Oxford Cambridge and RSA

GCE

Biology A

H020/01: Breadth in biology

Advanced Subsidiary GCE

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
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

Annotation	Meaning
BP	Blank Page – this annotation must be used on all blank pages within an answer booklet and on each page of an additional object where there is no candidate response.
	Tick
	Cross
CON	Contradiction
BOD	Benefit of doubt
KU	AO1 – Knowledge and understanding
APP	AO2 – Apply knowledge and understanding
AN	AO3 - Analyse
EVAL	AO4 - Evaluation
^	Omission
NAQ	Not answered question
SEEN	Noted but no credit given
TV	Too vague
OFR	Own figure rule
REP	Repetition

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.

Question			Answer	Mark	AO element	Guidance
						Where a response is written and overwritten with a different letter the mark cannot be awarded unless it is clear which is the answer provided
1			D	1	**1.2**	
2			B	1	**2.6**	
3			A	1	**1.1**	
4			C	1	**1.2**	
5			C	1	**1.2**	
6			A	1	**2.5**	
7			C	1	**2.2**	
8			B	1	**2.5**	
9			B	1	**2.8**	
10			C	1	**1.1**	
11			D	1	**1.2**	
12			D	1	**2.7**	
13			D	1	**2.7**	
14			C	1	**2.4**	
15			C	1	**1.1**	
16			C	1	**2.1**	
17			B	1	**2.6**	
18			D	1	**1.1**	
19			D	1	**1.1**	
20			C	1	**2.6**	

Question			Answer	Mark	AO element	Guidance
21	(a)		(mitosis) for growth (of zygote / embryo) ✓ (which needs) genetically identical cells ✓ (not meiosis as) gametes / haploid cells not produced ✓	2 max	1.2	 **ALLOW** identical genetic information **ALLOW ORA** **ALLOW** diploid cells produced **ALLOW** there is no halving of chromosome number in mitosis **ALLOW** meiosis produces haploid cells / gametes / cells with 23 chromosomes
21	(b)	(i)	*embryonic stem cells* (are) undifferentiated / not specialised ✓ (are) a renewing source of cells / AW ✓ (can) differentiate into any cell type (of the developing foetus) ✓	2 max	1.2	 **ALLOW** have ability to divide continually **ALLOW** can form all types of cells
21	(b)	(ii)	*not totipotent stem cells* as cannot form whole organism ✓ cannot give rise to extra-embryonic tissues / AW ✓ named example of tissue not formed ✓	2 max	2.1	 **ALLOW** are pluripotent **ALLOW** cannot form any, cell / tissue, type Eg have already differentiated a bit (into embryo cells) e.g. umbilicus / placenta / amnion

Question			Answer	Mark	AO element	Guidance
22	(a)	(i)	**1** is long chain (of amino acids) ✓ **2** little / no, tertiary structure ✓ **3** insoluble / has many non-polar amino acids ✓ **4** has, only two different amino acids / only glycine and proline / a small range of amino acids ✓ **5** has a structural function / provides strength (to the artery wall) ✓	**3 max**	**2.1**	**ALLOW** long molecule **IGNORE** reference to secondary structure **Note:** 'many' non-polar amino acids must be implied in response **ALLOW** has many, hydrophobic R groups / amino acids **ALLOW** so can withstand pressure of blood
22	(a)	(ii)	many, hydrogen bonds (between polypeptides) ✓ many, covalent bonds / crosslinks (between collagen molecules) ✓ polypeptides overlap / polypeptides have staggered ends ✓	**1 max**	**2.1**	
22	(b)		1 digest / hydrolyse / break down, collagen into amino acids ✓ **and** 2 place, sample / AW, on, chromatography paper / chromatography plate / stationary phase ✓ 3 dry and repeat ✓ 4 place, (chromatography) paper / (chromatography) plate/ stationary phase, in solvent ✓ 5 additional detail ✓ *max 2*	**3 max**	**1.2 / 2.7**	**ALLOW** 'collagen' for 'sample' unless mp 1 awarded **DO NOT ALLOW** ethanol or water for solvent but allow Butanol or ethanoic acid EG: Place sample on pencil line Draw pencil line close to end of paper Ensure solvent does not reach sample

