OCR
Oxford Cambridge and RSA

GCSE

Biology A

Unit **J247H/03**: Higher Tier – Paper 3

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

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 Biology A:

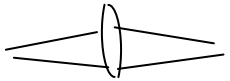
	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge 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**	1.1	
2			B ✓	**1**	1.2	
3			B ✓	**1**	2.1	
4			C ✓	**1**	1.2	
5			D ✓	**1**	1.2	
6			C ✓	**1**	1.1	
7			A ✓	**1**	1.1	
8			C ✓	**1**	2.2	
9			D ✓	**1**	2.1	
10			C ✓	**1**	2.1	
11			A ✓	**1**	1.1	
12			D ✓	**1**	2.2	
13			C ✓	**1**	1.1	
14			B ✓	**1**	1.1	
15			A ✓	**1**	1.1	

Question			Answer	Marks	AO element	Guidance
16	(a)		can control temperature (easier)/ can be set to a specific / constant temperature ✓ limited fire risk✓	2	2 x2.2	**IGNORE** reference to ease of measurement **ALLOW** less risk of burns **ALLOW** ORA
	(b)		for 60^0C / high temperatures: idea that (membranes break down) at 60^0C releasing more DNA / DNA is extracted easily ✓ against 60^0C / high temperatures: increased risk of DNA breaking down at 60^0C / more DNA destroyed at 60^0C / DNA not preserved at 60^0C ✓	2	2 x 2.2	 **ALLOW** idea that enzymes destroying DNA are denatured so less DNA destroyed Answers must make it clear which temperature they are referring to. **ALLOW** ORA
	(c)		wear face mask / goggles to prevent protease/ethanol/chemicals being inhaled / entering eyes✓ gloves / use tongs prevent ethanol/protease/chemicals being in contact with skin✓ turn Bunsen off as ethanol is flammable✓	2	2 x 2.2	 **ALLOW** use tongs as solution/ tube may be hot **IGNORE** reference to lab coats / glass breakages

Question			Answer	Marks	AO element	Guidance
	(d)	(i)	**First check answer on answer line** **If answer = 33.1 (mg) award 2 marks** $\frac{99.2}{3}$ **OR** 33.067 / 33.07✓ = 33.1 (mg) ✓	**2**	**1.2** **2.2**	
		(ii)	(yes because) idea that there is a greater mean / yield / mass produced (of DNA)✓ there is less range/variation in results✓	**2**	**2 x 3.1b**	**ALLOW** ECF **ALLOW** examples of data from table to indicate less range/variability

Question			Answer	Marks	AO element	Guidance
17	(a)		pupil has dilated (in diagram B)✓ radial muscles contracted✓ to allow more light into the eye✓	3	2.1 1.1 1.1	**ALLOW** pupil is larger **IGNORE** eyes / iris dilated **ALLOW** reflex action has occurred
	(b)	(i)	person **X** is short-sighted✓ person **Y** is long-sighted✓	2	2 x 2.1	**ALLOW** person X is myopic / has myopia **ALLOW** person Y is hypermetropic / has hypermetropia (hyperopia)
		(ii)	person X concave/divergent lens **and** person Y convex/convergent lens✓ idea that concave lenses diverge light rays / person X needs a lens to diverge light rays (before they enter the eye)✓ idea that convex lenses converge light rays / person Y needs a lens to converge light rays (before they enter the eye)✓	3	1.1 2 x 2.1	**ALLOW** minus powered lens **ALLOW** plus powered lens **Allow** diagram showing lens diverging light  **Allow** diagram showing lens converging light  Must be stated which diagram refers to which lens or person.

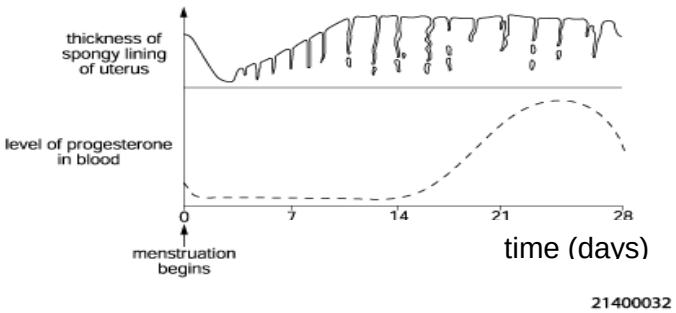
Question			Answer	Marks	AO element	Guidance
18	(a)	(i)	loop of Henlé✓	1	1.1	
		(ii)	collecting duct✓	1	1.1	**ALLOW** DCT **IGNORE** collection duct
	(b)		**Any four from:** glucose (in filtrate but) not in urine so must be reabsorbed✓ sodium chloride low**er** in urine so reabsorbed✓ urea (much) high**er** in urine so not reabsorbed✓ others high**er** in urine so not reabsorbed✓ waste products high**er** in urine so not reabsorbed but useful substances reabsorbed✓	4	3.2b	**IGNORE** unqualified responses e.g. glucose is reabsorbed If no other mark awarded **ALLOW** some substances reabsorbed but others are not

