GCE

Biology B

H022/02: Biology in depth

Advanced Subsidiary GCE

2021 Mark Scheme (DRAFT)

This is a DRAFT mark scheme. It has not been used for marking as this paper did not receive any entries in the series it was scheduled for. It is therefore possible that not all valid approaches to a question may be captured in this version. You should give credit to such responses when marking learner's work.

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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.

1. 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

2. Subject Specific Marking Instructions

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
1	(a)	(i)	waft / move, mucus removes dust / pollen / pathogens ✓	1	1.1	**NOT** dirt
		(ii)	**FIRST CHECK ANSWER ON ANSWER LINE** **If answer =** 3250 **award 2 marks** 13/4 = 3.25 ✓ x 1000 = 3250 ✓✓	2	2.8	**ALLOW one mark** for 13/4
	(b)		*yes, because* salbutamol increased the oxygen consumption the most ✓ *no, because* the range bars overlap ✓ no statistical test carried out ✓ only two drugs tested ✓ may have more side effects (than Fenoterol) ✓	max 4	3.2	**ALLOW** corticosteroids have not been tested
	(c)		(saline) may cause water to move from cells (by osmosis) ✓ *idea that* (saline) may cause blockage of the bronchioles / alveoli ✓ reducing air supply to alveoli ✓	max 2	2.1	

<table>
<tr><td></td><td>(d)*</td><td></td><td colspan="4">Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.
In summary:
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.</td></tr>
<tr><td></td><td></td><td></td><td>Level 3 (5–6 marks)
Provides a detailed description of how to calibrate an eye piece graticule with a stage micrometer before using it, measuring the cell and details of how to make the results more accurate and reproducible.
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)
Provides a description of how to use an eye piece graticule and how to make the results more accurate and reproducible.
There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.

Level 1 (1–2 marks)
Provides a brief description of how to use an eye piece graticule and how to make the results either more accurate or reproducible.
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.</td><td>max 6</td><td>1.2, 2.8</td><td>Indicative points may include:

Calibration
• align the eyepiece graticule with the stage micrometer
• count how many EPU = 1 division of micrometer scale (100µm or 0.1mm)
• calculate length of one EPU
• must be recalibrated if magnification changed

Using the eye piece graticule
line up the eye piece graticule with the cell
count how many EPU = 1 cell
calculate number of EPU x size of one EPU

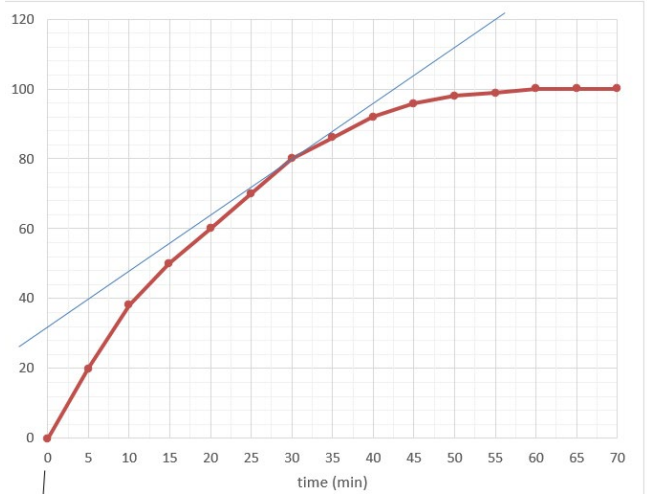
Accuracy
use at the highest magnification (x400)
use a stain or adjust lighting (to make edge of cell easy to identify)
measure more than one diameter per cell and take a mean
repeat with (more than 3 cells) to identify anomalous results

Reproducibility</td></tr>
</table>

						Same method should be carried out by another scientist using different equipment to check that the same result is obtained

Question			Answer	Mark	AO element	Guidance
2	(a)		*Not a younger person as* not fully grown / full maturity ✓ *Not an older person as* older person will have lost some lung function ✓	2	2.3	**ORA** **ACCEPT** examples such as reduced elasticity or respiratory disease
	(b)		less aerobically fit ✓ loss of lung elasticity ✓ more chance of respiratory disease ✓ smoking ✓ long-term effect of air pollution ✓	max 2	2.3	
	(c)		cover mouth and nose for baby **AND** cover mouth and pinch nose for adult ✓ smaller breaths / puffs for baby **OR** larger breaths in adults ✓ more breaths per minute for baby **OR** fewer breaths per minute for adult ✓	3	1.2	Answer must have comparative statements **ACCEPT** explanations in terms of force e.g. gentler breaths for baby **ACCEPT** suitable figures e.g. 15 for adult and 20 for baby

Question			Answer	Mark	AO element	Guidance
3	(a)	(i)	time **and** absorbance ✓	**1**	3.2	
		(ii)	decreased temperature decreases kinetic energy ✓ enzymes <u>and</u> substrates collide less frequently ✓ turns colourless more slowly ✓	**max 2**	2.3	**ORA** throughout **ACCEPT** named trypsin <u>and</u> casein
		(iii)	<u>thermostatically controlled</u> water bath ✓	**1**	2.7	**NOT** electronic or electric water bath
	(b)		pH ✓ alters the tertiary structure / denatures, the enzyme ✓ casein/substrate concentration ✓ more substrate would increase the time taken to go colourless ✓	**4**	3.4	Answer must have explanation of the variables for full marks **ACCEPT** a description of denaturation e.g. breaking H/ionic bonds **ACCEPT** increased substrate conc. would increase rate of reaction until all active sites are in use.
	(c)		correctly drawn tangent ✓	**3**	2.8	Should touch the top of curve at 30 minutes with all points below the tangent line as shown

