GCSE (9–1) H

Combined Science (Biology) A

(Gateway Science)

J250/07: Paper 7 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2019

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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
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
/	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			C	1	1.1	
3			C	1	1.1	
4			B	1	2.1	
5			B	1	1.1	
6			D	1	1.1	
7			D	1	2.2	
8			D	1	2.2	
9			C	1	1.1	
10			D	1	2.2	

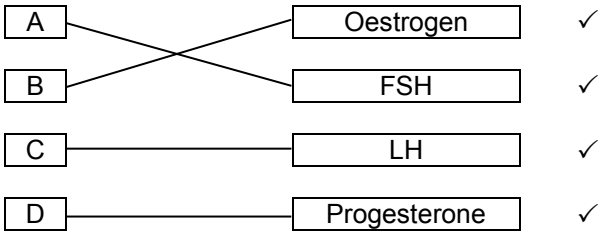
BLANK PAGES MUST BE ANNOTATED TO SHOW THEY HAVE BEEN SEEN

Question			Answer	Marks	AO element	Guidance
11	(a)	(i)	7 ✓	1	1.2	If answer line is blank open up the whole script to check for answer in table. **IGNORE** units
		(ii)	**Any two from:** it is an anomaly / does not fit the pattern ✓ much lower/faster than the other two results ✓ makes the **mean** more accurate ✓	2	3.1b	**ALLOW** (considerably) different to the other results / too far away from the rest of the results / outlier **IGNORE** incorrect result **ALLOW** is **only/just** 8 **ALLOW** it is small compared to other results / should take longer / should be 17-19 **IGNORE** just 'it is small' / 'it is 8' **ALLOW** not using it brings mean closer to true value **ALLOW** using it would lower the mean **IGNORE** not fair test / they measured it wrong
	(b)		10 - spread (of data) is least / smallest range ✓	1	3.2a	**ALLOW only** two minutes between highest and lowest / all within one (minute) of each other **ALLOW** numbers are clos**er** (than the others) **IGNORE** results are similar to each other / mean is close to the other numbers / no anomalies / highest values

	(c)		to show that the algae/algal/beads was causing the effect / as a control ✓	**1**	**2.2**	**ALLOW** to see if the indicator changes colour without algae/algal/beads present **ALLOW** examples of being used as a control e.g. to see if the carbon dioxide is used up without any algae/algal/beads present make sure the hydrogen carbonate does not react with anything else (other than the algal beads) to see if anything changes without the algae (beads) to make sure indicator does not change on its own **ALLOW** as a comparison (to the normal)
	(d)		**Max. two from:** idea that (more algae beads there are) the more chlorophyll/chloroplasts ✓ (more algae beads) absorbs more light ✓ larger surface area to take up more carbon dioxide ✓ **Max. one from:** the more algae/algal/beads present the faster the rate of photosynthesis / ora ✓	**3**	**2x 3.2b** **3.1a**	**ALLOW** more enzymes available (that are involved in photosynthesis) **ALLOW** (more algae beads) absorb more energy **ALLOW** the more algae/algal/beads the more photosynthesis / ora **ALLOW** the more algae/algal/beads present the faster or more carbon dioxide is used / ora **IGNORE** faster rate of reaction **IGNORE** carbon dioxide is a limiting factor/needed for photosynthesis

	(e)	**(i)**	idea of water bath to maintain the temperature ✓	**1**	**2.2**	**ALLOW** change the temperature / idea of using it as a water bath / control the temperature
		(ii)	put the algae beads at different temperatures ✓ **Max. two from:** states the need for controlling **other** variables✓ identifies at least one variable they need to control ✓ measure time to turn purple (at different temperatures) ✓	**3**	**2.2** **2x3.3a**	 **ALLOW** keep everything else the same e.g. keeping the number of beads the same each time / always use 20 beads / same concentration of hydrogen carbonate indicator solution / control light intensity **ALLOW** time how long it takes **IGNORE** find the rate (of photosynthesis)

