OCR
Oxford Cambridge and RSA

H

GCSE (9-1)

Biology A (Gateway Biology)

J247/03: Paper 3 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2019

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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
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 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**	2.2	
2			B	**1**	2.1	
3			A	**1**	1.1	
4			C	**1**	1.1	
5			C	**1**	1.1	
6			D	**1**	1.1	
7			C	**1**	2.1	
8			B	**1**	1.2	
9			D	**1**	1.1	
10			A	**1**	1.1	
11			B	**1**	1.2	
12			B	**1**	2.2	
13			C	**1**	2.1	
14			C	**1**	1.1	
15			B	**1**	2.1	

Question			Answer	Mark	AO Element	Guidance
16	(a)		blood travels through pump/heart twice ✓ on full circuit around body ✓	2	1.1	**ALLOW** idea that there are two pumps / idea that blood is pumped twice **ALLOW** idea that blood passes **separately** to lungs and body
16	(b)		bird ✓ bird has 4 chambered heart ✓ bird has double circulation✓	3	2.1	If bird is not ticked or bird not selected in answer, then zero for question **ALLOW** bird has heart with 4 sections/compartments/named four chambers **ALLOW** description of double circulation
16	(c)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 4 award 2 marks** 25 000÷5800 = 4.3 ✓ = 4 (nearest whole number) ✓	2	 2.2 1.2	 **ALLOW** ECF mark for correct rounding if calculation is incorrect
16	(c)	(ii)	**Any two from:** muscles need more energy / more ATP / more respiration ✓ muscles need more oxygen / more carbon dioxide to be removed / more glucose / to avoid anaerobic respiration / to avoid lactic acid production ✓ other organs not needed (in exercise) ✓	2	3.2a	need to include only one comparative word e.g. more, to be able to score the first two marking points, e.g. muscles need **more** oxygen for energy = 2 marks **ALLOW** to remove more heat **ALLOW** other organs not prioritised / blood diverted from other organs

Question	Answer	Mark	AO Element	Guidance

17	**(a)**		alcohol / ethanol **and** carbon dioxide ✓	**1**	**1.1**	**ALLOW** either order **ALLOW** correct formulae
17	**(b)**		**Any two from:** alcohol produced in yeast (not humans) / ORA✓ lactic acid produced by humans (not yeast) / ORA✓ carbon dioxide produced by yeast (not humans) / ORA✓	**2**	**1.1**	If any incorrect product is stated, then max 1 mark. If yeast or humans are not stated assume answer refers to yeast **IGNORE** reference to oxygen debt / ATP production
17	**(c)**	**(i)**	sucrose ✓	**1**	**3.2a**	
17	**(c)**	**(ii)**	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 12 award 2 marks** 6.0 ÷ 0.5 ✓ = 12 ✓	**2**	**2.2**	
17	**(c)**	**(iii)**	glucose ✓	**1**	**3.2a**	
17	**(c)**	**(iv)**	(Yeast B) doesn't ferment fructose ✓ (Yeast B) produces some fermented products ✓	**2**	**3.1a**	**ALLOW** (Yeast B) does not use up fructose / fructose levels decrease slightly / fructose levels remain high / higher yield of fructose / fructose levels remain constant **ALLOW** reverse arguments for Yeast A **DO NOT ALLOW** fructose is produced **ALLOW** fermented products increased **DO NOT ALLOW** fermented products produced from fructose **DO NOT ALLOW** produces high levels of fermented products **IGNORE** fermented product level stays the same / less fermented product than A

Question			Answer	Mark	AO Element	Guidance
18	(a)		iodine (molecules) moved into bag / through membrane ✓ starch (molecules) cannot move through membrane / out of the bag ✓ starch molecule are large / iodine molecule are small / starch molecules larger than iodine / ORA ✓	3	2 x 3.2a 2.1	**ALLOW** iodine moved into starch solution **DO NOT ALLOW** iodine moved by osmosis through membrane **ALLOW** starch cannot diffuse through membrane **DO NOT ALLOW** starch cannot move by osmosis through membrane **ALLOW** iodine smaller than pores in membrane/ORA✓
18	(b) *		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)**	6	3 x 1.1 3 x 2.1	**AO1.1 Demonstrates knowledge and understanding of scientific ideas to explain how low levels of Na^+ affects the blood**

