OCR
Oxford Cambridge and RSA

GCE

Biology B

H022/02: Biology in depth

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

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

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.

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>1</td><td>(a)</td><td>(i)</td><td>hydrogen ✓</td><td>1</td><td>AO1.2</td><td></td></tr>
<tr><td>1</td><td>(a)</td><td>(ii)</td><td>phosphate (group)
AND
deoxyribose ✓</td><td>1</td><td>AO1.2</td><td>Both required for 1 mark.</td></tr>
<tr><td>1</td><td>(b)</td><td></td><td>X has deoxyribose not ribose ✓
X has 1 phosphate group not 3 ✓
X has sulphur atom ✓</td><td>2 max</td><td>AO2.1</td><td>ACCEPT ORA throughout</td></tr>
<tr><td>1</td><td>(c)</td><td></td><td>
<table>
<tr><th>Nucleotide base</th><th>Percentage of each base in DNA strand 1 (%)</th><th>Percentage of each base in DNA strand 2 (%)</th></tr>
<tr><td>A</td><td>21</td><td>26</td></tr>
<tr><td>C</td><td>11</td><td>15</td></tr>
<tr><td>G</td><td>15</td><td>11</td></tr>
<tr><td>T</td><td>26</td><td>21</td></tr>
<tr><td>X</td><td>18</td><td>9</td></tr>
<tr><td>Y</td><td>9</td><td>18</td></tr>
<tr><td></td><td>✓</td><td>✓</td></tr>
</table>
</td><td>2</td><td>AO2.8</td><td></td></tr>
</table>

Question			Answer	Mark	AO element	Guidance
1	(d)		DNA helicase ✓ cannot unzip the DNA / hydrogen bonds not broken ✓ bases not exposed ✓ *idea of* nucleotides unable to bind ✓ cannot copy whole strand ✓	**4 max**	AO1.2	
1	(e)		P1 blend (all samples) for same (length of) time / at the same speed ✓ P2 same volume of cold water ✓ P3 same mass of table salt ✓ P4 same volume/concentration of protease enzyme ✓ E1 *idea that* sample needs to have similar surface area / similar cell wall breakage ✓ E2 *idea that* the dilution should be the same ✓ E3 *idea that* DNA should have similar solubility ✓ E4 *idea that* unwanted proteins should be removed equally ✓	**2 max** **2 max**	AO3.3	Explanations must match the chosen precautions
			TOTAL:	**10**		

Question			Answer	Mark	AO element	Guidance
2	(a)	(i)	more cases of cervical cancer caused by HPV16 <u>and</u> 18 ✓ fewer caused by HPV 31/33/45/52 ✓ could be caused by another / named factor ✓ no comparison to see if healthy women have HPV ✓	2 max	AO3.1	**ACCEPT** no control group
2	(a)	(ii)	(unpaired) T-test ✓ because means are being compared ✓ unpaired because the strains of HIV are unrelated ✓	2 max	AO2.8	

Question			Answer	Mark	AO element	Guidance
2	(b)*		***Summary of instructions to markers:*** *Read through the whole answer. (Be prepared to recognise and credit unexpected approaches where they show relevance.)* *Using a 'best-fit' approach based on the science content of the answer, first decide which of the level descriptors,* ***Level 1****,* ***Level 2*** *or* ***Level 3****, best describes the overall quality of the answer.* *Then, award the higher or lower mark within the level, according to the* ***Communication Statement*** *(shown in italics):* ○ *award the higher mark where the Communication Statement has been met.* ○ *award the lower mark where aspects of the Communication Statement have been missed.* • ***The science content determines the level.*** • ***The Communication Statement determines the mark within a level.***			

			Level 3 (5–6 marks) Provides a comprehensive list of the types of antigenic material used **and** a detailed description of the problems faced in developing a vaccine. *There is a well-developed line of reasoning which is clear and logically structured and uses scientific terminology at an appropriate level. All the information presented is relevant and forms a continuous narrative.* **Level 2 (3–4 marks)** Provides a list of the types of antigenic material used **and** a description of the problems faced in developing a vaccine. *There is a line of reasoning presented with some structure and use of appropriate scientific language. The information presented is mostly relevant.* **Level 1 (1–2 marks)** Provides a named type of antigenic material **and** a problem faced in developing a vaccine. *The information is communicated with only a little structure. Communication is hampered by the inappropriate use of technical terms.* **0 marks** No response or no response worthy of credit	6	**AO1.1** **AO2.1**	**Indicative scientific points may include:** *types of antigenic material* whole live organism attenuated organism dead pathogen preparation of antigens toxoid *biological problems in producing vaccines* mutation rates antigen variability incubation/storage of vaccine remote area distribution general health of the target group risk of disease from live vaccine
			Total:	**10**		

Question			Answer	Mark	AO element	Guidance
3	(a)	(i)	35% ✓✓	2	AO2.8	**ALLOW** 1 mark for *(17-23) = 6* **ALLOW** 1 mark for Ans/ 17 x 100
3	(a)	(ii)	*idea that* (net) movement of water would have been measurable ✓	1	AO3.2	**ACCEPT** water loss in lower concentrations would be slow **ACCEPT** *idea that* time needed to reach equilibrium
3	(a)	(iii)	all carrot extracts lost water ✓ carrot extracts had a higher water potential (than NaCl sol.)✓ more water loss into more concentrated NaCl solutions✓ both 0.8 & 1.0 had stopped (net) loss of water ✓	2 max	AO3.2	
3	(a)	(iv)	more values 0-0.4 ✓ more intervals ✓ draw graph of distance moved against concentration ✓ read off where the line crosses x-axis ✓	3 max	AO3.3	
3	(a)	(v)	record the distance moved at regular time intervals✓ plot a graph of distance against time and calculate, gradient of steepest part / tangent ✓ **OR** record the distance moved by the meniscus in the first hour ✓ calculate distance/time ✓ *idea of* using volume of cylinder formula ($\pi r^2 d$) to calculate volume of water ✓	2 max	AO3.1	**ACCEPT** suitable time (15-30 minutes) **ACCEPT** volume plotted against time **ACCEPT** suitable time (30 minutes -2 hours) **ACCEPT** volume/time

