Mark Scheme 2815/02
June 2005

Abbreviations, annotations and conventions used in the Mark Scheme	/ = alternative and acceptable answers for the same marking point ; = separates marking points NOT = answers which are not worthy of credit ( ) = words which are not essential to gain credit ___ = (underlining) key words which **must** be used to gain credit ecf = error carried forward AW = alternative wording ora = or reverse argument

Question	Expected Answers	Marks
(1) (a)	Any two from Specific ✓ More reactive/effective/faster ✓ More sensitive to changes of pH/temperature ✓ Milder conditions ✓ Cleaner product ✓ But not active site. AW in each case.	2
(b)	Allow uncharged structure/zwitterion ✓ for CONH and ✓ for the rest(correct). Must be a genuine attempt to link them. $HOC_6H_4CH_2CH(NH_2)CONHCH(COOH)CH_2C_6H_4OH$ Or displayed in part or full.	2
(c)	Phenylalanine – van der Waals ✓ using benzene/phenyl/arene ring. ✓ AW Tyrosine – hydrogen bonding ✓ using the OH/phenol. ✓ AW Accept van der Waals again here for 1 mark. The structural feature mark only follows from a correct attraction. Ignore any reference to ionic attraction using the terminal COO^- and NH_3^+.	4
(d)	Any 6 marks. AW throughout. • Correct use of term transcription/translation. ✓ • A different t-RNA,(with a different amino acid), will be brought up to altered m-RNA triplet. ✓ • Example of one transcription eg ATA (in DNA) UAU (in m-RNA) Or AAA(in DNA) → UUU (in m-RNA) ✓ • Translation of normal RNA eg UAU Tyr ✓ • Translation of changed RNA UUU Phe ✓ Do not give the second translation if same acid. • New amino acid has a different sidechain ✓ • then an important part of the tertiary structure/active site/shape may be changed. ✓ For one of these two marks accept reference to degeneracy of the triplet code. Accept also a base change which results in a new stop code rather than new amino acid	6
	Question total	14

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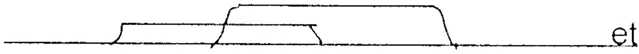
(2) (a)(i)	Their diagram should show two bridges, either as –S-S- or as lines. Give ✓ for one bridge; ✓ for other bridge which will require a loop/spiral/crossover. Eg  or  etc Accept any one bridge (even if wrong structure) eg –SH---HS-	2
(ii)	In primary structure it is a peptide/amide link ✓ In bridges it is a disulphide link (bond between S atoms) ✓ Either -CONH- or –S-S- for third mark✓ (But if both given and one incorrectly then CON) If only structures without names give 2 marks. Fish back to part (i) for correct –S-S- if no structure.	3
(b)	Link between S and Zn ✓; dative/covalent✓ or Link between Zinc ion (Zn^{2+}) and COO^-/COOH; ionic/covalent .✓ AW In either case must have first mark to score the second	2
	Question total	7

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Question	**Expected Answers**	**Marks**
(3) (a)(i)	$\longrightarrow$ $2C_6H_{12}O_6$ ✓ Accept version with structures or with separate molecules of $C_6H_{12}O_6$	1
(ii)	Similarities: any two points from - made from glucose only - glycosidic link - 1,4 link But not other alternatives. Difference: α in maltose, β in cellobiose.	3
(b)	Cellobiose is wrong shape for active site ✓ AW. Accept maltase specific for 1α4 links/not 1β4 links. Do not accept maltase specific for maltose.	1
(c)	At low maltose concentrations: - the rate is lowered by glucose✓ - because it is similar in structure/shape to maltose✓ - and competes for the binding/active site✓ - reversibly✓ - leaving fewer sites available to the maltose substrate✓ - mention of end product inhibition✓ At high maltose concentrations. - greater probability that maltose will bind✓ - rate increases, possibly almost back to uninhibited rate✓. A graph can earn the 2 rate marks. AW throughout. Find any 5 marks, at least 1 must be at high concentration.	5
	QWC mark is for SPG, which can be awarded for a well organised answer with fewer than 3 mistakes in two complete sentences.	1
	Question total	11

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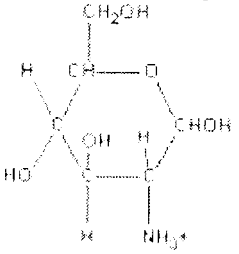
Question	Expected Answers	Marks
(4) (a)	1.00 g of the acid produces 11360/284 kJ✓ = 40 kJ 2800 kJ of heat is produced by 180 g of glucose 40 kJ is produced by 180 x 40/2800 ✓ = 2.57 g ✓ (accept 2.6 g) Find 3 marks for any correct answer with working. A correct method with too early trimming of sig figs can earn 2. In an incorrect answer find 1 mark for moles of acid = 1/284 = 3.52×10^{-3}.	3
(b)	The energy is produced by the formation of bonds✓ in carbon dioxide and water✓. In carbohydrates some of these bonds have already been formed/carbohydrates are partially oxidised.✓ Any reference to exothermic bond breaking is wrong.	3
(c)	Any three points ✓✓✓ from • insoluble (therefore cannot move out of cells) • minimise OP for many glucose molecules • compact/occupy little space • not involved in immediate reactions in cells • easily hydrolysed to glucose when required Mark first three points if more are given.	3
(d)(i)	✓ for amino glucose (accept $-NH_2$ version)  Must all be there. Ignore stereochemistry at C1 – others must be correct.	1
(ii)	Hydrolysis ✓ with hydrochloric acid ✓ Accept other acids, eg aqueous sulphuric (but not conc). Allow 1 mark for hot instead of the hydrolysis mark.	2
(iii)	1β- glycoside also/ monomer like β-glucose. ✓	1
	Question total	13
	PAPER TOTAL	45