Question	Answer	Marks	AO element	Guidance
(c)*	Please refer to the marking instructions on page 5 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Explains more than one body response to different temperature **and** osmotic challenges. **AND** applies knowledge and understanding to identify a drink requirement both pre-race **and** post-race **AND** analyses information and ideas to explain which sports drink is best for pre-race **and** for post-race. *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)** Explains a body response to different temperature **or** to osmotic challenges **AND** applies knowledge and understanding to identify a drink requirement for pre-race **or** for post-race. **AND** analyses information and ideas to explain which sports drink is best for pre-race **or** for post-race. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.*	**6**	**2 x 1.1** **2 x 2.1** **2 x3.2a**	**AO1.1 Demonstrate knowledge and understanding of scientific ideas of responses of body to different temperature and osmotic challenges.** • exercise causes loss of water through sweating • will use up much of the sugar for energy/respiration/exercise • exercise causes loss of salts through sweating **AO2.1 Apply knowledge and understanding of scientific ideas to identify drink requirements pre-race and post-race** • pre-race drink needs to provide the body with sugar needed for exercise • post-race drink will need to replace salts lost / replace sugars used up **AO3.2b Analyse information and ideas to make judgements about which sports drink is best for pre-race and post-race.** • hypertonic is best for pre-race as it contains the highest levels of sugars / is taken 60 minutes before race as takes time to be absorbed / absorbed slowly so it's effects last for the race • isotonic drink after the race will not change / dilute / increase the concentration of the blood / will match the concentration of body fluids

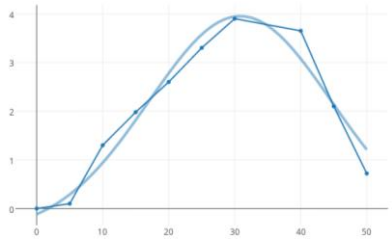
Question			Answer	Marks	AO element	Guidance
			Level 1 (1–2 marks) demonstrates knowledge and understanding of **one** body response to different temperature and osmotic challenges **OR** applies knowledge and understanding to identify a drink requirement either pre-race **or** post-race. **OR** analyses information and ideas to explain which sports drink is best for either pre-race **or** for post-race *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.*			

Question			Answer	Marks	AO element	Guidance
19	(a)	(i)	**Any two from:** idea that ruler release height is not standardised✓ idea that release of ruler may cause uneven fall ✓ It (is the distance measured but time recorded) requires a calculation / may lead to conversion errors ✓ distance apart of fingers is not standardised ✓ fingers cover a range of different readings ✓ anticipation is possible / may learn to expect when it will be dropped ✓	**2**	**2 x 3.3a**	eg may fall sideways **IGNORE** simply readings taken incorrectly **ALLOW** does not specify which part of finger is measured
		(ii)	stimulus is randomised / **time** rather than distance measured / no calculation needed✓ **and any two from:** improvements could include: randomising left and right hand✓ making each target number same distance to move to / same distance from the start button✓ randomising the delay time before the number flashes✓ use a touch screen to avoid moving the mouse ✓	**3**	**3.2a** **2 x 3.3b**	**IGNORE** it uses a computer so its accurate
	(b)	**(i)**	**First check answer on answer line** **If answer = 0.25 award 2 marks** list in rank order / selects correct 5th and 6th values✓ $\frac{0.25+0.25}{2}$ = 0.25 ✓	**2**	**2 x 2.1**	**IGNORE** decimal place for the list in rank order

Question			Answer	Marks	AO element	Guidance
		(ii)	**Any two from:** there is no difference in **reaction times** between left (non-dominant) hand and right (dominant) hand✓ mean **and** the median are the same for both hands / the same for the right (dominant) hand ✓ results from right (dominant) hand have a wider range (than left (non-dominant) hand) ✓	**2**	**2 x 3.1a**	**ALLOW** ECF from b) **ALLOW** ORA Do not credit marks for reference to right and left handed students in each marking point.
	(c)	**(i)**	(skin stem cell) differentiates into (motor) neurone✓	**1**	**2.2**	**ALLOW** differentiates into MN (taken from abbreviation of motor neurone disease to MND in stem of question)
		(ii)	cerebrum✓ idea that area of brain controlling motor function / movement / conscious activities ✓	**2**	**1.1** **2.1**	**ALLOW** cerebral cortex / motor cortex **IGNORE** it is the area that coordinates reactions. **DO NOT ALLOW** a list of correct functions of the cerebrum without the importance of movement being highlighted
		(iii)	**Any two from:** difficult to access brain (due to skull) ✓ large number of neurones / large number of nerve impulses in the brain/ difficult to follow a single neurone ✓ ethical issues of researching on brain / risk of damage ✓	**2**	**2 x 2.2**	**IGNORE** difficult to take measurements in brain unless qualified