Question			Answer	Mark	AO element	Guidance
3	(b)	(i)	could have more/less sugar / starch ✓ extract could have a lower / higher water potential ✓ less / more water leaves by osmosis ✓ meniscus move down less / more ✓	1 max 1 max	AO3.2	**ACCEPT** correct refs to reducing g and non-reducing sugars MP 2 - 4 must be correct description of MP1
3	(b)	(ii)	sugar might be sucrose which is not detected by the Benedict's test ✓ *idea that a* positive test for Benedict's is orange-red same as the carrot extract ✓ *idea that* the concentration of sugar may be too low to give a positive test ✓	1 max	AO1.2	**ALLOW** test is subjective
			Total	**13**		

Question			Answer	Mark	AO element	Guidance
4	(a)	(i)	0.66 ✓ dm^{-3} s^{-1} ✓	2 max	AO2.8	(4.8-1.5)/5 = 0.66
4	(a)	(ii)	allows a comparison ✓	1	AO3.1	
4	(b)		reduced lung capacity ✓ less recoil / force of exhalation ✓	2	AO2.5	
4	(c)		age ✓ BMI ✓ gender ✓ smoker ✓	2 max	AO3.1	
4	(d)	(i)	the squamous epithelium becomes scar tissue/ thicker ✓ increased diffusion distance ✓ alveolar walls damaged/absent ✓ lower surface area of alveoli ✓	2 max	AO2.1	**ACCEPT** ref to alveoli
4	(d)	(ii)	less oxygen supplied to muscle (cells) ✓ reduced (aerobic) respiration / energy release / ATP production ✓ tiredness / lethargy ✓ decreased activity ✓	2 max	AO2.1	
			Total:	11		

Question			Answer	Mark	AO element	Guidance
5	(a)	(i)	2 million (per year) ✓✓	2	AO2.1	**ALLOW** 1 mark for (8-24) = 16 **ALLOW** 1 mark for Answer/ 8
5	(a)	(ii)	deaths falling (since 2004) ✓ new diagnoses falling (since 1996) ✓	2	AO2.1	
5	(a)	(iii)	not all countries have accurate records on cause of death ✓	1	AO2.1	
	(b)		antibiotics cannot destroy (HIV) virus ✓ can kill opportunistic (bacterial) pathogens ✓	2	AO2.1	**ACCEPT** named example of an opportunistic pathogen that is killed

Question			Answer	Mark	AO element	Guidance
5	(c)*		***Summary of instructions to markers:*** *Read through the whole answer. (Be prepared to recognise and credit unexpected approaches where they show relevance.)* *Using a 'best-fit' approach based on the science content of the answer, first decide which of the level descriptors,* ***Level 1****,* ***Level 2*** *or* ***Level 3****, best describes the overall quality of the answer.* *Then, award the higher or lower mark within the level, according to the* ***Communication Statement*** *(shown in italics):* ○ *award the higher mark where the Communication Statement has been met.* ○ *award the lower mark where aspects of the Communication Statement have been missed.* • ***The science content determines the level.*** • ***The Communication Statement determines the mark within a level.***			

Question			Answer	Mark	AO element	Guidance
			Level 3 (5–6 marks) Provides a comprehensive description of the biological, ethical **and** economic factors and how factors may differ between developing and developed countries. *There is a well-developed line of reasoning which is clear and logically structured and uses scientific terminology at an appropriate level. All the information presented is relevant and forms a continuous narrative.* **Level 2 (3–4 marks)** Provides a detailed description of the biological, ethical **and** economic factors. *There is a line of reasoning presented with some structure and use of appropriate scientific language. The information presented is mostly relevant.* **Level 1 (1–2 marks)** Provides a brief description of the biological **or** ethical / economic factors. *The information is communicated with only a little structure. Communication is hampered by the inappropriate use of technical terms.* **0 marks** No response or no response worthy of credit	6	**AO1.1** **AO2.1**	**Indicative scientific points may include** *Ethical problems* encouraging use of contraception discouraging breast feeding contact tracing encouraging testing religious objection stigma *Economic problems* cost of education cost of contraception cost of health facilities / medical staff cost of tests cost of treatments *Biological problems* high mutation rate of virus hides / evades immune cells symptomless carriers easily transmitted *Differences* access to medical services access to education cultural practices and beliefs
			Total	**14**		

Question			Answer	Mark	AO element	Guidance
6	(a)	(i)	5 ✓	1	AO1.2	
6	(a)	(ii)	we share a common ancestor with *Pan paniscus* more recently than with *Gorilla gorilla* ✓	1	AO1.2	**ACCEPT** 5 million years ago compared with over 7 million years ago
6	(b)	(i)	moves further under the skull/AW ✓ allows the species to walk upright ✓	2	AO2.1	
6	(b)	(ii)	increased cranial capacity / cavity ✓ larger skull ✓	1	AO2.1	**IGNORE** bigger brain as this is not seen in Fig 6.2
6	(b)	(iii)	complete fossils not found / only pieces of fossils found ✓ (similarities in) behaviour cannot be observed ✓ unknown if viable (hybrid) offspring have been produced ✓ *idea that* not all tissues fossilise ✓	1	AO2.1	
6	(c)		deoxyribose (nucleotide) ✓ ribose nucleotide ✓ amino acid ✓	3	AO1.2	
			Total	9		

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