water potential outside (cells) is **less** ✓
			(so) water moves out when the water potential inside (cells) is **greater** ✓			**ALLOW** water moves out when the water potential outside (cells) is **less**✓ **IGNORE** stated definitions of osmosis if they are not applied to the different concentration

Question			Answer	Marks	AO element	Guidance
16	(a)	(i)	follicle stimulating hormone or FSH **AND** luteinising hormone or LH ✓	**1**	1.1	either order **ALLOW** fsh **AND** lh ✓
		(ii)	follicle stimulating hormone or FSH or hormone **Y** causes egg or ovum to mature ✓ **then either** levels of luteinising hormone or LH or hormone **X peaks** which causes ovulation **or** release of egg **or** release of ovum **OR** levels of luteinising hormone or LH or hormone **X** which causes ovulation or release of egg or release of ovum on **day 14** ✓	**2**	1.1 2.1	**DO NOT ALLOW** incorrectly named hormone causes egg to mature e.g. oestrogen causes egg to mature **ALLOW** incorrect name of hormone **X** as long as they identify it as hormone **X** e.g. hormone **X** is oestrogen that peaks to cause ovulation ✓ **ALLOW** incorrect name of hormone **X** as long as they identify it as hormone **X** e.g. hormone **X** is oestrogen that causes ovulation on day 14 ✓ **IGNORE** just 'luteinising hormone or LH or hormone **X** causes ovulation or release of egg or release of ovum' **IGNORE** references to follicle stimulating hormone or FSH or hormone **Y** causes ovulation or release of egg or release of ovum

Question			Answer	Marks	AO element	Guidance
	(b)		idea that body temperature needs to be maintained at optimum temperature for enzymes to work ✓	**3**	3x1.1	**ALLOW** (hypothalamus helps) keeps enzymes working at optimum temperature / keeps enzymes at a temperature where they work the best ✓ **IGNORE** enzymes only work at 37°C or body temperature **IGNORE** references to kinetic energy or collisions
			idea that at low(er) temperatures/temperatures below body temperature the enzyme reactions are slower **OR** idea that at low(er) temperatures/temperatures below body temperature respiration is not releasing enough energy ✓			**ALLOW** at low temperature enzymes work slower / do not work as well **/** have less kinetic energy / collide less often ✓
			idea that at high(er) temperatures or an increase in temperature may cause enzymes to denature ✓			**ALLOW** description of denature e.g. at high(er) temperatures the active site changes shape ✓

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