

1. Consider the imaginary amino acid, fictine. Its properties are yours to determine.
- (a) Invent a possible structural formula of fictine. /2
 - (b) Draw the structural formula of the product formed when fictine self-ionises. /1
 - (c) A sample of fictine is mixed with another amino acid, fakine. A condensation reaction occurs and long chains are formed.
Draw a section of one of these chains (you'll have to invent fakine too). /2
 - (d) Circle a peptide link on your answer to part (c). /1
 - (e) Name the functional group that a peptide link consists of. /1
 - (f) On the diagram drawn for (c), show how the chain can interact with water. /2
 - (g) Name the interaction shown in part (f). /1
 - (h) Write (draw) the general formula of amino acids. /2
- 2.
- (a) Explain why the biological function of a protein (e.g. an enzyme) is altered if its spatial arrangement is altered. /2
 - (b) Explain why proteins are sensitive to changes in pH. /2
 - (c) Explain why proteins are sensitive to changes in temperature. /2
- 3.
- (a) Draw the structural formula of the oil (or fat) formed from these carboxylic acids:
 - lauric acid $\text{CH}_3(\text{CH}_2)_{10}\text{COOH}$
 - oleic acid $\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$
 - stearic acid $\text{CH}_3(\text{CH}_2)_{16}\text{COOH}$ /2
 - (b) Give the systematic name for the alcohol from which triglycerides are formed. /1
 - (c) Identify the most likely source of an edible triglyceride if it is solid at 25°C. /1
 - (d) Describe and explain the use of a solution of bromine or iodine to determine the degree of unsaturation of a compound. /3
 - (e) The oil or fat formed in part (a) is reacted with bromine. Draw the structural formula of the reaction product. /1
 - (f) Explain the role of pressure, temperature, and a catalyst in the hydrogenation of liquid triglycerides. /3
4. Consider the simple sugar, glucose.
- (a) Draw its structure in both cyclic and open chain forms /2
 - (b) Explain with the aid of a diagram why glucose is soluble in water. /3
 - (c) State the structural feature of glucose which allows it to react with Tollens' reagent. /1
 - (d) Draw the structure of the organic product formed from the reaction of glucose with Tollens' reagent. /2
 - (e) State what would be observed if a saturated glucose solution was heated with a small amount of acidified dichromate solution. Explain these observations with the aid of an equation. /3

TOTAL /40