

Revision solutions

- 1) Explain the following using the terms, covalent bonds, dispersion forces, ionic bonds, hydrogen bonds, amino acids.

a) Primary structure

A linear sequence of amino acids covalently bonded to each other.

b) Secondary structure

Parts of the amino acid chain attract each other via hydrogen bonding to form 3 dimensional shapes such as pleats, helices and folds.

c) Tertiary structure

Attraction of the R groups influences the 3 dimensional shape of the protein.

d) Quaternary structure

When two or more tertiary structures assemble to form a complex structure.

4 marks

- 2) With reference to the tertiary structure of a protein, explain the reason why:

- when enzymes are subjected to heat or changes in pH, they fail to catalyse reactions.

Heat and pH will disrupt the tertiary structure of the protein by breaking bonds. This alters the shape of the active site.

- each enzymes acts as a biological catalysts for specific chemical reactions

The surface of a protein has a unique shape that allows it to temporarily bind substrates. This part of the external surface where substrates bind is known as the active site.

2 marks

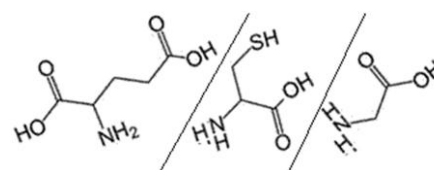
- 3) A small peptide chain is shown on the right

a) How many amino acids were used ?

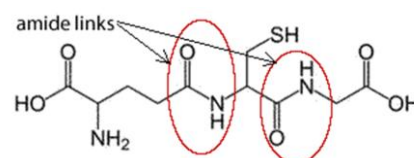
At each amide link place a water molecule.

Place the OH on the carbon double bonded to oxygen and the H on the NH

Three



b) Circle the amide link/s



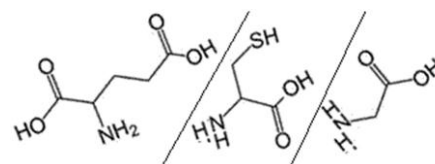
- c) Is this peptide heavier, lighter or the same mass as the total mass of the amino acids that formed it?

It is lighter by the equivalent of two water molecules

d) By how many mass units?

36 atomic mass units

e) Give the structure of each amino acid present



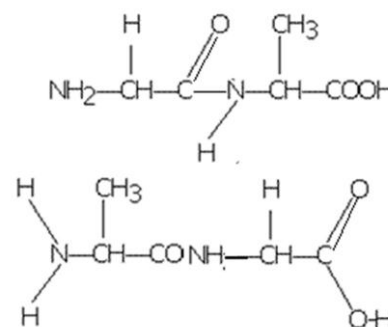
and identify it as an alpha or beta amino acid.

All three amino acids are alpha.

4) Consider the amino acids glycine and alanine.

- a) How many possible dipeptides can be formed?

2



- b) What type of reaction is this? Explain

Condensation, a small molecule is given off at the formation of each bond.

- c) Draw the structural formula of a product of this reaction.

Answer given above.

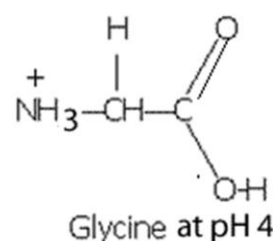
- d) What is the molecular formula of glycine?

C₂H₅NO₂

- e) Draw the structure of glycine at pH 4

- f) Explain why alanine and cytosine are used as pH buffers ?

Amino acids can act as both acids and bases and therefore can react with excess OH⁻ ions or H⁺ ions.



5) The following compounds form a mixture. C₂H₆, C₅H₁₂, C₅H₁₂O₂. They can be separated by fractional distillation.

- a) Explain how fractional distillation works.

Fractional distillation provides a large surface area for the vapours to condense. A temperature gradient exists up the fractionating column with the lowest temperature at the top. Vapours move up the column until the temperature is low enough for the vapour to remain a liquid.

- b) Place the molecules above in order of boiling point from lowest to highest.

Lowest C₂H₆ C₅H₁₂ C₅H₁₂O₂ highest

6) Fermentation occurs in yeast due to anaerobic respiration to produce ethanol.

- a) Write an equation for this reaction as glucose (C₆H₁₂O₆) is converted to ethanol.

C₆H₁₂O₆ (aq) => 2C₂H₆O(aq) + 2CO₂(g)

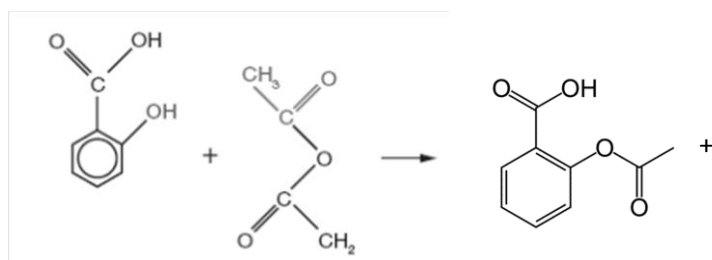
- b) Photosynthesis produces glucose and oxygen gas from atmospheric carbon dioxide and water. Write a balanced chemical equation for this reaction.

