

Question number	Answer	Marks	Guidance
1	Statement 3;	1	
2 (a)	<i>A / rate of reaction increasing</i> active sites available; increasing number of collisions between active sites and substrates; more enzyme substrate complexes forming; <i>B / reaction rate constant</i> all active sites occupied by substrate; <i>idea of</i> substrate queuing up for active sites; V_{max} ;	5	Maximum 3 for A or B.
2 (b) (i)	enzymes;	1	
2 (b) (ii)	break bond; involving the addition of water;	2	
2 (b) (iii)	enzymes specific; amylose is hydrolysed to maltose; active site of maltase is complementary to maltose;	3	
2 (b) (iv)	maltose hydrolysed / digested, by enzymes; enzymes are proteins; stomach contents contain proteases; proteases hydrolyse proteins;	4	
2 (c)	stomach contents are acidic; optimum pH of, enzymes / named, is at higher pH; (pancreatic) enzymes not denatured;	3	
2 (d)	reaction is at maximum rate; all active sites occupied; enzyme activity is maximum;	3	
3 (a)	amino acids;	1	
3 (b)	malonate is similar shape to substrate / succinate; part of / group on, malonate the same as on succinate; malonate, fits into / is complementary to, active site of enzyme; prevents substrate binding; competitive inhibition;	4	
3 (c)	B;	1	Reaction rate of B eventually equals A.
3 (d) (i)	<i>idea of</i> control mechanism; need to be reversible so more product can be made, when needed; with competitive inhibitor, more substrate would overcome inhibition; (leading to) excess product;	3	Max 3
3 (d) (ii)	prevent build-up of, excess / unnecessary products; maybe toxic; prevent waste of resources / energy; ensure sufficient levels of required products;	3	Max 3
4	take samples at a range of times / AW ; same volumes (of solutions) added / removed (each time) ; heat with, Benedict's (solution) / $CuSO_4$ and NaOH ; (use of) excess Benedict's ; changes to, green / yellow / orange / brown / (brick) red ; remove precipitate / obtain filtrate ; colorimeter ; calibrate / zero, using, a blank / water / (unreacted) Benedict's ;	1 B2 B3 B4 B5 C6 C7 8	B2 must be in context of Benedict's test rather than reaction mixture B3 DO NOT CREDIT boil / warm B3 DO NOT CREDIT if Benedict's added to the mixture at the beginning C6 CREDIT description of method e.g. filtering / centrifuging / decanting 8 IGNORE 'control'

	<p>use (red / orange) filter ; reading of, transmission / absorbance OR mass of precipitate ; more transmission / less absorbance, of filtrate, OR greater mass ppt, = more maltose present ; ora using, standard / known, concentrations (of maltose) ; (obtain) calibration curve ; plot, transmission / absorbance / mass of ppt, against (reducing sugar) concentration ; use graph to read off concentration of maltose / AW ;</p> <p>QWC – correct sequence ;</p>	<p>9 T10 11 12 13 14 15 6 max 1</p>	<p>9 DO NOT CREDIT if colour of filter is incorrect T10 ACCEPT 'measure how much light, does / does not, pass through' 11 if unfiltered Benedict's / precipitate is clearly indicated as being present in sample, ACCEPT 'less transmission / more absorbance, = more maltose present' 11 DO NOT CREDIT if precipitate is added to colorimeter 12 CREDIT 'serial dilutions' 1 of mps B2 to B5, then mp C6 or C7, then mp T10</p>																																																		
<p>5 (a)</p>	<p>increases / greater / faster ; reaction completed in / plateaus after / concentration is 100% after, 3.5 minutes ; figures with units to support mp 1 ;</p>	<p>1 2 3 2 max</p>	<p>1 ACCEPT any time between 3.45 and 3.55 min. 3 two maltose concentrations (+ or – chloride) for a given time or two times (+ or – chloride) for given maltose concentration. 3 ACCEPT calculated difference 3 DO NOT CREDIT if '%' and 'min.' not given 3 ACCEPT any concentration within ± 1 % and time within ± 0.05 min.</p>																																																		
	<table border="1"> <thead> <tr> <th rowspan="2">Presence or absence of chloride ions</th> <th colspan="10">The percentage concentration of maltose (%) present every half a minute</th> </tr> <tr> <th>0.0 min</th> <th>0.5 min</th> <th>1.0 min</th> <th>1.5 min</th> <th>2.0 min</th> <th>2.5 min</th> <th>3.0 min</th> <th>3.5 min</th> <th>4.0 min</th> </tr> </thead> <tbody> <tr> <td>Chloride ions present</td> <td>0</td> <td>24</td> <td>54</td> <td>70</td> <td>80</td> <td>88</td> <td>95</td> <td>100</td> <td>100</td> </tr> <tr> <td>Chloride ions absent</td> <td>0</td> <td>12</td> <td>20</td> <td>29</td> <td>36</td> <td>40</td> <td>45</td> <td>48</td> <td>50</td> </tr> <tr> <td>Difference in maltose concentration when chloride ions are either present or absent</td> <td>0</td> <td>12</td> <td>24</td> <td>41</td> <td>44</td> <td>48</td> <td>50</td> <td>52</td> <td>50</td> </tr> </tbody> </table> <p>Allow a +/- 1% for any concentration of maltose and a +/- 2% for the difference in maltose concentrations</p>		Presence or absence of chloride ions	The percentage concentration of maltose (%) present every half a minute										0.0 min	0.5 min	1.0 min	1.5 min	2.0 min	2.5 min	3.0 min	3.5 min	4.0 min	Chloride ions present	0	24	54	70	80	88	95	100	100	Chloride ions absent	0	12	20	29	36	40	45	48	50	Difference in maltose concentration when chloride ions are either present or absent	0	12	24	41	44	48	50	52	50	
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<p>5 (b)</p>	<p>temperature ; pH ; enzyme / amylase / chloride, concentration ; substrate / starch / amylose, concentration ; constant / regular, stirring ; (fixed) volume of solution (removed each time for sampling) ;</p>	<p>1 2 3 4 5 6 3 max</p>	<p>Mark the first three answers only regardless of which line they are on DO NOT CREDIT refs to, time 3 IGNORE 'amount' or 'volume' 3 DO NOT CREDIT 'concentration' unqualified 4 IGNORE 'amount' or 'volume' 4 DO NOT CREDIT 'concentration' unqualified</p>																																																		