Question			Answer	Marks	AO element	Guidance
12	(a)		**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 0.8 : 1 award 3 marks** surface area and volume calculated as 384 and 512 ✓ = 0.75 ✓ = 0.8 : 1✓	3	 **2.2** **2.2** **1.2**	 **ALLOW** 384 and 512 anywhere in the answer **ALLOW** 0.7 / 0.80 for 2 marks **ALLOW** 3 : 4 for 2 marks **ALLOW** 0.8 for 3 marks
	(b)	**(i)**	(root hair cells) large surface area (to volume ratio) for mineral or water uptake ✓ idea adaptation increases rate of uptake ✓	**2**	**1.1**	**IGNORE** thin walls / nutrients / xylem / phloem **ALLOW** (larger surface area) increases rate of diffusion/active transport/osmosis **IGNORE** more diffusion/active transport/osmosis /uptake
		(ii)	meristem ✓ (divide) to provide **specialised** cells ✓	**2**	**1.1**	**ALLOW** stem cells / undifferentiated cells **IGNORE** they are specialised cells **ALLOW** (divide) to provide **different types** of cells **ALLOW** they **specialise/differentiate**

Question			Answer	Marks	AO element	Guidance
13	(a)	(i)	 ✓ ✓ ✓ ✓	4	2.1	**ALLOW** any indication of the correct linking when candidates have crossed out lines e.g. letters next to the hormones
		(ii)	**A**/follicle stimulating hormone/FSH causes egg or ovum to mature/develop ✓ **C**/luteinising hormone/LH causes ovulation ✓	2	1.1	**ALLOW** stimulates oestrogen production / stimulates ovaries to release oestrogen / stimulates development of follicles **DO NOT ALLOW** releases the egg or ovum **ALLOW C**/luteinising hormone/LH causes egg to be released (from ovary) **DO NOT ALLOW** prepares/develops the egg for ovulation **IGNORE** references to uterus lining and progesterone / inhibits FSH If no other mark then one mark for FSH and LH cause the egg to be matured and released

	(b)		**Any two from:** (contraceptive pills contain) oestrogen and progesterone/ progesterone ✓ (hormones) prevents FSH/LH release ✓ (lack of FSH/LH) prevent development or maturing of egg or ovulation ✓ (hormones) thickens mucus from **cervix** (stops sperm) ✓ (hormones) **thins** uterus lining preventing implantation ✓	**2**	**1.1**	**IGNORE** just oestrogen **DO NOT ALLOW** FSH or LH in contraceptive pill **DO NOT ALLOW** increased levels of FSH/LH **ALLOW** (lack of FSH/LH) prevent release of egg **ALLOW** (hormones) produces a mucus that stops sperm entering the uterus **DO NOT ALLOW** stops sperm entering egg **IGNORE** thickens or maintains the uterus lining

Question			Answer	Marks	AO element	Guidance
14	(a)	(i)	independent variable – attempt(s) ✓ dependent variables - time (to draw round star) **and** (number of) errors ✓	2	2.2	**IGNORE** distance between lines on the star both needed for mark in either order
		(ii)	**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 73(%) award 3 marks** (15 – 4) = 11 ✓ ((11 ÷ 15) × 100) = 73.3333 ✓ = 73 (%) (2 sig. figs) ✓	3	2.2	 **ALLOW** 11 anywhere in answer for one mark **IGNORE** negative signs anywhere in answer
	(b)		**Any two from:** no repeats / only one person tested / not tested with different people ✓ small **sample** size ✓ only investigates one task ✓	2	3.2a	 **ALLOW** only did the experiment once **ALLOW** results might be different if tested on more/different people **ALLOW** needs bigger **sample** size **ALLOW** idea that results were specific to this task / may not be true for all tasks e.g. drawing between lines is not comparable to most things e.g. it's not a complex task so it is easy to learn **IGNORE** references to chance / flukes / circumstances