Question			Answer	Mark	AO Element	Guidance
			Detailed explanation of how low levels of Na^+ affects the blood and how this can affect cells. **AND** Explains the effect of blocking ADH and suggests how this can correct the condition. 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 how low levels of Na^+ affects the blood or how this can affect cells **AND** explains the effect of blocking ADH or suggests how this can correct the condition **OR** Explains how low levels of Na^+ affects the blood and how this can affect cells. **OR** Explains the effect of blocking ADH and suggests how this can correct the condition. 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 how low levels of Na^+ affects water potentials. **OR** Describes the effect of blocking ADH**.** 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.			• blood is hypotonic / less concentrated / higher water potential **AO2.1 Applies knowledge and understanding of scientific ideas to explain how low levels of Na^+ affects cells** • water enters cells by osmosis / as cells are more concentrated / lower water potential than the blood • cell membrane becomes overstretched / lysis may happen / cells will burst **AO1.1 Demonstrates knowledge and understanding of scientific ideas to explain the effect of blocking ADH** • blocking ADH makes the kidney tubule less permeable/less water reabsorbed • blocking ADH increases the volume of water lost from the body/present in urine / urine becomes more dilute **AO2.1 Applies knowledge and understanding of scientific ideas to suggest how blocking ADH can correct the condition** • blood concentration is increased / water potential lowered / water would move out of cell / water will not move into cells • eventually blood and cells are isotonic/same concentration/same water potential/same sodium ion concentration
18	**(c)**	**(i)**	suitable best-fit curve ✓	**1**	**2.2**	**DO NOT ALLOW** obvious double lines or lines drawn with ruler
18	**(c)**	**(ii)**	answer should match where curve of best fit crosses X axis on candidates own line of best fit	**1**	**3.2a**	**ALLOW** +- half a small square ie +- 0.02 from intercept on candidates graph

Question			Answer	Mark	AO Element	Guidance
18	**(c)**	**(iii)**	0.6 (mol/dm^3) ✓	**1**	**2.2**	
18	**(d)**		meristem ✓	**1**	**1.1**	**ALLOW** cambium

Question			Answer	Mark	AO Element	Guidance
19	**(a)**	**(i)**	progesterone ✓	**1**	**2.1**	
19	**(a)**	**(ii)**	any two from oestrogen / FSH / LH ✓	**1**	**1.1**	

19	**(b)**		**Any four from:** treatment contains oestrogen / progesterone / both oestrogen and progesterone ✓ inhibits LH ✓ prevents ovulation ✓ inhibits FSH ✓ prevents egg maturing ✓ thickens mucus ✓	**4**	**1.1**	**ALLOW** inhibits LH which controls ovulation = 2 marks **ALLOW** inhibits FSH which matures eggs = 2 marks **ALLOW** produces mucus
19	**(c)**		glucagon ✓	**1**	**1.1**	
19	**(d)**	**(i)**	(person) **C** ✓	**1**	**3.2a**	
19	**(d)**	**(ii)**	insulin is produced/released / insulin level is high ✓ idea that ability to control glucose levels is reduced ✓	**2**	**2.1**	mark independently of (d)(i) **ALLOW** idea that body is resistant to insulin
19	**(e)**		embryonic stem cells are able to differentiate into any cell / totipotent / adult stem cells are limited / pluripotent ✓ **therefore insulin producing cells** are easier to develop from embryonic stem cells/adult stem cells are not ✓	**2**	**1.1** **2.1**	**IGNORE** adult stem cells are already specialised **ALLOW** difficult to locate adult stem cells **IGNORE** embryonic stem cells can repair all parts
19	**(f)**		gibberellins breaks seed dormancy / elongation of shoots ✓ ethene stimulates fruit ripening ✓	**2**	**1.1**	**ALLOW** stimulates flowering / fruit development / fruit growth / seed formation / germination / growth of shoots **DO NOT ALLOW** fruit ripening **ALLOW** dropping of leaves/fruit / stimulates fruit maturation

Question			Answer	Mark	AO Element	Guidance
20	(a)		digital balance/scales / electronic balance/scales ✓	1	1.2	**ALLOW** analytical balance/scales / scientific balance/scales ✓ **IGNORE** balance/scales unqualified / sensitive scales

20	**(b)**	**(i)**	no chloroplasts / no chlorophyll / no leaves ✓ they cannot photosynthesise ✓	**2**	**2 x 2.1**	**DO NOT ALLOW** chlorophyll removed by alcohol no chlorophyll/chloroplasts/leaves to allow photosynthesis = 2 marks
20	**(b)**	**(ii)**	**Any two from:** include a thermostat ✓ keep the temperature constant/at optimum ✓ control the humidity ✓ circulate air inside the cabinet / keep well ventilated / give a supply of carbon dioxide ✓	**2**	**3.3a**	**IGNORE** include insulation **ALLOW** increase humidity/water vapour **IGNORE** water the plants **ALLOW** give a supply of oxygen
20	**(c)**		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 4 x 10^{-2} (mm) award 2 marks** 0.04 ✓ = 4 x 10^{-2} (mm) ✓	**2**	**2.2**	**ALLOW** correct variations of standard form
20	**(d)**		increased resolution / high magnification / sub-cellular structures visible ✓ (can only be done on) dead material / thin sections only / gives 2-D / expensive (equipment) / possible distortion of material in preparation / less mobile / preparation takes longer/is more complex / (only) black and white images ✓	**2**	**2.2**	**IGNORE** clearer/sharper/more detailed images / can see small cells

