Oxford Cambridge and RSA

H

GCSE (9–1)

Combined Science (Biology) A (Gateway Science)

J250/07: Paper 7 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for November 2020

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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

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 A:

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

BLANK PAGES MUST BE ANNOTATED TO SHOW THEY HAVE BEEN SEEN

Question			Answer	Marks	AO element	Guidance
11	(a)	(i)	meristem ✓	1	1.1	**IGNORE** shoot tip
	(a)	(ii)	embryonic stem cells can become any cell type in the body / adult stem cells can only become a few different cell types in the body ✓	1	1.1	**ALLOW** embryonic cells can differentiate into any or many cells (adult cannot) **ALLOW** embryonic stem cells are pluripotent/totipotent / adult stem cells are (only) multipotent **IGNORE** references to ethics / lasting longer / more efficient
	(b)	(i)	**FIRST CHECK ANSWER ON THE ANSWER LINE** **If answer = 74 award 3 marks** 11 + 18 = 29 ✓ 254 x 29 ÷100 or 73.66 ✓ = 74 (rounded to nearest whole number) ✓	3	 2.2 2.2 1.2	 **M1** addition of 11 and 18 or value 29 **M2** answer from M1 x 254 ÷100 **ALLOW** for M2 ecf e.g. 18x254÷100 **M3** answer from M2 rounded to nearest whole number Include ecf e.g. two marks if clear working 18x254÷100=45.72=46 **BUT** 46 with no working = zero **ALLOW** 73 for 2 marks

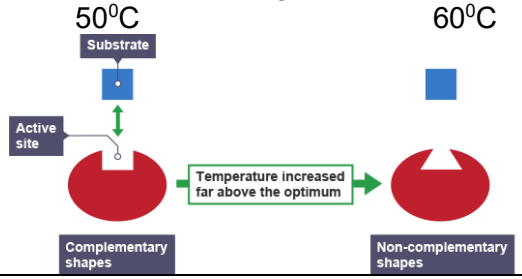
Question			Answer	Marks	AO element	Guidance
	(b)	(ii)	**Any two from:** human embryos may be destroyed ✓ unknown long-term effects ✓ idea of rejection in patient ✓ ethical reasons / religious reasons ✓	**2**	**2 x 2.1**	 **ALLOW** idea that embryo is a living human **ALLOW** may cause viral infection / stem cells may mutate / stem cells may turn cancerous / possible side effects **IGNORE** might be dangerous **ALLOW** examples of ethical issues 'designer babies' / imbalance of sex of child **IGNORE** 'playing god'

Question			Answer	Marks	AO element	Guidance
12	(a)		messenger ✓ endocrine ✓	2	2 x 1.1	**ALLOW** signal **ALLOW** any named endocrine gland
	(b)	(i)	idea that uterus wall builds up/thickens as oestrogen levels rise / idea that progesterone stays high to maintain thickness of uterus wall / when progesterone levels fall uterus lining will break down/get thinner ✓ correct use of data that links either hormone to its level or affect on the uterus wall ✓	2	2 x 2.1	e.g. oestrogen levels rise/thickens (uterus wall) from day 6/7/8/9 progesterone levels stays high/rises/maintains thickness (uterus wall) from day 14-25 (**ALLOW** any value in range 14-25) progesterone levels fall from day 23/24/25 or progesterone levels allow (uterus) wall to break down from day 23/24/25
	(b)	(ii)	causes the egg to mature / stimulates the production of oestrogen ✓	1	1.1	**ALLOW** causes the ovum to mature **IGNORE** references to follicle/progesterone **IGNORE** produces the egg **DO NOT ALLOW** causes ovule to mature

Question			Answer	Marks	AO element	Guidance
13	(a)	(i)	no nucleus ✓ more room to transport oxygen✓ or biconcave disc✓ increase surface area (for diffusion) ✓ or (contains) haemoglobin✓ to bind with oxygen / form oxyhaemoglobin✓	2	2x1.1	**Explanation must match feature for second mark** **ALLOW** so more haemoglobin **ALLOW** description e.g. central dip (on both sides) **ALLOW** large surface area **IGNORE** to transport/carry oxygen (in the stem)
	(a)	(ii)	carbon dioxide✓	1	1.1	**ALLOW** CO_2
	(b)	(i)	cardiac✓ contracts✓	2	2 x 1.1	 **IGNORE** relax
	(b)	(ii)	(**Y**) thin(ner) muscle wall / thin(ner) muscle layer ✓ large(r) lumen✓	2	2 x 2.1	**If answer is X then award zero marks** **ALLOW** thin(ner) elastic wall/layer **IGNORE** just 'thin(ner) wall' **ALLOW** description of lumen e.g. large(r) passage / hole / centre / space **IGNORE** reference to valves

