

Biological Chemistry: Starch and Cellulose

Starch and cellulose are both polymers of glucose. Each macromolecule is composed of thousands of units of the monomer glucose. Chemically and functionally starch and cellulose are very different. They are different because of the location of the glycosidic bond joining adjacent glucose units. They are also functionally different as far as nutrition. Humans can use foods containing starch as a source of nutrition. We can digest starch. Cellulose on the other hand is non-digestible and passes through the digestive tract intact. While cellulose is not a nutritional source, it is an important part of the diet. It is commonly referred to as fiber.

Activity 1

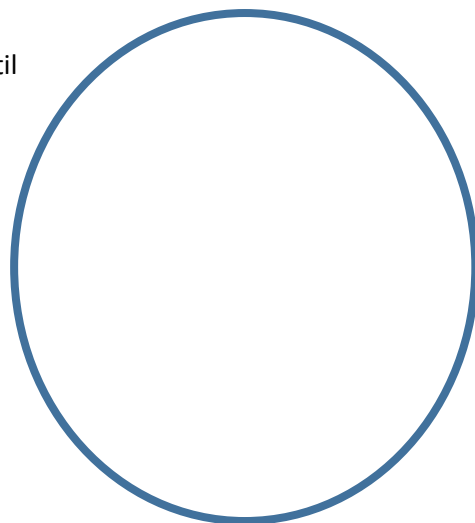
Materials

Potato
Microscope slide
Cover slip
Microscope
Razor blade or scalpel

Procedure

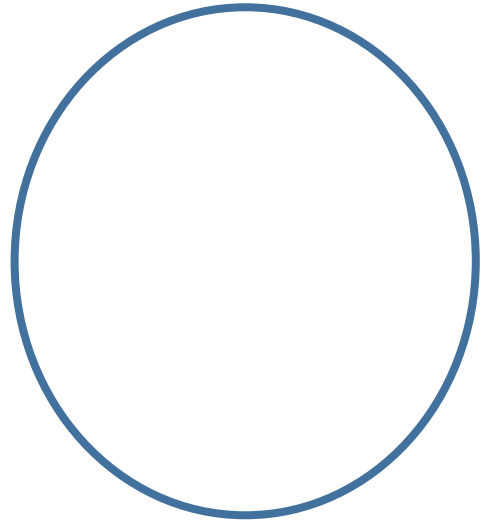
1. Add a drop of water to the center of the microscope slide.
2. Use the razor blade or scalpel to make a very, very thin slice of potato (1 mm or less).
3. Place the potato slice in the drop of water.
4. Place the coverslip over the potato slice.
5. View the slice on the microscope.
6. Focus on the cells of the potato. Increase the magnification until the potato is magnified 400X. You may need to move the slide on the stage to see the cells well. You may also need to adjust (lower) the light level passing through the specimen. The edges of the sample may be the thinnest part of the section and provide the best viewing.
7. Draw the image in the circle provided. Label the cell structures. Include at least 3 cells.

Potato (400 x)



8. Without moving the microscope stage or objectives, add a drop of iodine to the microscope slide at the edge of the coverslip.
9. Place a piece of absorbent paper on the edge of the coverslip on the opposite side of the iodine drop. This should draw the iodine across the slide. Do not worry if the iodine does not cross the entire potato.
10. Look into your microscope and observe any changes. If you do not see any changes, use the mechanical stage to move the microscope slide. Move the slide to the area covered with iodine under the objective.
11. Draw the image below. Label the cell structures.
Include at least 3 cells.

Potato stained with iodine (400 x)



Starch and cellulose stained with iodine are visually different. Describe the appearance of starch and cellulose.

Starch and cellulose are both polymers of glucose. Why do they appear differently?

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Activity 2

Materials

Spot plate

Iodine

Glucose solution

Starch powder

Water

Cellulose powder

Write your hypothesis for this activity here. _____

Procedure

1. Obtain a spot plate from the common materials area.
2. Add water 10 drops of water to the first well.
3. Add 10 drops of glucose to the second well.
4. Add a small scoop of starch powder to the third well. Add 10 drops of water to the starch powder.
5. Add a small scoop of cellulose powder to the fourth well. Add 10 drops of water to the cellulose powder.
6. Add a thin sliver of potato to the fifth well.
7. Add 5 drops of iodine to each well. Record your observations below.

Substance	Color reaction
Water	
Glucose	
Starch	
Cellulose	
Potato	

What is the purpose of using water as a test substance?

Which samples contained starch? How do you know?

Was your hypothesis supported? Why or Why not?

What was the control? What was the dependent variable? What was/were the independent variables?