Question			Answer	Mark	AO Element	Guidance
21	**(a)**	**(i)**	<u>understanding has increased because:</u> wider range of recording/scanning techniques / technology has developed ✓	**4**	**3.1b**	**ALLOW** named examples eg CAT, EEG / description of the techniques

Question			Answer	Mark	AO Element	Guidance
			improved accuracy of measurement ✓ **maximum three from:** <u>problems existing:</u> difficulties in getting individuals for case studies ✓ may cause harm to patients ✓ interpreting data from case studies is very complex ✓ ethical issues with experimenting on (live) animals / killing/harming animals for experimentation ✓			**ALLOW** map brain function with more accuracy **ALLOW** people reluctant to give consent / need many cases to draw reliable conclusions **IGNORE** consent is needed **ALLOW** may cause cancer in patients **ALLOW** Interpreting brain function/information is difficult / several areas may be involved in a specific function. **IGNORE** unethical to study the brain
21	**(a)**	**(ii)**	**Any two from:** to inform other **scientists** (who might be working on the topic) ✓ to see if other scientists can replicate the work/ to have it peer reviewed✓ to allow recognition for their work✓	**2**	**1.1**	**ALLOW** communicate scientific rationale/methodology for investigations / share ideas with other scientists / allow other scientists to develop work **ALLOW** check/prove/reproduce results **IGNORE** to let people know / to spread it more widely / to make it be accepted as fact
21	**(b)**	**(i)**	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 0.05 (metres per second) award 3 marks** Conversion of 32(nm) to 3.2×10^{-8} (metres) ✓ $3.2 \times 10^{-8} \div 6.4 \times 10^{-7}$ ✓	**3**	**1.2** **2.2 x2**	**ALLOW** ECF from first making point

Question			Answer	Mark	AO Element	Guidance
			= 0.05 (metres per second) ✓			**ALLOW** 5 x 10^{-2}
21	**(b)**	**(ii)**	(in Alzheimer's,) neurotransmitter/it takes longer to diffuse/move (across the synaptic gap) ✓ communication between areas of the brain takes longer / idea that brain function less co-ordinated / idea that making decisions takes longer / idea that reactions are slower / takes longer to comprehend / lack of concentration ✓	**2**	**2.1** **3.2a**	**ALLOW** in healthy people the speed (of diffusion) is faster / in Alzheimer's the speed (of diffusion) is slower need to score first marking point to score this marking point

Question			Answer	Mark	AO Element	Guidance
22	(a)	(i)	**Any two from:** transcription ✓ DNA (template) used to code for/make mRNA ✓ mRNA nucleotides/bases used to synthesis a mRNA molecule / mRNA nucleotides/bases pair with DNA nucleotides/bases ✓	2	1.1	
		(ii)	**Any two from:** translation ✓ mRNA attaches to ribosome✓ tRNA is a carrier molecule for amino acids / tRNA/carrier molecule brings (correct) amino acids into place / tRNA reads the triplets on the mRNA✓	2	1.1	**ALLOW** each triplet code on tRNA/carrier molecule is specific for an amino acid. **DO NOT ALLOW** amino acids are made
22	(b)	(i)	**small traces** of DNA can now be replicated (using PCR) ✓ PCR **makes enough** DNA to profile / PCR **makes enough** DNA to match with suspects ✓	2	2.1	**IGNORE** single copy of DNA Small traces of DNA can be replicated using PCR so that it can match to suspects = 2 marks DNA can be replicated using PCR so that there is enough to match to suspects = 2 marks
22	(b)	(ii)	S phase / DNA replication ✓	1	2.1	**ALLOW** DNA duplication / **IGNORE** synthesis unless qualified
22	(c)	(i)	**Any two from:**	2	2.1	

			check on heredity ✓ look for genetic disorders /identify health risk factors ✓ idea of choosing correct medication / genomics ✓ to confirm a person's identity ✓			**ALLOW** establish family tree / find relatives **ALLOW** specified health risk factor
22	**(c)**	**(ii)**	avoid being identified for a crime / avoid high insurance costs / reluctance of employers to offer jobs / remain unaware of family history/genetic disorders / idea of dislike of sharing personal details / privacy (reasons) ✓	**1**	**3.1a**	**ALLOW** do not want to be found by lost relatives **ALLOW** against the Human Rights Act

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

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553