Question			Answer	Marks	AO element	Guidance
20	(a)		(Diagram B) because vasodilation✓ (blood vessels) release **more** heat / energy (to environment)✓ sweat being released to <u>evaporate</u> ✓	3	 1.1 2 x 2.1	**if A chosen award no marks** **ALLOW** blood vessels/arterioles have widened / dilated idea of more heat released must be linked to blood vessels **IGNORE** cools down more **ALLOW** sweat not evaporated due to humidity preventing evaporation
	(b)		adrenaline reduces blood flow to the skin✓ less blood lost (during time to clot/receive medical treatment)✓	2	1.1 2.1	**ALLOW** causes vasoconstriction **in skin** **IGNORE** stops bleeding
	(c)	(i)	corpus luteum / (empty) follicle / yellow body ✓	1	1.1	
		(ii)	smooth curve drawn rising and falling✓ fall must start on day 21 or after✓	2	2 x 1.1	 if no fall in progesterone then award 0 marks

Question			Answer	Marks	AO element	Guidance
	(d)	(i)	**First check answer on answer line** **If answer = 19.98 (mm) award 3 marks** 20 - 0.025✓ but 19.975 (mm)✓ 19.98 (mm) ✓	**3**	 **2 x 2.2** **1.2**	
		(ii)	lining is not repaired correctly✓	**1**	**1.1**	**ALLOW** lining will not thicken / not build up **IGNORE** lining will not be maintained / will become thinner
		(iii)	**Any three from:** gonadotrophins used ✓ FSH and LH used✓ FSH lead to ripening of follicle ✓ and LH causes ovulation ✓ human chorionic gonadotrophin (hCG)✓ causes egg/ovum to mature inside follicle✓	**3**	**3 x 1.1**	 **ALLOW** stimulate egg production/development
		(iv)	order of bases is changed (in gene)✓ order of amino acids changed in protein / change in shape of the enzyme ✓	**2**	**1.1** **2.1**	**ALLOW** nucleotides **ALLOW** mutation in base sequence **ALLOW** different amino acids in protein **IGNORE** codes for wrong amino acid to be made

Question			Answer	Marks	AO element	Guidance
21	(a)		energy/heat is taken from surroundings/into the reaction✓	1	1.1	**ALLOW** energy absorbed is more than the energy released
	(b)		suitable smooth line of best fit is drawn✓	1	2.2	 dot to dot line = 0
	(c)		at point A light is limiting as increasing light intensity increases the rate / as it has sufficient temperature and carbon dioxide ✓ at point B temperature is limiting as increasing temperature increases rate / as it has sufficient light and carbon dioxide ✓/ at point C carbon dioxide is limiting as increasing carbon dioxide increases rate / it has sufficient temperature and light ✓	3	3 x 2.1	if no other mark scored allow one mark for correct identification of the three limiting factors with no explanations

Question			Answer	Marks	AO element	Guidance
	(d)	(i)	photosynthesis makes sugars in guard cells✓ epidermal cells (don't photosynthesise so) lower in sugar than guard cell✓ **and any two from:** epidermal cells higher osmotic / water potential than guard cells✓ ORA water enters guard cells (by osmosis) ✓ ORA increasing turgidity of guard cell opens stomata✓ ORA due to thicker inner cell wall✓ opening / size of stoma affects transpiration rate✓	**4**	**2 x 1.1** **2 x 2.1**	**ALLOW** correct description of transpiration linked to the size of stoma
		(ii)	they have differentiated✓ have a **specific** job to do (in the leaf/plant)✓	**2**	**2 x 1.1**	**ALLOW** they have adapted (to their function) **ALLOW** no other cells do the same job **ALLOW** they can open / close stomata they have adapted to a **specific** job / they are adapted to open and close stomata = 2 marks
	(e)		phloem is removed✓ swelling caused by a build-up of food/sugar ✓ food/sugar produced in the leaves / moving downwards cannot get past (the ringed area) ✓	**3**	**3 x 3.2b**	**ALLOW** phloem is on the outside **IGNORE** nutrients / minerals / ions **ALLOW** glucose / sucrose **ALLOW** translocation to roots is prevented

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

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Head office
Telephone: 01223 552552
Facsimile: 01223 552553