Identifying macromolecules essay

As the name suggests, macromolecules are large molecules that make up more than 90% of the total cell mass. These biological macromolecules vary greatly in size – from several hundred to several hundred million molecular weight units – and are made up of monomer units. There are four major classes of biological macromolecules: proteins, carbohydrates, lipids, and nucleic acids (Sheeler & Bianchi, 1980). Proteins are made up of polymers of amino acids. The shape and structure of a cell is defined by proteins (Alberts et al. , 1989).

Carbohydrates are made up of polymers of simple sugars called monosaccharides. Carbohydrates can also be made up of two sugars, three sugars or more, and they are called disaccharides and polysaccharides respectively (Sheeler & Bianchi, 1980). Lipids are a collection of molecules that are insoluble in water but soluble in non polar solvents. Common lipids include fatty acids, glycolipds, neutral fats, and so on (Sheeler & Bianchi, 1980). Nucleic acids store and transfer all kinds of genetic information and are polymers of nucleotides (Pollard & Earnshaw, 2004).

The experiment performed was designed to identify the biological macromolecules. These biological macromolecules are to be identified by the changes in colour through three different tests – Iodine Test for starch and glycogen, Benedict’s Test for reducing sugars, and Biuret Test for Proteins. However, only two macromolecules are being identified in this experiment – carbohydrates and proteins. There are 12 solutions to be tested in this experiment. The Iodine test is used to indentify starch and glycogen in the given solutions.

Of the 12 solutions, solution 8 is a starch solution and solution 7 is a glycogen solution. Starch solutions turn blue-black when Iodine solution is added to it. This is due to the formation of polyiodide chains when the Iodine solution mixes with starch. Starch contains both amylose and amylopectin. The amylose molecules in starch form helices at the locations where the Iodine molecules assemble. This cause a dark blue-black colour change (" Starch-iodine test", 2008). Therefore, solution 8 should turn blue-black when Iodine solution is added to it since it is a starch solution.

However, glycogen solutions turn red-brown when Iodine solution is added. The chemical structure of glycogen is similar to the structure of amylopectin. Glycogen is highly branched. These branches are formed through acetal linkages. It is because of the highly branched structure of glycogen that solutions of glycogen turn red-brown in Iodine solutions (Ophardt, 2003). Thus, solution 7, a glycogen solution, should turn red-brown with the addition of Iodine solution. Solution 12 is an unknown, unknown 318. The Benedict's Test is used to identify reducing sugars.

Reducing sugars are sugars that contain free aldehyde or ketone groups that are oxidized into carboxylic acids. The Benedict's solution contains blue Cu+2 ions. These ions react with the electrons from aldehyde or ketone group, reducing the Cu+2 ions to Cu+ ions to form a red-brown precipitate of Copper (I) Oxide (Hunt, n. d.). A change in colour to red-brown indicates the presence of sugars. Of the 12 solutions, solution 4 is a solution of honey. This solution should turn red-brown since honey contains sugars.

Solutions 1(glucose solution), 3(maltose solution), 5(sucrose solution), and 6(lactose solution) should turn red-brown as well. This is because glucose, maltose, sucrose, and lactose are sugars. There should be no change in colour in the other solutions. However, since solution 12 is an unknown solution, we do not know if a colour change will take place. The Biuret Test is used to identify the presence of proteins in a solution. During the Biuret Test, 2 mL of 10% NaOH and 5 drops of 1% CuSO4 solutions are added to every test tube. Proteins are made up of polypeptides of amino acid chains linked together by peptide bonds.

The polypeptide backbone includes Nitrogen from the amino group of the amino acid, the ? -carbon, and the carbonyl carbon from the carboxyl group (Pollard & Earnshaw, 2004). The CuSO4 solution contains Cu+2 ions that cause protein solutions to turn violet when they stick to the Nitrogen atoms of the amino group (McRae, n. d.). Of the 12 solutions, solution 9 should turn violet because it was originally a protein solution. However, none of the other solutions should turn violet, and the colour change of the unknown 318 solution cannot be predicted yet.