GCE

Biology A

H020/01: Breadth in biology

Advanced Subsidiary GCE

Mark Scheme for Autumn 2021

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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.

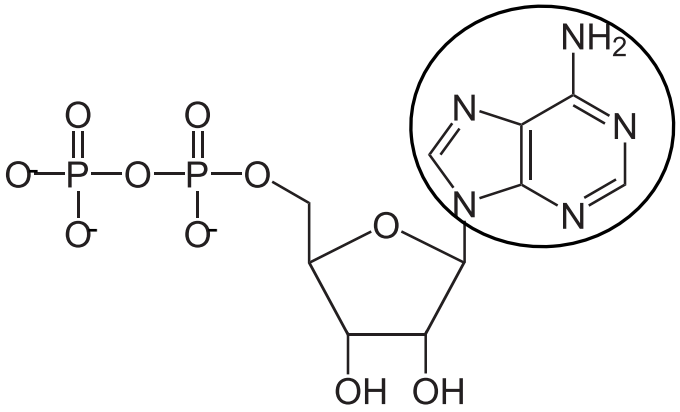
Annotations

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

Marking Annotations

Annotation	Use
BOD	Benefit of Doubt
CON	Contradiction
	Cross
ECF	Error Carried Forward
GM	Given Mark
	Extendable horizontal wavy line (to indicate errors / incorrect science terminology)
I	Ignore
	Large dot (various uses as defined in mark scheme)
	Highlight (various uses as defined in mark scheme)
NBOD	Benefit of the doubt not given
	Tick
^	Omission Mark
BP	Blank Page
L1	Level 1 answer in Level of Response question
L2	Level 2 answer in Level of Response question
L3	Level 3 answer in Level of Response question

Question			Answer	Mark	Guidance
1			B ✓	1	
2			C✓	1	
3			B ✓	1	
4			D ✓	1	
5			D ✓	1	
6			B ✓	1	
7			C ✓	1	
8			D ✓	1	
9			A ✓	1	
10			D ✓	1	
11			C ✓	1	
12			D ✓	1	
13			A ✓	1	
14			D ✓	1	
15			B ✓	1	
16			D✓	1	
17			A ✓	1	
18			A ✓	1	
19			D ✓	1	
20			C ✓	1	

Question			Answer	Mark	Guidance
21	(a)	(i)	circle around the two nitrogen containing rings ✓	1	e.g. 
21	(a)	(ii)	ADP has 2 phosphates **whereas** DNA nucleotide (with adenine) has 1 phosphate ✓ ADP has ribose **whereas** DNA (nucleotide with adenine) has deoxyribose ✓ **or** ADP has OH on carbon 2 of sugar **whereas** DNA (nucleotide with adenine) has no OH on carbon 2 of sugar ✓	2	Note: a clear comparison between ADP and DNA nucleotide must be made
21	(a)	(iii)	condensation ✓	1	**ALLOW** phosphorylation

21	**(b)**	**(i)**	3 bases / triplet, code for 1 (specific) amino acid ✓ sequence of, bases / triplets, determines the sequence of, amino acids / primary structure ✓ (code) non-overlapping ✓ AVP ✓	2 max	e.g. more than one codon codes for an amino acid / degenerate code is, universal / similar in eukaryotes and prokaryotes
21	**(b)**	**(ii)**	mechanical strength (to cells) ✓ cell, support / stability / maintains shape ✓ movement of (named), molecules / vesicles / organelles within cell **OR** holding organelles in position ✓ formation / movement, of, cilia / flagella ✓ cell movement / endocytosis / exocytosis / phagocytosis / cytokinesis / described ✓	3 max	**IGNORE** strength unqualified **ALLOW** maintain internal organisation
21	**(b)**	**(iii)**	movement of mRNA from nucleus to ribosome ✓ movement of <u>polypeptides</u> through the rER ✓ movement of vesicles from rER to Golgi ✓ movement of vesicles between cisternae of Golgi (cis to trans face) ✓ movement of <u>secretory</u> vesicles from Golgi to cell surface membrane✓	2 max	Note: this requires more detail than part ii