						Stop movement before solvent reaches top of paper / plate Use pencil line to mark solvent front Use stain to make amino acids visible
22	**(c)**	**(i)**	Rf values 0.23 +/-0.02 and 0.70 +/-0.03 ✓✓ 42/60 = 0.70 14/60 = 0.23	**2**	**2.8**	**ALLOW** 0.21-0.25 and 0.67-0.73 **IGNORE** additional decimal places
22	**(c)**	**(ii)**	(Rf value shows amino acids are) glycine and leucine / isoleucine / phenylalanine ✓ Proline low concentration ✓	**2**	**3.2**	**ALLOW** ecf amino acid from incorrect calculation in cii **IGNORE** any response that refers to the chromatogram and does not refer to the table

Question			Answer	Mark	AO element	Guidance
23	(a)		phospholipid (molecules form) bilayer ✓ (forming) cisternae / network of membranes / flattened sacs ✓ covered (on outside) with ribosomes / AW ✓ membrane continuous with nuclear envelope ✓	3 max	2.1/1.1	**IGNORE** fluid filled **IGNORE** contains / lined with / has a lot of, ribosomes
23	(b)		1 compartmentalisation / maintain different conditions from cell cytoplasm ✓ 2 separating proteins (synthesised) from cell cytoplasm ✓ 3 hold, ribosomes / enzymes, in place ✓ 4 AVP ✓–	2 max	2.1	**1 ALLOW** keeps specific conditions needed in RER **ALLOW** controls what enters RER **ALLOW** for attachment of ribosomes e.g. packaging proteins into transport vesicles / labelling proteins (on vesicle membranes)

Question			Answer	Mark	AO element	Guidance
24	(a)		**P1** some water vapour not condensed ✓ **S1** (so) record mass of bag ✓ **P2** water accumulating in bag / AW, reduces transpiration ✓ **S2** record for, shorter time / less than 6 hours ✓ **P3** not all (liquid) water enters syringe as some left in the bag ✓ **S3** record mass of bag before and after experiment ✓ **P4** time of day / temperature / light intensity, not controlled ✓ **S4** do all experiments at the same, time of day / temperature / light intensity ✓ **P5** paperclip seal not completely airtight (water vapour might escape) ✓ **S5** use, elastic band / sticky tape , to seal bag on leaf ✓ **P6** insufficient time for water to accumulate ✓ **S6** leave for longer time ✓ **P7** leaves of different size ✓ **S7** pick similar sized leaves / measure leaf area and divide ✓	**4 max**	**3.3** **3.4**	Mark first two problems and solutions only Mark as pairs of answers **P** for problem and **S** for suggested improvement **ALLOW** e.g. record for 1 hour **ALLOW** not all water collected from bag **IGNORE** measure leaf surface area
24	(b)		*conclusion* there is (probably) no (significant) difference between the transpiration rates of tomato and water melon leaves ✓ *because* difference in, water collected / transpiration rate, between tomato and watermelon very small ✓ standard deviations (very) large / data very spread out ✓ *max 1*	**2 max**	**3.1/3.2**	 **ALLOW** only 0.008 cm^3 difference 'for very small' **ALLOW** error bars / standard deviations overlap **ALLOW** SD for standard deviation **ALLOW** range bars overlap