*	(c)		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 how the body coordinates this specific response, including a detailed outline of the correct pathway, in the correct order. **AND** Suggests why the time and number of errors decrease. *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 to explain how the body coordinates this specific response, including an outline of the correct pathway, in the correct order. **AND** Suggest why the time and number of errors decrease. *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 explain how the body coordinates this specific response. **OR** Outlines the correct pathway, in the correct order. **OR** Suggests why the time and number of errors decrease. *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**	**2x 1.1** **2x 2.1** **2x3.2a**	**AO1.1 Demonstrates knowledge and understanding of scientific ideas to identify the correct pathway** • receptors detect the stimulus and sends **impulse** to the sensory neurone • sensory neurone sends **impulse** to CNS or relay neurone • CNS or relay neurone sends **impulse** to motor neurone • motor neurone causes muscles or effectors to respond **AO2.1 Applies knowledge and understanding of scientific ideas to explain how the body coordinates the response** • image in mirror detected by **receptors** in the **eye** • CNS/brain **coordinates** the response • motor neurone takes **impulse** from spinal cord down the **arm** to the muscles of the **hands** • muscles in the **hands** bring about the response **Detailed explanation at level 3** • if image in mirror is between stars then CNS/brain coordinates response to continue • if image in mirror outside the space between the stars, CNS/brain coordinates to adjust response in muscles in hand **AO3.2a Analyse information and ideas to make judgements about the pattern in the results** • idea that the response is learned so fewer errors or faster time / becomes more used to the task so fewer errors or faster time / brain remembers so fewer errors or faster time **Detailed explanation at level 3** • new pathways form in CNS/brain (to speed up response) so fewer errors or faster time **IGNORE** reference to muscle memory

Question			Answer	Marks	AO element	Guidance
15	(a)		Q - glycerol **and** R - fatty acid ✓	1	1.1	
	(b)	(i)	optimum pH or peak or highest activity is pH9/is above pH7.5✓	1	2.1	**ALLOW** human lipase denatures after pH7.5 this one is after pH9 **ALLOW** lipase activity still increases above pH7.5 **IGNORE** the graph goes above pH7.5
		(ii)	**Any two from:** each enzyme can only bind to one/a (single) substrate ✓ the substrate fits into/binds the **active site** of the enzyme ✓ the shape of the **active site** fits perfectly/matches the **shape** of its substrate molecules ✓	2	1.1	**ALLOW** each enzyme can only bind to specific substrates **ALLOW** the idea that each enzyme has only one substrate that will fit into enzyme's **active site**✓✓ **DO NOT ALLOW** substrate having an active site **ALLOW** substrate is complementary in **shape** to the **active site** of the enzyme **DO NOT ALLOW** substrate having an active site **IGNORE** references to denaturing

Question			Answer	Marks	AO element	Guidance
16	(a)		**Any two from:** high levels of thyroxine (in blood) inhibit release of TSH ✓ low levels of TSH (in blood) inhibits the release of thyroxine ✓ any change (in energy levels) is detected ✓ changes in thyroxine levels bring energy levels back to normal ✓ high levels of thyroxine inhibit release of (more) thyroxine ✓	**2**	**1.1**	**ALLOW** higher levels of thyroxine increase energy levels / ora **ALLOW** idea that body responds to change to bring it back to normal **IGNORE** when a system counteracts a change in order for internal body conditions to remain constant
	(b)		eating lunch/intake of food increases levels of glucose in the **blood** ✓ insulin converts **glucose** to glycogen (so levels rise) ✓ levels of glycogen then fall as **glucose** in the blood is used up ✓ (because) glucagon causes glycogen to be converted to **glucose** ✓	**4**	**2.1** **1.1** **2.1** **1.1**	**ALLOW** eating lunch/intake of food increases levels of **blood** sugar **ALLOW** eating lunch/intake of food results in high levels of glucose in the **blood** **DO NOT ALLOW** insulin breaks glucose down into glycogen **ALLOW** levels of glycogen fall as glucose levels fall **ALLOW** levels of glycogen then fall because it needs to be converted to glucose **IGNORE** references to time of day

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