

Iodine Test

Purpose

Carbohydrates are polyhydroxy aldehydes or ketones or substances. Carbohydrates can be monosaccharides, disaccharides and polysaccharides. In this experiment, iodine test will be used to characterize polysaccharides and monosaccharides on “Borderless Lab 365” platform.

Background

- The **iodine–starch test** is a chemical reaction testing the presence of starch or iodine. The combination of starch and iodine is intensely blue-purple. The triiodide anion instantly produces an intense blue- purple colour upon contact with starch.
- The intensity of the colour decreases with increasing temperature and with the presence of water-miscible organic solvents such as ethanol. The test cannot be performed at very low pH due to the hydrolysis of the starch under these conditions.
- It is thought that the iodine–iodide mixture combines with the starch to form an infinite polyiodide homopolymer. Different polysaccharides form different colors, for example, blue purple for starch, blue-black for amylose, black for dextrin, reddish-brown for glycogen and orange-yellow hue for amylopectin. Meanwhile, mono- and disaccharides do not react with the iodine buffer.
- Starch, a white, granular, organic chemical is produced by green plants. Starch is a soft, white, tasteless powder that is insoluble in cold water, alcohol, or other solvents. The basic chemical formula of the starch molecule is $(C_6H_{10}O_5)_n$. Starch is a polysaccharide comprising glucose monomers joined in α 1,4 linkages (Fig.1). The simplest form of starch is the linear polymer amylose; amylopectin is the branched form.
- Glucose is usually present in solid form as a monohydrate with a closed pyran ring (dextrose hydrate) (Fig.2). With six carbon atoms, it is classed as a hexose, a subcategory of the monosaccharides.

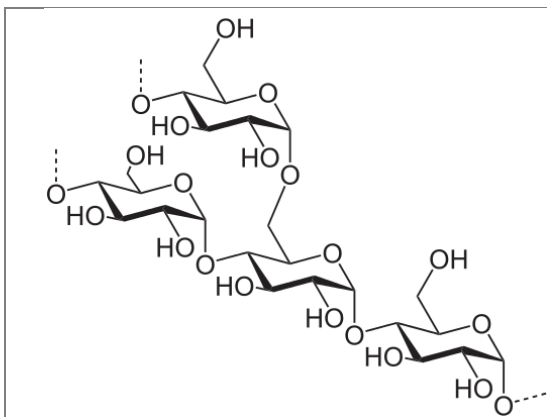


Fig.1 Structure of Starch

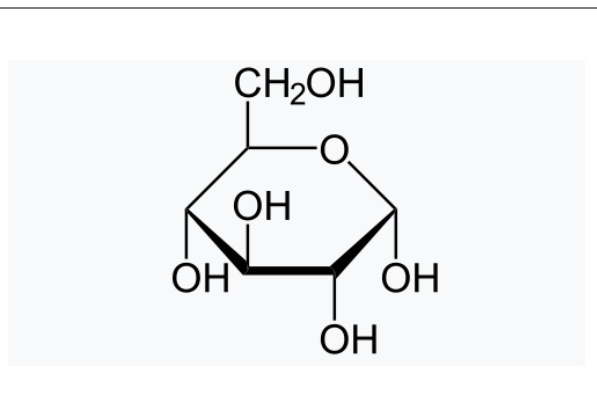


Fig. 2 Structure of Glucose

Apparatus and Material

- “Borderless Lab 365” Platform
- Iodine solution
- Starch solution
- 1% Glucose solution
- 1% Lactose solution

Preparation (by PolyU staff)

1. **Iodine 0.05 N:** Weigh 40g of potassium iodide (KI) in a 500 mL glass-stoppered flask and dissolve in 100 mL of purified water. Let the solution come to room temperature, add 12.7 g of resublimed iodine (I₂), restopper the flask, and swirl the flask until the iodine is completely dissolved. Add 3 drops of 37% HCl to prevent hydrolysis. Then add distilled water to 2L. Label it as “Solution 4”
2. **Starch solution:** Weigh 20g starch and dissolve it in 200ml of distilled water. Put the solution still. As starch should be slightly soluble in water, draw the supernatant as the starch solution. Label it as “starch Solution 1”
3. **1% Glucose solution:** Weigh 5g glucose and dissolve it in 500ml of distilled water. Label it as “1% Glucose Solution 2”
4. **1% Lactose solution:** Weigh 5g lactose and dissolve it in 500ml of distilled water. Label it as “Solution 3”

Procedure

- 1 Log in the experiment module “Iodine Test” on the Borderless Lab 365 platform. <https://stem-ap.polyu.edu.hk/remotelab/>
- 2 Wash the glass tube by pressing “WASH”. (Note: you can wash the glass tube 6 times only throughout the session.)
- 3 “ADD” Iodine solution, observe and record the color of the iodine solution.
- 4 Wash the glass tube by pressing “WASH”.
- 5 “ADD” Starch Solution into the tube.
- 6 “ADD” Iodine Solution into the tube.
- 7 “SHAKE”, observe and record the color change of the tube.
- 8 Wash the glass tube by pressing “WASH”.
- 9 Repeat the step 5-8 for glucose solution and lactose solution.
- 10 Press “LOGOUT” on the left when you complete the experiment

Results

Observe the results and fill in the table.

Color of Iodine solution: _____

	Starch	Glucose	Lactose
Colour			

Discussion

- 1 What is the definition and character of polysaccharides? List three other polysaccharide.
- 2 What is the definition and character of monosaccharides? List three other monosaccharide.
- 3 What kind of carbohydrate can solution 3 conclude? Why?
- 4 What is the principle of starch-iodine test?
- 5 How can this test be applied in our daily life?
- 6 Suggest other methods that can differentiate monosaccharide from polysaccharide.