Question			Answer	Mark	AO element	Guidance
24	(c)		1 ref. potometer airtight / watertight✓ 2 dry leaves ✓ 3 cut shoot under water / slanted cut ✓ 4 measure distance air bubble travels per (named) time interval OR Measure time for air bubble to travel known distance ✓ 5 calculate volume of water uptake ✓ 6 ref. maintaining (named) constant conditions ✓	4 max	1.2	**ALLOW** use of Vaseline **ALLOW** set up potometer under water **ALLOW** use of correct unit to indicate measurement eg. mm min^{-1} **ALLOW** use πr^2 / cross sectional area x distance (to calculate water uptake)
24	(d)		symplast pathway passing through the cytoplasm / plasmodesmata ✓ apoplast pathway passing, along / between, the cell walls ✓ vacuolar pathway passing through the vacuoles ✓	2 max	1.2	**ALLOW** 1 mark for two named pathways even if descriptions not given or incorrect **ALLOW** 1 mark for two correct descriptions even if names not given

Question			Answer	Mark	AO element	Guidance
25	(a)		1 nucleotides joined by phosphodiester bonds ✓ 2 hydrogen bonds between, complementary / named bases ✓ 3 (polynucleotides) are anti parallel / described ✓ 4 AVP ✓	3 max	1.1	**1 ALLOW** sugar phosphate backbone held with phosphodiester bonds e.g. sense / coding, strand is 5' to 3' antisense / nonsense / template, strand is 3' to 5'
25	(b)	(i)	2.8×10^3 ✓✓✓	3	2.6	**ALLOW** 2.777×10^3 or 2.778×10^3 or 2.78×10^3 **ALLOW** 2 marks for 2777 **ALLOW** max 2 marks for working Each line can be awarded 1 mark: 3000 000 000 / 50 = 60 000 000 (s^{-1}) 60 000 000 (s^{-1}) / 3600 (s) = 16 667 (h^{-1}) 16 667 / 6 (h) **OR** 3 000 000 000 ÷ 21600 (i.e. 6 x 60 x 60) = 138 889 138 889 ÷ 50 1.08×10^6 / 1080000 Each line can be awarded 2 marks: 3000000000 ÷ 1080000 (ie: 6 x 60 x 60 x 50)

						OR $3 \times 10^9 \div 1.08 \times 10^6$
25	**(b)**	**(ii)**	helicase ✓ <u>DNA</u> polymerase ✓ AVP ✓ e.g. (DNA) ligase (DNA) gyrase	**2 max**	**1.2**	**ALLOW** 'helixase'
25	**(b)**	**(iii)**	1 enzymes , are (biological) catalysts / speed up reactions ✓ 2 they lower the activation energy (so reactions can take place at, low / body, temperatures) ✓ 3 high temperatures (in living organisms), would denature, enzymes / proteins ✓	**2 max**	**1.1**	**ALLOW** enzymes catalyse reactions **ALLOW** enzymes reduce time taken for reaction

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>26</td><td>(a)</td><td>(i)</td><td>Ministeria ✓</td><td>1</td><td>2.1</td><td>DO NOT ALLOW 'Ministeria vibrans' or 'M. vibrans'</td></tr>
<tr><td>26</td><td>(a)</td><td>(ii)</td><td><table><tr><th>species</th><th>kingdom</th><th>cell wall molecule</th></tr><tr><td>S. tuberosum</td><td>Plants / Plantae</td><td>cellulose</td></tr><tr><td>C. pallens</td><td>Fungi</td><td>chitin</td></tr></table>✓ ✓</td><td>2</td><td>3.1</td><td>1 mark per column</td></tr>
<tr><td>26</td><td>(a)</td><td>(iii)</td><td>Ref. to nucleoid OR loop / circular OR free in the cytoplasm ✓

not associated with, histones / proteins OR is naked ✓

only one, molecule / chromosome / OR ref to plasmids ✓</td><td>1 max</td><td>1.1</td><td>IGNORE refs to no nucleus

DO NOT ALLOW single strand</td></tr>
<tr><td>26</td><td>(b)</td><td></td><td>sequence of , amino acids / DNA bases / RNA bases ✓

the smaller the, number of differences / percentage difference, the more closely related they are ✓ ORA

reference to named protein e.g. cytochrome c ✓</td><td>2</td><td>1.2</td><td>ALLOW the more similar the sequence the more closely related</td></tr>
</table>

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