Question			Answer	Marks	AO element	Guidance
14	(a)	(i)	prevent/reduce water loss (from the soil) ✓	1	2.2	**ALLOW** to slow down/stop evaporation (from the soil) **IGNORE** soil remains moist
	(a)	(ii)	idea that this would make the results inaccurate ✓	1	3.3a	**ALLOW** change in mass would not be due to water loss from the plant (only) **ALLOW** idea mass would decrease more than it should / would be more water loss than there should **IGNORE** water would be lost from the soil / incorrect results **DO NOT ALLOW** would not be a fair test / water would get in
	(b)		repeat investigation / have more than one plant in each condition ✓	1	3.3b	
	(c)	(i)	independent – number/amount of leaves ✓ dependent - mass after 24 hours ✓	2	2.2	**IGNORE** just 'leaves' **ALLOW (**percentage) change in mass / volume of water lost **IGNORE** rate of transpiration / just 'volume of water' / 'mass of plant'
	(c)	(ii)	**FIRST CHECK ANSWER ON THE ANSWER LINE** **If answer = 5.1 (%) award 3 marks** (138-131) =7 ✓ (7 ÷ 138) x 100 or 5.0724 ✓ = 5.1 (2 significant figures) ✓	3	2.2 x2 1.2	**M1** calculating difference in mass **M2** (M1÷138) x100 **ALLOW** 100- (131÷138) x100 = 5.072 = 2 marks **M3** evidence of converting percentage from M2 into 2 sig fig only award M3 if a percentage is calculated **ALLOW** two marks for ecf on M2 if M1and M3 are correct **ALLOW** 5.07/5.0 for two marks

Question			Answer	Marks	AO element	Guidance
	*(c)	(iii)	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 difference between plant A and B, to include ideas about transpiration, surface area and stomata. *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)** Attempts an explanation of the difference between plant A and B to include more than one idea about transpiration or surface area or stomata. **AND** Shows some knowledge or understanding of transpiration. *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)** Identifies at least one reason for the difference between plant A and B **OR** Shows some knowledge or understanding of transpiration. *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	1 x 1.2 4 x 3.1a 1 x 3.2b	**AO1.1 Demonstrates knowledge and understanding of scientific ideas about transpiration** • water loss due to transpiration • transpiration/water loss is through the stomata **AO3.1a Analyse information and ideas to interpret and explain the difference between plant A and B** plant **A** has more leaves so / plant **A** has greater (percentage) change in mass because: • more water lost as there are more stomata / ora • has a greater surface area for water loss / ora • more water is lost / ora • faster (rate of) transpiration / ora • faster (rate of) diffusion/evaporation / ora **AO3.2b Analyse information and ideas to draw conclusions to explain the difference between plant A and B** idea that plant A has more leaves so there is greater surface area for water loss as there are more stomata / ora **IGNORE** osmosis/light intensity/photosynthesis/minerals

Question			Answer	Marks	AO element	Guidance
15	(a)		idea that (both) solutions will reach the same temperature ✓	1	3.1b	**ALLOW** so that (both) solutions reach required temperature/temperature of water bath **IGNORE** to make sure the temperature stays constant **IGNORE** so enzyme reaches optimum temperature
	(b)	(i)	idea that molecules have less/low (kinetic) energy ✓ idea of fewer collisions between amylase and starch ✓	2	2x2.1	**ALLOW** less/slower movement of molecules **ALLOW** not enough energy for enzyme activity **IGNORE** enzyme substrate complex cannot form **MAX 1 mark** if reference to amylase has denatured / changes to active site / amylase no longer fits into active site
	(b)	(ii)	amylase is changing shape at 50^0C but still able to work slowly as active site still just fits substrate ✓ at 60^0C enzyme substrate complex cannot form / substrate no longer fits into amylase active site ✓	2	2.2 1.1	**ALLOW** only some of the enzymes are denatured **ALLOW** close to being (completely) denatured **IGNORE** enzymes not denatured (at 50^0C) **ALLOW** all of the enzymes are denatured **If no other mark awarded** **ALLOW** one mark for correct idea of denature at either temperature **ALLOW** labelled diagrams for 2 marks 