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>Guidance</th></tr>
<tr><td>22</td><td>(a)</td><td></td><td>use eyepiece graticule ✓

calibrate graticule, using stage micrometer / detail of calibration / calculate the length of one epu ✓

measure the diameter of the nucleus in, epu / graticule units ✓
take repeat measurements and calculate a mean diameter (in epu) ✓

use calibrated epu to calculate diameter (of nucleus) (in µm) / described ✓</td><td>4 max</td><td>e.g. of detail: align two scales and record number of divisions per graticule unit</td></tr>
<tr><td>22</td><td>(b)</td><td>(i)</td><td>
<table>
<tr><th></th><th>laser scanning confocal microscope</th><th>scanning electron microscope</th><th>transmission electron microscope</th></tr>
<tr><td>maximum resolution</td><td></td><td></td><td></td></tr>
<tr><td>image appearance</td><td></td><td>3D</td><td>2D</td></tr>
<tr><td>image colour</td><td>named colour /coloured</td><td>black and white</td><td></td></tr>
</table>
✓
✓
</td><td></td><td>Mark each row</td></tr>
<tr><td>22</td><td>(b)</td><td>(ii)</td><td>larger number of (named) organelles ✓
more DNA / larger nucleus ✓
no visible chromosomes ✓
nuclear membrane present ✓</td><td>2 max</td><td>ALLOW twice as much DNA</td></tr>
</table>

22	**(c)**	**(i)**	wbc do not have cell walls to break open ✓ wbc are, individual cells / not a tissue, so no separation needed ✓	1 max	
22	**(c)**	**(ii)**	disrupts / breaks down / dissolves, phospholipid bilayer / membrane ✓	1	**ALLOW** remove bilayer / membrane
22	**(c)**	**(iii)**	(named) protease ✓ break down, histones / proteins associated with DNA ✓	2	**ALLOW** hydrolytic

			Answer	Mark	Guidance
23	(a)	(i)	the volume of air in chamber decreases ✓ (spirometer air) contains less O_2 as absorbed by lungs ✓ CO_2 (in exhaled air) is absorbed by soda lime ✓	2 max	
23	(a)	(ii)	13 ✓✓	2	**ALLOW** 12.8 – 13 **ALLOW** one mark for: 9 breaths in 42s 8 breaths in 37s **ALLOW** one mark for ECF for correct calculation using incorrect data
23	(a)	(ii)	2900 ✓✓	2	**ALLOW** 2800 – 3000 max 1 mark for 2.9 **ALLOW** 2.8 – 3.0 for one mark
23	(b)	(i)	in boys (mtv) increases with age (from 13) up to 16 then plateau ✓ in girls (mtv) shows little variation from 12 – 19 ✓ range of values in boys always larger than in girls (except 13) ✓ mean / maximum, volume in boys larger than in girls (except 13) ✓	3 max	

23	**(b)**	**(ii)**	girls **and** 13 ✓ only group where girls mean is above boys ✓ **OR** boys **and** 16 ✓ upper range bar much higher than 15 and 17 ✓	2	*mark as pairs of answers* **ALLOW** does not fit rising trend in girls age 12 –15 **ALLOW** upper end of range bar higher than all others for girls
23	**(b)**	**(iii)**	(standard deviation shows) spread of data compared to mean ✓ reduces the effect of an anomaly (in a data point at the extreme of the range) ✓	2	
23	**(b)**	**(iv)**	103 ✓✓✓	3	**ALLOW** evidence of (√)74000 / 7 **OR** 102.8(174527) for **2 marks** **ALLOW** $\Sigma(x-\bar{x})^2$ = 74000 for **1 mark**
23	**(b)**	**(v)**	*idea of:* random selection (of participants) ✓ (select) healthy participants ✓ (select) participants who are rested ✓ *idea of:* sample to include a range of, fitness / height / size / build ✓ equal numbers boys and girls ✓ equal numbers in each age group ✓	2 max	

24	**(a)**	**(i)**	*any three from:* greater use / overuse / over prescription, of <u>methicillin</u> ✓ not completing course (of methicillin) ✓ *idea of:* use (of methicillin) in farming ✓ natural selection of MRSA ✓ *idea that:* large % increase (in a short time) due to fast generation time ✓	3 max	
24	**(a)**	**(ii)**	*idea of:* universal language ✓ shows evolutionary relationship between species (at the genus level) ✓	1 max	
24	**(b)**	**(i)**	cell wall ✓ (named) metabolic reaction ✓ reproduction of bacterium ✓	1 max	e.g. protein synthesis
24	**(b)**	**(ii)**	many drugs, found in / originated from, plants / microbes ✓ (so, maintaining biodiversity) increase the chance of, finding / developing, new drugs ✓ maintains a genetic resource (for future) ✓ *idea that:* once a species is extinct it's gone forever ✓	2 max	**ALLOW** forest

24	**(c)**		*idea that:* choice / development, of (more effective), drug / treatment, linked to, genotype / genes / individual ✓ GMOs to produce, drug / useful molecule / enzyme ✓ **OR** synthesis of new genes / organisms ✓	2	 **ALLOW** named example e.g. GM E. coli making human insulin GM mammals making drugs with milk proteins monoclonal antibodies for targeted drug delivery

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