

OXFORD

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AQA EXAMINATIONS

INTERNATIONAL AS **BIOLOGY**

BL02 (9610)

Unit 2 Biological Systems and Disease

Mark scheme

January 2021

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2 1 1 X B L 0 2 / M S

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MARK SCHEME – INTERNATIONAL AS BIOLOGY – BL02 – JANUARY 2021

Question	Marking guidance	Mark	Comments
01.1	1. Thick/muscular wall to withstand high pressure (at systole/when LV contracts); 2. (Thick) elastic tissue to stretch <u>and</u> recoil OR to maintain blood pressure/even out surges; 3. Valve to prevent backflow (when LV relaxes/diastole); 4. Wide lumen to carry large volume of blood (with little resistance);	3 max	

Question	Marking guidance	Mark	Comments
01.2	4200;;	2	Allow 4236 for 1 mark Allow $\frac{70.6}{100} \times 6000$ for 1 mark

Question	Marking guidance	Mark	Comments
01.3	Large lumen;	1	

Question	Marking guidance	Mark	Comments
01.4	To allow (metabolic) exchange;	1	Allow suitable named substance(s)

Question	Marking guidance	Mark	Comments
01.5	1. Small intestine/ileum; 2. (Pores would) allow large molecules to pass through OR (Pores would) allow faster movement;	2	1. Allow kidney/glomerulus or endocrine gland/named endocrine gland, e.g. pancreas; 2. Do not allow easier

Question	Marking guidance	Mark	Comments
02.1	Humidity; Light (intensity); Air movement/wind;	2 max	Any order

Question	Marking guidance	Mark	Comments
02.2	Refill pipette (to allow further measurements); OR Return fluid level to start;	1	

Question	Marking guidance				Mark	Comments
02.3	Time since start (min)	Reading on pipette	Volume of water taken up mm ³	Rate of water uptake mm ³ min ⁻¹	2 max	3 correct values to 2 decimal places for 2 marks Allow 2 correct values to same number of decimal places for 1 mark Allow inconsistent number of decimal places or incorrect rounding for 1 mark
	0	0.5	0.0	0.00		
	15	4.4	3.9	0.26		
	30	8.1	7.6	0.25		
	45	11.8	11.3	0.25		

Question	Marking guidance	Mark	Comments
02.4	(Idea of) How much bigger the whole plant is than a single leafy shoot;	1	For example, number of leaves on shoot compared to whole plant or leaf surface area of shoot compared with whole plant

Question	Marking guidance	Mark	Comments
02.5	1. Faster evaporation/transpiration; 2. from exposed soil or <u>higher</u> temperature or more dry/windy (than in lab); OR 3. Faster water uptake/loss/evaporation from leaves or loss of turgor; 4. As more leaves/larger surface area (than calculated); OR 5. (Wilting) reduces evaporation/transpiration; 6. (by) reducing surface area or covering stomata;	2	Mark in pairs 1 and 2 OR 3 and 4 OR 5 and 6 4. Allow (different species of plant so) more stomata 4. Allow increase in light intensity so more stomata open

Question	Marking guidance	Mark	Comments
02.6	1. Ions actively transported into xylem (by endodermal cells); 2. Lowers water potential (in xylem); 3. Water moves into xylem by <u>diffusion/osmosis</u> (forcing water up stem);	3	1. Allow salts

Question	Marking guidance	Mark	Comments
03.1	Stylet(s);	1	Allow rostrum/mandibles/maxillae

Question	Marking guidance	Mark	Comments
03.2	<ol style="list-style-type: none"> 1. (More) sucrose is actively transported/co-transported (with hydrogen ions into phloem/sieve element/tube); 2. Lowering water potential; 3. So water diffuses/moves by osmosis out of xylem/other tissues (into phloem/sieve element/tube); 	3	3. Allow examples of other tissues, e.g. mesophyll of leaf

Question	Marking guidance	Mark	Comments
03.3	<ol style="list-style-type: none"> 1. Nitrogen is unreactive/would push out air containing oxygen; 2. (Nitrogen/lack of oxygen) decreases (aerobic) respiration/production of ATP/active transport; 	2	

Question	Marking guidance	Mark	Comments
03.4	<p>1. Lack of oxygen/respiration results in lower hydrostatic pressure so active transport is involved;</p> <p>2. Pressure measurement only at source or not at sink or does not show a pressure gradient source to sink</p> <p>OR</p> <p>Pressure measurement only in phloem or does not show pressure (gradient) in xylem/another tissue;</p> <p>3. No test to identify which molecule is being translocated or might not be sucrose or could be a different molecule;</p> <p>4. Only done once or may not be repeatable/reproducible</p> <p>5. Other variables not controlled;</p>	4 max	<p>For full marks mp1 plus any 3 of mp 2-5</p> <p>1. Allow when only nitrogen present</p> <p>2. Allow pressure is not zero when only nitrogen present/between 6-30 min</p> <p>5. Allow examples of variables, e.g. light intensity, temperature</p>

Question	Marking guidance	Mark	Comments
04.1	Hydrolysis in the small intestine;	1	

Question	Marking guidance	Mark	Comments
04.2	Amylase <u>and</u> maltase;	1	Both named for 1 mark

Question	Marking guidance	Mark	Comments
04.3	<p>(Yes)</p> <p>1. % obesity increased as sugar intake increased/positive correlation up to 2000;</p> <p>(No)</p> <p>2. % obesity continued to increase while sugar consumption decreased from 2000 (to 2015);</p> <p>3. (But) correlation is not causation as may be other factors/examples;</p> <p>4. (Graph) <u>only</u> shows obesity or no data on incidence of coronary heart disease;</p> <p>5. Sample size unknown or only in USA/1 country;</p>	3 max	<p>Full marks for mp1 plus any 2 from mp2-5</p> <p>3. e.g. lack of exercise</p>