Question			Answer	Marks	AO element	Guidance
	(c)		**Any four from:** change pH using (buffer) solution✓ same temperature (using water bath) ✓ same volume of amylase/starch solution/buffer✓ water bath at a suitable temperature/40°C✓ suitable range of at least five different pH ✓ method of recording result ✓	**4**	**4x3.3a**	**IGNORE** change amount of pH buffer **IGNORE** put into acidic or alkaline solutions range should include acid pH7 and alkali e.g. record the time when indictor stays orange

Question			Answer	Marks	AO element	Guidance
16	(a)	(i)	**Any two from**: eukaryotes have a nucleus / prokaryotes do not have a nucleus ✓ eukaryotes have subcellular structures/membrane bound organelles / prokaryotes do not have subcellular structures/membrane bound organelles ✓ prokaryotes have plasmids/slime capsules/pilli / eukaryotes do not have plasmids/slime capsules/pilli ✓	2	2x1.1	**IGNORE** different size **ALLOW** prokaryotes have DNA in cytoplasm **ALLOW** any named membrane bound organelle e.g. mitochondria/chloroplasts/golgi apparatus **ALLOW** prokaryotes have chlorophyll spread around cell or in cytoplasm **IGNORE** eukaryotes have chlorophyll prokaryotes do not / reference to cell walls **IGNORE** cilia/flagella **ALLOW** high level answers e.g. prokaryotes have smaller ribosomes **DO NOT ALLOW** eukaryotes have ribosomes prokaryotes do not
	(a)	(ii)	contains chlorophyll to absorb light ✓	1	1.1	**ALLOW** absorbs light providing energy (for photosynthesis)
	(b)		**Any two from:** slower rate of photosynthesis ✓ less protein/amino acids produced ✓ less/slower growth ✓	2	2x2.1	**IGNORE** less light/less energy **ALLOW** less/no photosynthesis **ALLOW** not enough light for photosynthesis **ALLOW** less glucose/food/biomass/ carbohydrates produced **ALLOW** plants may die **IGNORE** affects growth

Question			Answer	Marks	AO element	Guidance
	(c)		**Any three from:**	3	3x2.1	answer must contain comparison e.g. ' (aerobic) respiration uses glucose and oxygen' = 0 **but** ' (aerobic) respiration uses glucose and oxygen photosynthesis uses water and carbon dioxide' = 1
			photosynthesis requires light energy and (aerobic) respiration requires chemical energy ✓			
			photosynthesis is endothermic (reaction) and (aerobic) respiration is exothermic (reaction) ✓			**ALLOW** photosynthesis takes in energy **and** (aerobic) respiration releases energy
			photosynthesis occurs in chloroplasts and (aerobic) respiration in mitochondria (and cytoplasm) ✓			**ALLOW** photosynthesis requires chlorophyll (aerobic) respiration requires mitochondria
			the rate of both photosynthesis and (aerobic) respiration can be affected by temperature✓			
			only photosynthesis is affected by light intensity or carbon dioxide levels ✓			**IGNORE** references to chloroplast **IGNORE** just photosynthesis needs light (aerobic) respiration does not
			photosynthesis requires carbon dioxide and water aerobic respiration glucose and oxygen ✓			if both of the last two marking points **not** awarded then **ALLOW** as alternatives:
			photosynthesis produces glucose and oxygen aerobic respiration carbon dioxide and water ✓			carbon dioxide and water are the reactants in photosynthesis but the products of (aerobic) respiration glucose and oxygen are the reactants in (aerobic) respiration but the products of photosynthesis **BOTH** equations correctly quoted = two marks (**IGNORE** incorrect balancing if formula used)

Question			Answer	Marks	AO element	Guidance
						IGNORE references to plants and animals **HIGH LEVEL ANSWERS** for extra marking points: photosynthesis uses ATP (aerobic) respiration produces ATP photosynthesis is a two-stage process (aerobic) respiration is a three-stage process photosynthesis uses light to split water into oxygen and hydrogen (aerobic) respiration produces water or uses oxygen

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