WINCHESTER
COLLEGE

Mark scheme for Biology Election 2018

<table>
<tr><th colspan="3"></th><th>Marks</th></tr>
<tr><td>1</td><td>a)</td><td><table>
<tr><th>Gelatine block</th><th>Surface area (mm^2)</th><th>Volume (mm^3)</th><th>Surface area/volume</th></tr>
<tr><td>2</td><td>250 ;</td><td>250 ;</td><td>1 ;</td></tr>
<tr><td>3</td><td>150 ;</td><td>125 ;</td><td>1.2 ;</td></tr>
</table></td><td>6</td></tr>
<tr><td></td><td>b)</td><td>mm^{-1} ;</td><td>1</td></tr>
<tr><td></td><td>c)</td><td>Random movement / collisions / Brownian motion ;
Kinetic energy ;
Difference in concentration gradient / high density to low density ;</td><td>max 2</td></tr>
<tr><td>2</td><td>a)</td><td>Suitable controlled variable suggested, e.g.
Volume of acid ;
Use same stomach extract (i.e. ensure same concentration/pH) ;
Concentration of cresol red in agar ;
Temperature of acid solution ;</td><td>max 1</td></tr>
<tr><td></td><td>b)</td><td>Straight line ;
Negative correlation ;
Axes labelled (x axis = surface area/volume, y axis = time) ;</td><td>3</td></tr>
<tr><td></td><td>c)</td><td>Connection made between
Increased surface area relative to volume ;
AND
Decreased time taken for acid to diffuse to centre/every part of block ;</td><td>2</td></tr>
<tr><td></td><td>d)</td><td>Use of ruler to draw column and rows ;
Independent variable in the left hand column ;
Independent variable correctly identified as surface area/volume, including units (not block 1, 2 and 3) ;
Column for time taken for cresol red to completely react ;
Units for time in column header (not main body of table) ;</td><td>5</td></tr>
<tr><td></td><td>e)</td><td>x axis – surface area/volume, plus units ;
y axis –time taken for cresol red to react, plus units ;
Suitable scale used on each axis ;
Accurate plotting of points ;
Line correctly drawn (no extrapolation allowed) ;</td><td>5</td></tr>
<tr><td></td><td>f)</td><td>Trend stated and linked to prediction ;
Comparative values read from the graph, including units ;
Anomalies identified if observed ;</td><td>max 2</td></tr>
</table>

	g)	Answer should be result dependent and could include: Diffusion resulted from random movement of molecule in stomach extract into block ; Lager surface area/volume ratio results in faster diffusion of stomach extract molecules ; Relating shape of block to distance to centre of block ; Discussion of inaccurate block cutting resulting in anomalous data ;	max 2
	h)	Increase temperature of stomach extract; Increase concentration of stomach extract (accepted but difficult to achieve) ; (Decrease size of the block whilst maintaining shape ;)	max 2
3	a)	Large cells have a reduced surface/volume ratio ; More time taken for diffusion to reach all parts of the cell ;	max 1
	b)	Suitable shape, e.g. Long, thin cuboid ; Dimensions indicate volume remains the same as cube A ;	2
	c)	Maximise surface area ; Reduce distance to the centre of the cell ;	2
	d)	Three suitable examples given, e.g. Oxygen ; Water ; Carbon dioxide ; Glucose ;	max 3
	e)	Folded/large surface area ; Good blood supply/large concentration gradient ; Thin cell layers/small distance between water and blood cells ;	3
	f)	Heart ;	1
	g)	Any two valid reasons given, e.g. Specialisation of function ; Larger size ; More able to survive damage ;	max 2
		Total:	45