			0.416 g min^{-1}✓✓			 Change in y e.g. 88% in 55 min = 1.6% min^{-1} 1.6% of 26g = 0.416g min^{-1} **OR** Change in y = 88% 88% of 26g = 22.88g Rate = 22.88/55 = 0.416g min^{-1} **ALLOW** answers between 0.36- 0.47 If incorrect award one mark <u>for using tangent line</u> to calculate $\frac{\text{change in y}}{\text{change in x}}$ **ALLOW** ecf when calculating g/min^{-1} from an incorrect tangent line or gradient **ALLOW** answers given up to 4d.p.
	(d)		(soybean trypsin inhibitor) reduces rate of, enzyme / trypsin, activity ✓ fewer proteins , broken down / digested ✓ fewer amino acids for protein synthesis ✓	**max 2**	3.1	**ACCEPT** fewer amino acids absorbed

Question			Answer	Mark	AO element	Guidance
4	(a)	(i)	**M** help cell bind to host cells ✓ **N** carries the genes / genetic information, for HIV ✓	2	1.1	**DO NOT ACCEPT** descriptions of regions without their roles
		(ii)	reverse transcriptase ✓	1	1.1	**ACCEPT** enzyme or other named enzymes e.g. integrase, ribonuclease, protease

Question			Answer	Mark	AO element	Guidance
	(b*)		***Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.*** ***In summary:*** *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) Detailed description of how HIV is transmitted, linked to the difficulty in controlling the spread of the disease. *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)** Good description of how HIV is transmitted and a brief description of why it is difficult to control the spread of the disease. *There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.* **Level 1 (1–2 marks)** Brief description of how HIV is transmitted. *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.*	**max 6**	1.2, 2.1	Indicative points may include: **Mode of transmission** Unscreened blood transfusion From mother to baby during breast feeding From mother to baby across the placenta or during childbirth sharing contaminated intravenous/hypodermic needles unprotected sexual intercourse Use of unsterilized surgical equipment Exchange of body fluids e.g. blood to blood contact Accidents such as 'needle-stick' **Difficulty controlling the spread** Time consuming / cost of screening blood or sterilising equipment in poorer countries Lack of education about transmission by breast feeding/pregnancy Reluctance to use formula milk due to cost/culture Intravenous drug users unlikely to tell others Cost of providing sterile needles to drug users

						Prefer unprotected sex / starting family/religious reasons Symptomless carriers
	(c)	**(i)**	(takes time for) recognition of HIV by white blood cells ✓ ribosomes to synthesise proteins ✓ Golgi to modify proteins into antibodies ✓ antibodies to be secreted into blood ✓	**max 2**	2.2	**ACCEPT** clonal selection / clonal expansion
		(ii)	**FIRST CHECK ANSWER ON ANSWER LINE** **If answer =** 7.63×10^{66} **award 3 marks** 18 x 24 = 432 / 16 = 27 life cycles 1×300^{27} 7.63×10^{66} ✓✓✓	**3**	2.8	**ALLOW** 1 mark for correct working **ALLOW** 2 marks for correct answer not in standard form
	(d)	**(i)**	constant region ✓ allows antibody to bind to phagocyte / mast cell ✓	**2**	1.1	
		(ii)	sequence of amino acids is different ✓ tertiary structure is different ✓ charges on the R-groups are different ✓ complementary to different antigens ✓	**max 2**	1.2	

Question			Answer	Mark	AO element	Guidance
5	(a)		set volume of glucose solution ✓ boil for suitable time ✓ measure / subtract, the mass of filter paper ✓ dry to constant mass ✓	**max 3**	3.4	**ACCEPT** a stated volume e.g. 2 cm^3 **ACCEPT** stated time e.g. 2 minutes **ACCEPT** description of drying to constant mass
	(b)		distilled water instead of glucose solution ✓	**1**	3.1	
	(c)		2.3 – 2.4% ✓	**1**	2.8	
	(d)		add (dilute) HCl and boil ✓ hydrolyses the glycosidic bonds ✓ add sodium hydrogen carbonate ✓ neutralises the acid ✓	**4**	3.3	 **ACCEPT** add alkali

Question			Answer	Mark	AO element	Guidance
6	(a)		Erythrocytes has no DNA/chromosomes, and prokaryotes have circular DNA molecules ✓ no cell wall and peptidoglycan cell wall ✓ have haemoglobin and no haemoglobin ✓ no mesosomes and have mesosomes ✓ no slime layer and have slime layer ✓	max 2	1.1	**DO NOT ALLOW** a description of one cell without comparative statements **DO NOT ALLOW** eukaryote features that would not apply to erythrocytes **ACCEPT** capsule for slime layer
	(b)		C D (E) A B ✓✓✓	3	2.1	If answer incorrect award up to 2 marks for: C FIRST B LAST ✓ D AFTER C ✓ A AFTER D ✓
	(c)		add bacteria to agar plates ✓ add plant extract to agar plates, in wells / sterile filter paper discs ✓ incubate plates (for 24 hours) ✓ identify zone of inhibition ✓	max 2	2.5	
	(d)		not cost effective ✓ not as effective as a drug currently available ✓ not considered safe / reference to side effects ✓	max 1	1.2	

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