

Chemistry Of Carbohydrates Lab Answers Sheet Greet

Chemistry Of Carbohydrates Lab Answers Sheet Greet Chemistry of Carbohydrates Lab Answers Sheet Carbohydrates are essential biomolecules that play crucial roles in living organisms providing energy structural support and serving as precursors for other important molecules This lab aims to explore the chemical properties and reactions of carbohydrates focusing on monosaccharides disaccharides and polysaccharides Through a series of experiments we will investigate their solubility reducing properties and interactions with various reagents gaining a deeper understanding of their structure and functionality

Materials Monosaccharides Glucose Fructose Disaccharides Sucrose Lactose Polysaccharides Starch Cellulose
Reagents Benedicts reagent Fehlings solution Iodine solution Barfoeds reagent Seliwanoffs reagent
Equipment Test tubes beakers graduated cylinders hot plates stirring rods water bath droppers

Procedures

- Solubility Test**
Purpose To observe the solubility of different carbohydrates in water
Procedure Add a small amount approximately 0.5 g of each carbohydrate to separate test tubes Add 5 mL of distilled water to each tube and shake well Observe the solubility of each carbohydrate at room temperature Record your observations
- Reducing Properties Test**
Benedicts Test
Purpose To identify carbohydrates with a free aldehyde or ketone group which can be oxidized
Procedure Prepare a Benedicts reagent solution according to the instructions Add 1 mL of each carbohydrate solution to separate test tubes Add 2 mL of Benedicts reagent to each tube and heat in a water bath for 5 minutes Observe the color change in each tube Record the color changes and the corresponding carbohydrates
- Fehlings Test**
Purpose Similar to Benedicts test Fehlings test is used to detect reducing sugars
Procedure Prepare Fehlings solution A and Fehlings solution B separately Mix equal volumes of Fehlings A and Fehlings B to form Fehlings reagent Add 1 mL of each carbohydrate solution to separate test tubes Add 2 mL of Fehlings reagent to each tube and heat in a water bath for 5 minutes Observe the color change in each tube Record the color changes and the corresponding carbohydrates
- Iodine Test**
Purpose To detect the presence of starch which forms a characteristic blueblack complex with iodine
Procedure Prepare a dilute iodine solution Add a small amount of each carbohydrate solution to separate test tubes Add a few drops of iodine solution to each tube Observe the color change in each tube Record the color changes and the corresponding carbohydrates
- Barfoeds Test**
Purpose To differentiate between monosaccharides and disaccharides based on their relative reducing abilities
Procedure Prepare Barfoeds reagent according to the instructions

Add 1 mL of each carbohydrate solution to separate test tubes Add 2 mL of Barfoeds reagent to each tube and heat in a water bath for 5 minutes Observe the color change in each tube Record the color changes and the corresponding carbohydrates

6 Seliwanoffs Test 3 Purpose To distinguish between ketohexoses like fructose and aldohexoses like glucose

Procedure Prepare Seliwanoffs reagent according to the instructions Add 1 mL of each carbohydrate solution to separate test tubes Add 2 mL of Seliwanoffs reagent to each tube and heat in a water bath for 5 minutes Observe the color change in each tube Record the color changes and the corresponding carbohydrates

Observations and Results Solubility Glucose Fructose Sucrose and Lactose Soluble in water at room temperature Starch Partially soluble in water at room temperature Cellulose Insoluble in water at room temperature

Reducing Properties Benedicts Test Glucose Fructose and Lactose Show positive results resulting in a brickred precipitate Sucrose Shows negative results remaining bluegreen Starch Shows negative results remaining bluegreen Cellulose Shows negative results remaining bluegreen

Fehlings Test Glucose Fructose and Lactose Show positive results forming a redbrown precipitate Sucrose Starch and Cellulose Show negative results remaining blue

Iodine Test Starch Shows a positive result turning dark blueblack Glucose Fructose Sucrose Lactose and Cellulose Show negative results remaining unchanged

Barfoeds Test Glucose and Fructose monosaccharides Show a positive result forming a red precipitate within 23 minutes Sucrose and Lactose disaccharides Show negative results or a very slow reaction forming a red precipitate after prolonged heating

Seliwanoffs Test 4 Fructose ketohexose Shows a positive result forming a bright red color within 12 minutes Glucose aldohexose Shows a negative result or a very slow reaction forming a light pink color after prolonged heating

Discussion The observations from this lab provide insights into the chemical properties of different carbohydrates

Solubility The solubility of carbohydrates in water is influenced by their molecular structure and the presence of hydroxyl groups Monosaccharides and disaccharides are generally soluble due to their relatively small size and the presence of numerous polar hydroxyl groups Polysaccharides like starch and cellulose are less soluble due to their larger size and the formation of complex structures with hydrogen bonding

Reducing Properties The reducing properties of carbohydrates are due to the presence of a free aldehyde or ketone group that can be oxidized Monosaccharides like glucose and fructose possess a free aldehyde or ketone group exhibiting strong reducing properties Disaccharides like lactose also have a free aldehyde group and show positive results in reducing tests However disaccharides like sucrose in which both anomeric carbons are involved in glycosidic linkages lack a free reducing group and show negative results

Iodine Test The iodine test specifically identifies starch which forms a blueblack complex with iodine due to the helical structure of amylose a component of starch

Barfoeds Test The different reducing abilities of monosaccharides and disaccharides are exploited in Barfoeds test Monosaccharides with their more readily available reducing groups react faster

with Barfoeds reagent producing a red precipitate within a short timeframe Disaccharides react slower due to their more complex structures and less accessible reducing groups Seliwanoffs Test This test differentiates between ketohexoses and aldohexoses based on their reactivity with Seliwanoffs reagent Ketohexoses like fructose react faster forming a cherry red color due to the formation of a hydroxymethylfurfural derivative Aldohexoses like glucose react slower producing a light pink color Conclusion This lab has provided a comprehensive understanding of the chemical properties and reactions of various carbohydrates We have successfully distinguished between monosaccharides disaccharides and polysaccharides based on their solubility reducing 5 properties and interactions with specific reagents The results demonstrate the structural differences and functional properties of these essential biomolecules highlighting their crucial roles in biological processes Further Exploration Investigate the effect of temperature on the solubility of carbohydrates Explore the hydrolysis of disaccharides and polysaccharides using enzymes Study the specific types of glycosidic bonds in various carbohydrates Analyze the structural differences between amylose and amylopectin in starch Examine the role of carbohydrates in food chemistry and their impact on human health

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functional carbohydrates is the term used to describe those carbohydrates that play an important role in strengthening immunity decreasing the level of blood lipid and regulating the intestinal flora of humans beyond those simply used as the energy supplying materials to date functional carbohydrates mainly cover dietary fiber functional polysaccharides functional oligosaccharides sugar alcohols and other functional monosaccharides functional carbohydrates development characterization and biomanufacture facilitates tracking the important progresses in functional carbohydrates this book addresses the history and recent developments of a selected number of important functional carbohydrates and it introduces the source properties and applications of a number of functional carbohydrates it describes in detail the biomanufacture of these carbohydrates based on fermentation or enzyme catalysis including the strain screening and improvement optimization of fermentation process and product downstream processing

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