1)

1. amino acids ; 2. peptide ; 3. condensation / polymerisation ; 4. amino / amine / NH_3^+ / NH_2 ; 5. carboxyl / carboxylic (acid) / COO^- / COOH ; [Accept answers for 4 and 5 the opposite way round]	(5)

Answer	Marl
ALLOW Mps in context of clearly labelled diagram 1. globular / eq ; 2. reference to active site ; 3. reference to specific shape of active site ; 4. reference to {bonds /named bond / interaction / eq} between R groups ; 5. credit correctly named {bond/interaction} e.g. disulphide bond, hydrogen bonds, hydrophobic interactions (between R groups) ;	(3)

1. (primary structure) {position / sequence / order /eq} of the {amino acids / R groups} / eq ; 2. idea that this determines the {positioning / type} of the {bonds / folding / eq} ; 3. determining the {shape / properties} of the active site / eq ; 4. idea of interaction of active sites and substrates e.g. enzyme substrate complex forms ; 5. idea of {polar / hydrophilic} on the outside of enzymes / {non polar / hydrophobic} on the inside / eq ; 6. reference to solubility ;	(3)

2)

(a)(i)	D ;	**(1)**
(a)(ii)	C ;	**(1)**
(a)(iii)	A ;	**(1)**

(b)	1. an increase in temperature increases the permeability / eq ; 2. idea of change in {colour / permeability} related to {42 °C / 64 °C} OR no change up to 42 °C ;	**(2)**
c)(i)	Any **two** from: 1. reference to pre-treatment e.g. rinsing method ; 2. {size / mass / surface area / volume / shape} of beetroot ; 3. beetroot storage conditions / eq ; 4. {same / type / species / eq} beetroot ; 5. {age of beetroot / storage time} ; 6. (incubation) time / eq ; 7. {volume / concentration / eq} of {water / solution}(added to beetroot) ; 8. pH ;	**(2)**
(c)(ii)	1. reference to repeats / replicates / eq ; 2. idea that (colorimeter / readings) are {objective / quantitative / not qualitative / more accurate / provide numbers / more precise / measured not judged / eq} ;	**(2)**

(c)(iii)	1. (pink colour due to) {pigment / dye /betalain / eq} ; 2. idea that this is released when {cells / vacuoles/ membranes} are damaged ; 3. and had not been washed off / eq ; ACCEPT converse argument when clear	(2)
(c)(iv)	idea that the second experiment shows that the permeability increases between {5 / 22} °C and 42 °C / in first experiment 5 °C has an effect / eq **OR** idea that the second experiment's results are quantified ;	(1)

3)

(a)	Any 3 of the following: 1. consists of (a) glucose ; 2. (joined by 1,4 / 1,6) glycosidic bonds ; 3. branched structure / eq ; 4. idea of compact structure ; Any 3 of the following: 5. idea that it is {easily / rapidly / eq} hydrolysed ; 6. (leading to) more {glucose / eq} in a smaller space (in a cell)/ eq ; 7. idea of low solubility ; 8. it does not diffuse out of cells /eq ; 9. it has no osmotic effect / eq ;	(4)
(b)(i)	1. increasing intensity {increases carbohydrate use / decreases fat use / eq} / eq ; 2. {low intensity exercise / intensity below {39 / 40} au} uses more energy derived from fats / eq ; OR {high intensity exercise / intensity above {39 / 40} au} uses more energy derived from carbohydrates / eq ; 3. at {39 / 40} au both sources of energy used equally / eq ; 4. credit correct manipulation of figures to compare energy usage ;	(3)

(b)(ii)	1. idea that this diet is suitable for {a high intensity / eq} event ;	
	2. credit suitable example of athletic event e.g. any endurance or power event ;	
	3. reference to more carbohydrate being used (than fat) above {39 / 40} a.u. / eq ;	
	4. reference to carbohydrate being stored as glycogen ;	
	5. idea of {maximum / more / lots of} glycogen (stored) ;	
	6. idea that breakdown of glycogen provides energy (for the event) ;	**(3)**

4)

(a)(i)	1. different tissues have different activities of catalase / eq ;	
	2. Z has highest (activity) / eq ;	
	3. Y has the lowest (activity) / X and Y have very similar levels / eq ;	
	4. credit correct manipulation of figures e.g. Z has 12 more than Y / Z has 11 more than X ;	**(3)**

