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General Certificate of Education (A-level)
June 2013

Biology BIO3X

(Specification 2410)

Unit 3X: Externally Marked Practical Assignment

Final

Mark Scheme

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BIO3X: TASK 1

Question	Marking guidance	Mark	Comments
1	Accept any feature of agar or dye being the same eg concentration, pore size, consistency, pH, colour, rate of diffusion;	1	Do not accept unqualified reference to confounding variable
2	Only need to cover the agar;	1	
3(a)	So all sides are in contact with acid / increases time (for colour change) / distance (for acid to enter the pieces of agar);	1	Would reduce surface area (in contact with acid)
3(b)	Swirl contents (at regular intervals) / suspend pieces of agar;	1	
4	Diffusion (of acid into the agar block) / acidity increases/pH falls;	1	
5	1. Smaller piece has larger surface area to volume ratio; 2. Smaller piece has shorter diffusion pathway;	2	Allow converse statements
	Total	**7**	

BIO3X: TASK 2

Question	Marking guidance	Mark	Comments
6 – Student's own table of raw data	1. Student's own data presented clearly with full description of independent and dependent variables; 2. Side length/volume/surface area/ SA:V ratio in first column; 3. Appropriate units for length or volume (if used) and for time and only in heading;	3	These marks are awarded irrespective of the quality of the data 1. Reject unqualified size or time 1. Credit information from title 2. Ignore first column if cube number 3. Although AQA uses the convention of separating units by a solidus (/), credit may be given for any method of expressing units 3. Do not allow mixed units
7 – Quality of data	Points show a general trend 2 marks One point not in trend 1 mark More than one point not in trend 0 marks	2	These marks can only be awarded if the student has collected the data
8(a)	Divide surface area by volume;	1	Or divide volume by surface area to get ratio then reciprocal / $\frac{1}{\text{ratio figure}}$

8(b) - Graph	1. SA:V ratio on *x* axis and time on *y* axis; 2. Both axes labelled correctly with appropriate unit for *y* axis; 3. Appropriate scales selected for both *x* and *y* axes; 4. All points plotted correctly; 5. Data presented as a line graph with points joined correctly or line of best fit as appropriate;	5	1. Accept plotting of rate on *y* axis 2. Although AQA uses the convention of separating units by a solidus (/), credit may be given for any method of expressing units 2. There must be no units for *x* axis 3. Ensure the scales are linear 5. Reject extrapolation beyond plotted points. The line of best fit must match the data plotted

	Total	**11**	

BIO3X: WRITTEN TEST
Section A

Question	Marking guidance	Mark	Comments
9	1. Temperature; 2. Because a higher temperature gives faster diffusion/ increases kinetic energy; ***OR*** 3. Viscosity/density/concentration of agar; 4. Diffusion is slower if viscosity/density/concentration is higher; ***OR*** 5. Concentration of acid; 6. Faster diffusion if concentration gradient steeper;	2	Mark as a pair
10	1. Blocks could touch each other/sides of beaker/all sides not in contact with acid; 2. End point difficult to judge/difficult to see end point; 3. No repeats;	2 max	
11	Suitable because: 1. Diffusion is passive / blocks do not need to be alive; Limitations: 2. Cells can be attached to other cells; 3. Cells can be different shapes; 4. No cell (surface) membrane/organelles; 5. Processes in cells maintain a concentration gradient; 6. Cubes are larger than cells;	2 max	4. Accept cell not homogeneous
12(a)	1. As surface area to volume ratio increases the time decreases, steeply and then less steeply; 2. Change at/after 0.85/200;	2	

12(b)	1. Small organisms have a large surface area to volume ratio; 2. Large surface area to volume ratio (on graph) gives rapid diffusion / fast uptake / fast absorption of oxygen;	2	

13	1. Adaptation to reduce surface area to volume ratio; eg needle form / spines rather than leaves / curled in leaves 2. Explanation related to adaptation; eg reduces surface area for evaporation of water (relative to volume) / reduces area of permeable surface	2	

14	1. Higher concentration of acid, greater the concentration gradient; 2. Faster the rate of diffusion;	2	1. Accept description, eg more acid in solution surrounding agar cube

	Total	**14**	

Section B

Question	Marking guidance	Mark	Comments
15	(In emphysema) 1. A lower volume breathed in/out (at start / throughout) / a lower tidal volume; 2. Faster breathing; 3. Shallower breaths over time;	2 max	Allow converse statements for healthy person
16	(In emphysema) 1. Reduced ventilation/described; 2. Can't maintain oxygen concentration; 3. Less oxygen reaches the blood/muscles/cells; 4. For (aerobic) respiration; 5. Less ATP produced / less energy released;	3 max	
17	1. Inability to recoil / stretch; 2. Reduced tidal volume / described; 3. Less oxygen enters the alveoli / less CO_2 leaves the alveoli; 4. Decreased concentration gradient;	3 max	
18(a)	(Walls of) alveoli break down / are damaged;	1	
18(b)	1. Reduced surface area (of alveoli); 2. Less contact with capillaries / longer diffusion pathways; 3. Less oxygen into the blood / less CO_2 out of the blood;	2 max	2. Reject references to diffusion linked to thickening of walls

19	FOR 1. (If the husband smokes) there's a greater risk of dying from lung cancer/emphysema/cervical cancer; 2. The more the husband smokes, the greater the risk of dying from lung cancer/emphysema; 3. Suitable use of figures from the table to illustrate answer; AGAINST 4. Little difference in risk of dying of stomach/ heart disease; 5. Other factor (than husband smoking) / named factor might cause death; 6. Only one sample / further studies needed;	4 max	

20	1. Carbon monoxide reduces oxygen in the blood; 2. Nicotine/smoking increases heart rate/blood pressure; 3. High blood pressure damages blood vessels; 4. Increases risk of atheroma formation; 5. Increases risk of blood clots/thrombus; 6. Nicotine/smoking makes platelets/red blood cells more 'sticky';	3 max	

	Total	**18**	