6CO₂(g) + 6H₂O(l) => C₆H₁₂O₆(aq) + 6O₂(g)

- c) Why is ethanol considered to be a carbon neutral fuel?

No net carbon dioxide is put into the atmosphere. The carbon dioxide absorbed during photosynthesis is released in the combustion process.

7) The structure of aspirin is shown on the right while the reactants shown on the left.



a) What two words can be used to describe the reaction above?

Esterification, condensation

b) What is the second product formed?

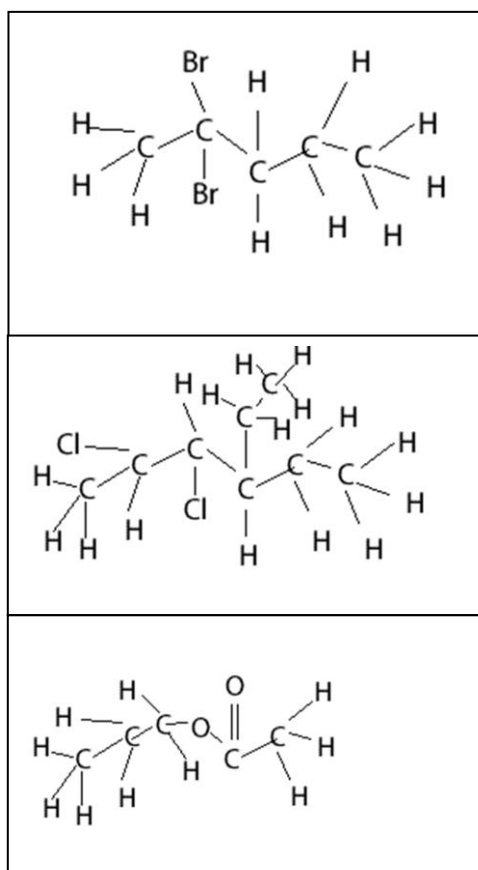
Ethanoic acid

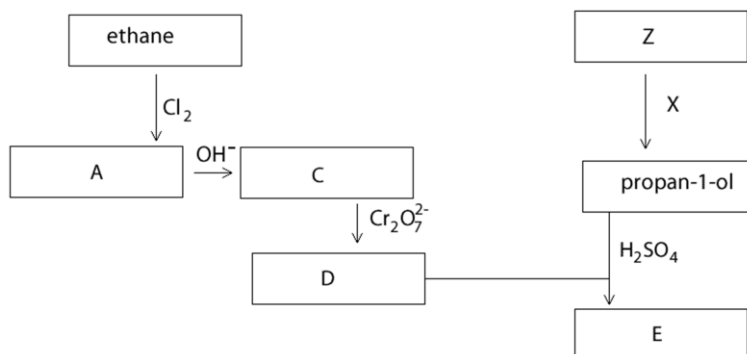
8) Draw the structures of the following compounds.

i) 2,2 dibromo pentane

ii) 2,3-dichloro, 4-ethyl hexane

iii) Propyl ethanoate





9) Name each of the following

A = chloroethane

Z = 1 chloro propane or propene

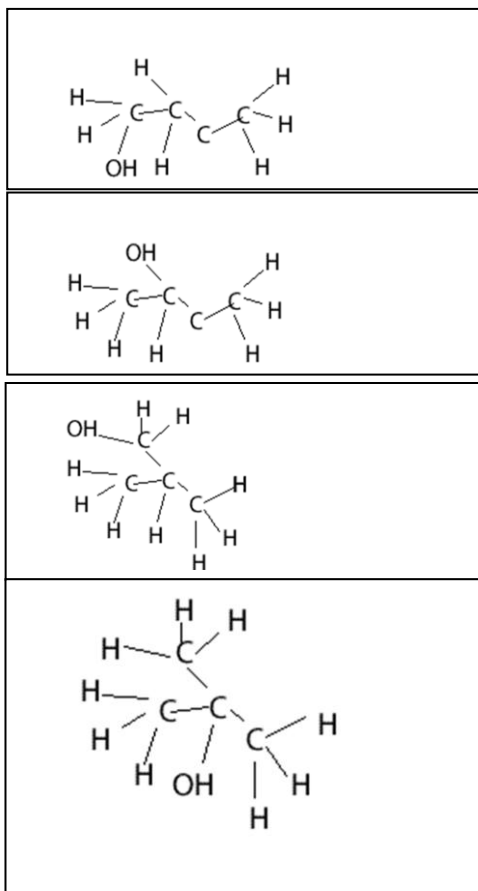
D = ethanoic acid

E = propyl ethanoate

X = OH^- (aq) or H_2O

C = ethanol

10) Draw and name the possible isomers for butan-1-ol



5 marks