(a)(ii)	1. idea activity in mussel E is not higher than M in all tissues ;	
	2. mussel E has lower (activity) in tissue X / eq OR (activity) is the same in tissue Y / eq OR mussel E has higher (activity) in tissue Z / eq ;	
	3. mussel E has more (overall activity)/ eq ;	
	4. credit correct comparative manipulation of figures ;	
	5. Idea that both mussels have tissues with same order of activity e.g. Y X Z ;	**(2)**

(b)	1. reference to measuring volume of oxygen ;
	2. suitable reference to time e.g. oxygen produced in unit time, time taken to produce same volume of oxygen ;
	3. idea of measuring the initial rate of reaction ;
	4. reference to controlled variable in relation to the mussel e.g. age, part of mussel, mass, surface area ;
	5. reference to a controlled variable in relation to the experiment e.g. volume of hydrogen peroxide, temperature, concentration, pH ;
	6. suitable reference to repeats ; **(4)**

5)

(a)	1. a bar showing 2% ;
	2. a bar showing 16% ;
	3. the obesity (dark) and overweight (light) portion identified / eq ;

b)(i)	A ; **(1)**
b)(ii)	D ; **(1)**
b)(iii)	A ; **(1)**

| **(b)(iv)** | Either C or A

This is because the bar chart presented, detailing overweight and obesity percentage of population by gender in different countries, can be interpreted as either:

    C - obesity as a subset of being overweight (following through the information in the question stem for 8(a))
    OR
      A - overweight and obese as discrete categories (If candidates only refer to the bar chart and ignore the information in the stem of question 8(a)). **(1)** |

(c)	1. graph shows percentages ;	
	2. population size is not known e.g. sample size not known / the actual number of males and females who are obese will depend on the population size of each gender / eq ;	
	3. there may be a different number of males to females / eq ;	(2)
(d)(i)	(relationship between two variables is such that) a change in one of the variables is reflected by a change in the other variable / eq ;	(1)
(d)(ii)	1. the (consumption of) corn syrup goes up / eq ;	
	2. (this is) before the increase in obesity / eq ;	
	3. reference to the (consumption of) dextrose falling with time e.g. during the 1970s ;	
	4. reference to the consumption of glucose staying fairly constant ;	(3)

6)

(a)(i)	1. idea that a monosaccharide consists of one {sugar / named sugar / eq} (unit) whereas a disaccharide consists of two (sugar units) ;	
	2. idea that disaccharide has a glycosidic bond (whereas monosaccharide does not) ;	
	3. general formula for a monosaccharide is $C_nH_{2n}O_n$ whereas formula for disaccharide is $C_nH_{2n-2}O_{n-1}$ / eq ;	(2)
(a)(ii)	1. amylose is {straight chained / unbranched / eq} whereas amylopectin is branched ;	
	2. amylose {coiled / eq} (whereas amylopectin is not) / eq ;	
	3. amylose has 1-4 (glycosidic) bonds whereas amylopectin has 1-4 and 1-6 (glycosidic) bonds ;	(2)
b)	1. idea of carbohydrates providing a source of energy ;	
	2. if the {energy / carbohydrate / eq} input is greater than the {energy output / carbohydrate use / eq} (weight will be gained) / eq ;	
	3. idea of excess carbohydrate converted to fat	(2)

7)

(a)	1. reference to enzyme increasing the rate of reaction (higher than the rate if no enzyme present) ; 2. idea that the rate of reaction with the enzyme present is non-linear ; 3. Idea that increase in (initial) rate of reaction is same with or without enzyme present above (substrate concentration) of {10 / 12} ; 4. credit correct manipulation of figures (in relation to the effect of the enzyme) ;	(2)
(b)(i)	ester ;	(1)
(b)(ii)	Any **two** from: 1. fatty acid (s) / carboxylic acid(s) 2. glycerol / propan1,2,3 triol 3. monoglyceride 4. diglyceride ;;	(2)
(b)(iii)	(pH) would {fall / drop / get lower / decrease / eq} ;	(1)

(c) **VC**	**Take into account quality of written communication when awarding the following points.** 1. reference to use of a range of substrate (triglyceride) concentrations ; 2. idea of mixing (enzyme and substrate) ; 3. identification of a suitable dependent variable e.g. pH ; 4. description of how to measure the dependent variable e.g. use of pH indicator ; 5. reference to measuring time ; 6. description of how to calculate (initial) rate of reaction ; 7. idea of repeating experiment without the enzyme ; 8. idea of control of enzyme (lipase) concentration ; 9. reference to one other named controlled variable (e.g. temperature, type of triglyceride, volume of solutions) ; 10. reference to {replicates / repeats} (using the same triglyceride concentration) ;	**(5)**