

International AS **Biology**

BL02- Biological systems and disease
Mark scheme

9610

June 2018

Version/Stage: 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

Question	Marking guidance	Mark	Comments
01.1	1. Salivary Glands; 2. Pancreas;	1	Both correct for 1 mark In either order
01.2	1. (Could be correct as) Benedict's test indicates the chewed bread contains a reducing sugar (which could be glucose); BUT 2. (The student's conclusion is incorrect because) Glucose is not the only reducing sugar/maltose is also a reducing sugar; BECAUSE 3. Amylase hydrolyses starch to maltose (a reducing sugar) hence positive test;	3	3 Subsumes 2
01.3	1. Villi and/or microvilli provide large/increased surface area; 2. Thin walls decrease the diffusion pathway; 3. Presence of channel/carrier proteins (for glucose) for facilitated diffusion/active transport/co-transport; 4. Mixing by movement of villi maintains a concentration gradient; OR Good blood supply to maintain a concentration gradient;	3 max	1. Accept description, e.g. walls are highly folded 2. Accept description, e.g. blood vessels are near the surface 4. Accept description, e.g. many capillaries/network of capillaries/blood flows

Question	Marking guidance	Mark	Comments
02.1	1. Small B-cell = $\frac{4}{3} \times \pi \times 3^3 = 113 \mu\text{m}^3$ and Plasma cell = $\frac{4}{3} \times \pi \times 6.5^3 = 1150 \mu\text{m}^3$; 2. Ratio is 10:1/10.17:1/10.2:1;	2	Accept 1:10 (10.17/10.2) for 1 mark Accept ratio = $6.5^3 : 3^3$ or $13^3 : 6^3$ for 1 mark (since $= \frac{4}{3} \times \pi$ cancels out) Reject 10 alone as needs to be a ratio
02.2	Cause agglutination/stimulate phagocytosis;	1	Accept description
02.3	(The deliberate) introduction of an antigen/weakened pathogen/attenuated pathogen to cause an immune response;	1	Accept description
02.4	(BCG unsuitable as) Live bacteria so may cause disease (in immunocompromised/people with CVID);	1	

Question	Marking guidance	Mark	Comments
03.1	- glucose; - ions/named ions/electrolytes	2	- Ignore starch - Accept salt(s) /named salt e.g. NaCl Accept chemical symbols e.g. Na⁺ but reject metals e.g. sodium/Na
03.2	- Standard ORS plus PHGG/study shortens duration of symptoms; - Mass of watery diarrhoea decreases from d1 to d3 in both control and study groups; - Larger reduction in the mass of watery diarrhoea over the 3 days in study group than in control; - Differences are significant/not due to chance because standard deviation bars do not overlap;	4	- Accept converse – differences are not significant/are due to chance because standard deviation bars overlap
03.3	(More sodium ions taken into cells of walls of colon) - Lowers water potential (of cells in the walls of colon/in blood); - So water is taken in by osmosis;	2	- Accept converse re gut lumen - Accept converse
03.4	Standard ORS works so it's not ethical to withhold known effective treatment for a trial/ water is not effective treatment; OR Patients could become more ill/become worse/die;	1	

Question	Marking guidance			Mark	Comments
04.1		Binary fission	Mitosis	2	Mark by column
	Genetically identical cells are produced	✓	✓		
	Nuclear membrane breaks down	x	✓		
	Chromosomes are arranged on the spindle	x	✓		
04.2	A change in the DNA sequence/base sequence;			1	Accept change in a base/gene/chromosome
04.3	Horizontal gene transmission;			1	
04.4	Correct answer 3.3 per min = 2 marks;; For one mark accept incorrect answer if shows converted mutation rate to per min i.e. division by 30 (min); OR 1. multiplication of mutation rate by 10^5 /100000;			2	Accept 3/3.33 for 1 mark

04.5	(For) 1. Protein g3p would block pili/conjugation tube; 2. Stop conjugation/horizontal gene transfer; 3. Prevent/reduce transfer of plasmid/antibiotic resistance gene from bacterium to bacterium; (Against) 4. Not all conjugation tubes blocked so some transfer of plasmid may still occur; 5. Would not prevent bacteria gaining antibiotic resistance by mutation; 6. Bacteria can still reproduce asexually/undergo binary fission so we get large numbers of resistant bacteria;	3 max	For full marks must have at least one for and one against 6. Accept mitosis as equivalent to asexual reproduction (as concept already tested in Q4.1)
-------------	--	--------------	---

