Proteins - Mark Scheme

Q1.

Question Number	Answer	Additional Guidance	Mark
	An answer which makes reference to four of the following: • both are chains of amino acids joined by peptide bonds (1) • both contain named bonds (holding molecule in its three dimensional shape) (1) • globular proteins have hydrophilic groups on the outside whereas fibrous proteins have hydrophobic groups on the outside (1) • globular have tertiary or quaternary structures whereas fibrous have little or no tertiary structure (1) • globular are folded into compact shapes whereas fibrous have long chains (1)	 i.e. hydrogen bonds, disulfide bridges, ionic bonds Allow converse ALLOW globular being spherical and fibrous being long strands	**(4)**

Q2.

Question Number	Answer	Additional Guidance	Mark
	An answer that makes reference to the following: • (proteins which) reduce activation energy of biological reactions (1)	 ALLOW increase rate of biological reactions ALLOW references to {in cells / in living organisms}	**(1)**

Q3.

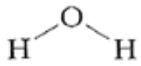
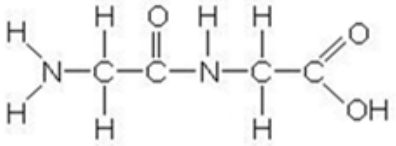
Question Number	Answer	Additional Guidance	Mark
(a)	Diagram clearly showing: 1. central carbon with {R / H / eq} and H attached by single bonds ; 2. {NH2 / $NH3^+$ } attached to carbon by single bond ; 3. {COOH / COO^- } attached to carbon by single bond ;	 1. Must show C, H and R or a plausible R group 2. and 3 ACCEPT groups attached to a central C that is not shown (chemical notation) ACCEPT groups written wrong way round e.g. C-H_2N NOT incorrect bonding within groups e.g. C=OH ACCEPT if correct group attached to wrong molecule e.g. glucose	(3) Exp

Question Number	Answer	Additional Guidance	Mark
(b) (i)	1. idea that enzymes reduce activation energy ; 2. reference to active sites (of enzyme) ; 3. reference to effect on collisions between enzymes and substrates / enzyme substrate complexes / eq ; 4. idea of number of active sites occupied ; 5. (levels off when) substrate becomes limiting factor ;	IGNORE increases the rate of the reaction 1. Accept 'decreases energy needed for reaction', provides an alternative reaction pathway 4. ACCEPT below 6a.u. all sites occupied OR above 6 a.u. not all occupied	(3) Exp

Question Number	Answer	Additional Guidance	Mark
(b) (ii)	1. idea of a range of concentrations of enzyme (at least 5) ; 2. idea of substrate concentration not limiting ; 3. reference to mixing ; 4. description of how to measure dependent variable with time ; 5. description of how to measure the initial rate of reaction ; 6. reference to an appropriate named controlled variable ; 7. reference to {replicates / repeats} at each enzyme concentration ; 8. control {described / used as comparison} ;	 4. and 5. Must relate to reaction / enzyme named 5. ACCEPT clear indication of rate measured soon after mixing, plot and calculate rate from linear part of graph NOT time taken for all substrate to be converted but could get Mp4 6. ACCEPT e.g. pH, temperature, volume, concentration of substrate 7. IGNORE repeat for other concentrations ACCEPT repeat whole experiment 8. ACCEPT control used is with {no enzyme / distilled water}	(4) Exp

Q4.

Question Number	Acceptable Answer	Additional guidance	Mark
(i)	C		(1)

Question Number	Acceptable Answer	Additional guidance	Mark
(ii)	water molecule indicated (1)  correct dipeptide shown (1) 		(2)

Question Number	Acceptable Answer	Additional guidance	Mark
(iii)	C		(1)

Q5.

Question Number	Answer	Additional Guidance	Mark
	1. idea of formation of secondary or tertiary structure ; 2. idea of bonding between R groups ; 3. named bond e.g. ionic, disulfide, hydrogen ;	1. **ACCEPT** e.g. alpha helix, beta pleated sheet, globular structure **ACCEPT** folding (of primary structure) **IGNORE** 3D shape 2. **ACCEPT** hydrophilic R groups go to outside/ hydrophobic R groups go to inside / eq 3. **DO NOT ACCEPT** peptide	(3)

Q6.

Question Number	Answer	Additional Guidance	Mark
	1. idea that this increased temperature changes the bonding in the enzyme ; 2. the active site is {denatured / changes shape} ; 3. the substrate no longer fits into the active site / the enzyme no longer {catalyses the reaction / lowers the activation energy / eq} ;	**IGNORE** enzyme is denatured **ACCEPT** bonds are broken 3. **ACCEPT** no enzyme substrate complex can form / eq	**(2)**

Q7.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to the following: • (different primary structure) results in a different sequence of amino acids (1) • change in R groups changes { folding / bonding / secondary structure / tertiary structure } (1) • changing { shape / charge } of the active site prevents substrate from being able to bind (1) • { stopping / reducing } the production of fibrin (1)	Do not accept peptide bonds ALLOW another specific aspect of blood clotting cascade	**(4)**

Q8.

Question Number	Answer	Additional guidance	Mark
	A description that makes reference to the following: • (a peptide bond is formed by a) condensation reaction (1) • between the {amine group / NH_2} and the {carboxyl group / COOH} of adjacent amino acids (1)	ALLOW 'amino' for 'amine' and 'carboxylic acid' for 'carboxyl'	**(2)**