Question Number	Answer	Additional Guidance	Mark
1(a)	1. glycerol drawn correctly with three OH groups ; 2. 3 fatty acids ; 3. fatty acid(s) have COOH included at the end ;	Mp1 and 3 ACCEPT OH / HO NOT double bond to OH 2. ACCEPT 3x one fatty acid stated ACCEPT R or zig-zag chain for fatty acid chain	**(3)**

Question Number	Answer	Additional Guidance	Mark
1(b)	1. idea of energy imbalance ; 2. loss of weight / eq ; 3. reduced metabolic rate / eq ; 4. lack of protein / reduced insulation / eq ; 5. idea that they will need to eat more {carbohydrate / protein / eq} for energy balance ;	2. ACCEPT lower BMI 3. ACCEPT fatigue 4. ACCEPT muscle wastage, Malnourishment, reduced immune system	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(c) *QWC	**(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)** 1. idea that there is a change in the {DNA sequence / base sequence of a gene / eq } ; 2. change in amino acid / change in primary structure of { protein / enzyme } ; 3. reference to different R groups ; 4. leading to different {type / position / eq} bonding ; 5. idea of change in folding e.g. different 3D structure ; 6. idea of change in {shape / properties} of the active site ; 7. idea of {lipid / substrate / eq} does not fit in the enzyme's active site ;	**QWC emphasis clarity of expression** 1. IGNORE mRNA 4. ACCEPT named bond e.g. hydrogen, ionic, disulphide NOT peptide 5. ACCEPT change to tertiary structure 7. ACCEPT no enzyme-substrate complex made	**(5)**

Question Number	Answer	Mark
2(a)(i)	A ;	(1)

Question Number	Answer	Mark
2(a)(ii)	8 ;	(1)

Question Number	Answer	Additional guidance	Mark
2(b)	Transcription ;		(1)

Question Number	Answer	Additional guidance	Mark
2(c)	1. idea that there is a change in the {DNA sequence / base sequence of a gene / eq } ; 2. change in amino acid / change in primary structure of { protein / enzyme } ; 3. reference to different R groups ; 4. leading to different {type / position / eq} bonding ; 5. idea of change in {shape / properties} of the active site ; 6. idea of {phenylalanine / substrate / eq} does not fit in the enzyme's active site ;	1. GNORE mRNA 4. ACCEPT named bond e.g. hydrogen, ionic, disulphide NOT peptide 5. CCEPT enzyme is not made 6. ACCEPT no enzyme-substrate complex made	(4)

Question Number	Answer	Additional guidance	Mark
2(d)	1. loss causes whole amino acid sequence (beyond mutation) to change / causes frame shift / eq ; 2. replacement only changes one {codon / amino acid / may not change the amino acid if third base / eq } eq ; 3. idea that the number of amino acids remains the same with replacement ;		(2)

Question Number	Answer	Additional Guidance	Mark
3(a)	1. (structure G is {glycoprotein / gp120} ; 2. used for {attachment / eq} to CD4 (molecules / receptors /antigens) ; 3. on T helper {cells / lymphocytes} ;	1. IGNORE gp 41 and gp 160 and other wrong numbers 3. ACCEPT macrophages / dendritic cells / CD4 cells	(3)

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	1. they are globular proteins ; 2. it has an active site ; 3. idea of {charged R groups on outside of molecules / composed of many small R groups} ;	2. idea of active site R groups enable binding of substrate 3. idea of hydrophilic on the outside	(3)

Question Number	Answer	Additional Guidance	Mark
*3(b)(ii)	(QWC – spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. idea that drugs would prevent viral replication ; 2. idea that T (helper) {cells / lymphocytes} will not be { killed / burst / destroyed}(by virus particles leaving cell) ; 3. idea of {inhibition / eq} of reverse transcriptase ; 4. idea that (viral) DNA could not be made; 5. from the (viral) RNA ; 6. idea of {inhibition / eq} of integrase ; 7. idea that (viral) DNA cannot integrate into (host) {DNA / genome} / eq ;	QWC emphasis on clarity of expression 1. ACCEPT description of virus formation 3. ACCEPT drugs prevent action of reverse transcriptase 4. reject idea that RNA is {turned into / converted into} DNA 6. ACCEPT drugs prevent action of integrase 7. ACCEPT idea that drugs would prevent {latency / formation of provirus / eq} ;	(5)

Question Number	Answer	Additional Guidance	Mark
4(a)	Diagram clearly showing: 1. central carbon wit {R / H / eq} and H attached by single bonds ; 2. {N / $NH3^+$ } attached to carbon by single bond ; 3. OOH / COO^- } attached to carbon by single bond ;	1. ust show C, H and R or a plausible R group 2. and 3 CCEPT 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) p**

Question Number	Answer	Additional Guidance	Mark
4 (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 f reaction', provides an alternative reaction pathway 4. ACCEPT below 6a.u. all sites occupied OR above 6 a.u. not all occupied	**(3) p**

Question Number	Answer	Additional Guidance	Mark
4 (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. a 5. Must relate to reaction / enzyme named 5. CCEPT 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. CCEPT e.g. pH, temperature, volume, concentration of substrate 7. IGNOR repeat for other concentrations ACCEPT repeat whole experiment 8. CCEPT control used is with {no enzyme / distilled water}	**(4) Exp**

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	1. {skin / epidermis} is a barrier / eq ; 2. reference to keratin ; 3. reference to lack of receptors (for the virus) ;	**Accept** prevents entry but **not** prevents infection **NB** keratin in skin forms a barrier = 2 marks **Accept** skin has different receptors	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	1. idea that viruses only {infect / attach to / eq} {specific receptors / specific cells / host cells} ; 2. idea that receptors not present on {blood cells / endothelial cells / eq} ; 3. reference to {destruction / eq} of viruses by phagocytes ;	**Accept** white blood cells. neutrophils; PMN **Ignore** macrophages **Not** lymphocytes, T cells, plasma cells	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)	1. reverse transcriptase (required) in HIV, no reverse transcriptase in cold virus ; 2. DNA formed (using RNA) in HIV, {no DNA formed / RNA used to make protein / translation} in cold virus ; 3. reference to {provirus / latency / delay in virus formation / eq} in HIV infection, {no provirus / lytic cycle / (immediate) formation of virus particles / eq} in cold virus ;	**NB** answers can be pieced together but candidates still have to state both parts of mark point	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(c)(i)	1. to synthesise (common cold) RNA / eq ; 2. for amino acids to bind to tRNA / eq ; 3. to synthesise (common cold) protein (capsid) / eq ;	**Accept** translation	**(2)**

Question Number	Answer	Additional Guidance	Mark
5(c)(ii)	1. idea of enzyme affecting {molecules in membrane / proteins / (phospho)lipids / cholesterol} ; 2. enzyme breaks {bonds / named bonds / eq} ; 3. reference to {(by) hydrolysis / hydrolytic enzymes} ; 4. credit detail of enzyme action ; 5. reference to enzyme U as {protease / lipase / cholesterase} ;	eg lowers activation energy, binding of active site to substrate (cannot credit reference to catalyst, as in stem of question) **Ignore** lysosyme	**(3)**