Question	Marking guidance	Mark	Comments
05.1	(Genetic material) RNA used to synthesise DNA;	1	Reject RNA is converted into DNA
05.2	To attach to (host/human) cells/receptors/CD4 cells;	1	Ignore antigen-antibody binding unless qualified
05.3	<u>Helper-T</u> cells;	1	Accept T _H cells
05.4	1. Overall pattern: Initial decrease then increase/return to normal followed by decrease; 2. Suitable values from graph: Peak 530-550, trough 400;	2	2. Accept calculated values, e.g. decreases by 150
05.5	1. Replication of HIV/virus/particles/increased viral load / destroys/infects/reduces number of T (helper) cells/CD4 cells; 2. T cells/CD4 cells required for immune response/stimulate B cells; 3. AIDS is a series of (opportunistic) diseases caused by immune system not working/insufficient T cells/CD4 cells;	3	2. Accept antibody production if clearly stated by <u>B</u> / <u>plasma cells</u>

Question	Marking guidance	Mark	Comments
06.1	Any three from • age/age range • gender • level of fitness/exercise • no activity between step 3 and 4 • reference to time of day/food/drink intake beforehand/diet • ethnicity • health, e.g. not diabetic/heart conditions • size/body mass/BMI/weight • seated position of students • similar/normal caffeine intake • volume/amount of drink • type of drink/dose of caffeine • smoker/non-smoker	3 max	Ignore temperature Reject time to drink the drink as in stem of Q
06.2	Identical ingredients minus caffeine;	1	No caffeine alone is not enough Accept decaffeinated soft drink as mirrors wording of Q
06.3	1. Heart rate higher after caffeine/drug; 2. Standard deviations/error bars overlap; 3. Effect of caffeine/drug/difference between means not significant/may be due to chance/another factor;	3	1. Accept use of numbers 2. Reject standard error/SE bars 3. Reject results not significant

Question	Marking guidance	Mark	Comments
07.1	Glucose/sucrose;	1	Reject starch Accept sugars/any named sugar/amino acids
07.2	1. Present in leaves supplied with radioactive carbon dioxide/region A; 2. Not present in other leaves/leaves not supplied with radioactive carbon dioxide; 3. Present in stem <u>and</u> roots <u>and</u> flowers;	3	Everywhere = 0 marks Everywhere except leaves not given radioactive CO ₂ = 3 marks
07.3	1. (Radioactive) carbon dioxide taken up by leaves in region A; 2. (Radioactive) sucrose/carbon compounds translocated /transported in phloem; 3. (Radioactive) glucose/sucrose/carbon compounds found in roots/flowers for respiration/growth/synthesis/storage; 4. Other leaves (those not in region A) using CO ₂ from air to make their own carbon compounds;	3	Allow sugars throughout Accept organic substances throughout as matches Q stem
07.4	1. Co-transport/active transport/facilitated diffusion of sugars into phloem sieve tubes; 2. Water potential is lowered; 3. <u>Water</u> moves in by osmosis/diffusion;	3	1. Accept solutes, substances 2. Accept Ψ , Ψ_s , osmotic potential, solute potential
07.5	Comparing the difference between 2 means/to see if the difference is significant;	1	

07.6	The probability of the differences between the sets of data being due to chance is less than 5%/0.05; The differences are therefore significant/not due to chance/can reject the null hypothesis;	2	Reject “results” once
------	--	---	-----------------------

Question	Marking guidance	Mark	Comments
08.1	cardiac output = <u>stroke volume</u> × heart rate;	1	Accept CO= SV x HR
08.2	(At 20 dm ³ min ⁻¹) heart rate is 120 (118-122) and stroke volume is 168 (166-170) 1. 120 × 168 2. 20,160/1000 = 20.2 dm ³ min ⁻¹	2	Accept instructions on how to calculate without numbers Calculated values should lie between 19.5-20.4 2. Allow 20.16 or 20
08.3	1. Diastole/atria and ventricles relaxed; 2. Blood enters from pulmonary veins and vena cava; 3. Atrial systole/atria contract <u>and</u> increased pressure opens AV valves; 4. Ventricular systole/ventricles contract <u>and</u> increased pressure closes AV valves; 5. Increased pressure opens semi lunar valves; 6. Blood pumped into aorta and pulmonary artery;	6 max	Accept converse re closure of any valves If no marks gained from mp3, 4 or 5, accept prevents backflow

08.4	1. This group has highest incidence of coronary heart disease/CHD; 2. High(er) cholesterol and/or low(er) HDL concentration leads to atherosclerosis/atheroma/plaque formation/fatty deposits in <u>coronary arteries</u>; 3. High(er) blood pressure may damage walls of coronary arteries/cause aneurism/thrombosis;	3	
------	---	---	--