Question	Marking guidance	Mark	Comments
04.4	22/22.0/22.01;;	2	114 g x 16.8 kJ = 1915.2 kJ from sugar; $\frac{1915.2}{8700} \times 100 = 22.0\%$ 1 mark for incorrect value from graph but sum done correctly 1 mark for correct value from graph but incorrect answer

Question	Marking guidance	Mark	Comments
04.5	Smoking; High blood pressure; Lack of exercise Genetics/race; Gender; Age;	1	Allow prolonged stress

Question	Marking guidance	Mark	Comments
05.1	1. Only women/only those living in farming areas/no-one with no nitrate exposure (in sample)/group sizes unknown; 2. Only small number of cases/less than 0.2% of sample; 3. Some with lowest doses got thyroid cancer/ not clear what high dose is; 4. No statistics; 5. Cancer could develop after end of study period (even though exposure was during study); OR Cancer was present before study started (but takes a long time to be detectable);	3 max	1. Allow may be other variables e.g. pesticides, radiation 4. Allow correlation does not mean causation

Question	Marking guidance	Mark	Comments
05.2	1. Number of cases increased but death rate remained stable; 2. Cases from 5 in 100 000 / 0.005% in 1980 to 15.5 in 100000/0.015% in 2013 (3 x increase); 3. Death rate stable/only small increase at between 0.42 and 0.52 or around 0.5 in 100 000/0.0005%;	3	Allow any valid data from Figure

Question	Marking guidance	Mark	Comments
05.3	(Increase in number of cases due to) better detection/detection at earlier stage AND (Death rate stays same/less likely to die as) treatment more effective;	1	

Question	Marking guidance	Mark	Comments
05.4	1. Chromosomes cannot attach to spindle (via their centromeres) during prophase/metaphase; 2. Chromosomes can't line up in middle of spindle during metaphase; 3. Chromatids/chromosomes cannot be separated during anaphase OR 3. Chromatids/chromosomes cannot reach poles during telophase;	3	If no stages named then allow 1 mark for any two correct descriptions Max 2 if homologous chromosomes mentioned If no other marks awarded allow 1 mark for 'Mitosis/cell division stops'

Question	Marking guidance	Mark	Comments
06.1	(Cardiac output =) stroke volume x heart rate;	1	Accept (CO =) SV x HR

Question	Marking guidance	Mark	Comments
06.2	1.9 m ² ;;	2	Allow 1.899 m ² for 1 mark or allow 1.9 no units/incorrect units for 1 mark

Question	Marking guidance	Mark	Comments
06.3	<p>1. Thicker (ventricle) wall/septum or ventricles cannot relax fully so reduced blood volume in LV/reduced stroke volume;</p> <p>2. (so) heart rate increases to maintain CO or to supply enough blood/oxygen;</p> <p>3. Breathlessness (as) can't get enough oxygen to muscles/tissues for respiration (especially when increased demand during exercise);</p> <p>4. (CO not maintained so) fainting due to reduced oxygen/blood flow/blood pressure to the brain;</p>	3 max	

Question	Marking guidance	Mark	Comments
07.1	1. To release cells from tissue (to get 1 layer of cells); 2. To break down cell wall/membrane (to allow stain in/make chromosomes visible); 3. (To kill cells and) stop mitosis/cell division;	1 max	

Question	Marking guidance	Mark	Comments
07.2	1. (Lower mitotic index in A), fewer cells are dividing/in mitosis; 2. Root A is not growing as quickly (as B);	2	Accept converse for B

Question	Marking guidance	Mark	Comments
07.3	Phase	Processes	2 Allow G2 energy stores increase or example e.g. starch
	G1	Replication of organelles	
	S	DNA replication	
	G2	Cell growth or protein synthesis;	

Question	Marking guidance	Mark	Comments
07.4	Spearman's rank correlation (test) or correlation coefficient;	1	

Question	Marking guidance	Mark	Comments
07.5	1. 0.93 indicates a strong (positive) correlation/relationship (between length of S phase and genome size); 2. P=0.02 indicates a 2% probability that this correlation/relationship is due to chance OR The null hypothesis can be rejected or the correlation/relationship is (statistically) significant OR P is less than 0.05 so correlation/relationship is unlikely to be due to chance;	2 max	

Question	Marking guidance	Mark	Comments
07.6	56517/56500/56520 or $5.6(517) \times 10^4$;;	2	Allow 1 mark for 17340 s Allow any correct rounding for answers in standard form

Question	Marking guidance	Mark	Comments
07.7	(Idea that) Replication starts in more than 1 place;	1	

Question	Marking guidance	Mark	Comments
08.1	1. Bacteria (secretes) toxins; 2. (Toxins) increase secretion/movement of chloride ions in the lumen of (small) intestine; 3. (increased Cl ⁻ ions) decreases water potential in (small) intestine; 4. Water moves by osmosis/diffuses out of epithelial cells (of small intestine)/into lumen/down a water potential gradient;	4	1. Allow <i>Vibrio cholerae</i> 2. Ignore reference to sodium ions 3. Allow converse for epithelial cells 2, 3 and 4 Ignore colon
08.2	1. Pathogen identified as foreign due to antigen on its surface or toxins act as antigens; 2. Clonal selection/B cell that can make complementary antibody identified; 3. B cells clone/divide by mitosis; 4. Differentiation into plasma cells (and memory cells); 5. Plasma cells secrete specific/complementary antibodies to toxin/antigen or form antibody-antigen complexes; 6. Antibodies agglutinate pathogen or neutralise toxin; 7. Phagocytosis/described; 8. Helper T cells activate B cells; 9. Role of antigen presenting cells;	6 max	5. Allow B cells