

7.6B - Chemical and Physical Changes in the Digestive System

StemScopes Key

A decorative graphic consisting of several horizontal lines of varying lengths and colors (teal, white, and light blue) extending from the right side of the page towards the center.

Background Questions



What is a physical change?

- A physical change is a change to a substance that does not alter the identity of the substance.

Give an example of a physical change during digestion.

- An example of a physical change during digestion is teeth crushing and cutting food into pieces.

Why does food need to be physically broken down?

- Food needs to be physically broken down to increase the surface area. This makes it easier for food to undergo chemical changes.

What is a chemical change?

- A chemical change transforms a substance into a different substance.

Give an example of a chemical change during digestion.

- A chemical change that takes place during digestion occurs when chemicals from the stomach and small intestine combine with the food that has been eaten. The food is changed into smaller, different substances that can be used by the body.

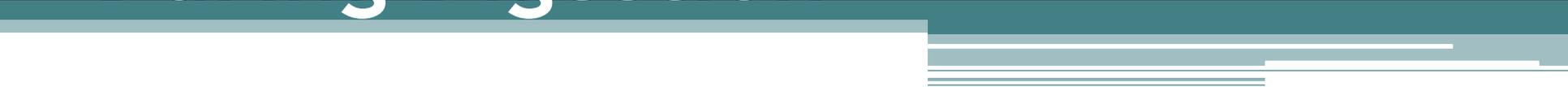
What is starch?

- Starch is a type of carbohydrate found in breads, crackers, and vegetables.

Why can it be said that we are what we eat?

- The food we eat gets broken down into small enough pieces to be absorbed by the cells in our body.

Part I: Chemical Changes During Digestion



Procedure for Saliva

Cup	Time of iodine addition	Color after iodine addition	Result: Starch present?
Starch	Immediately	Blue-black	Yes
#1	Immediately	Blue-black	Yes
#2	After 30 minutes	Red-orange	No

What color was the solution in cup #1 immediately after putting the iodine in the solution?

- **Blue-black - a positive test for starch**

What color was the solution in the cup labeled Starch immediately after putting the iodine in the solution?

- **Blue-black - a positive test for starch**

What is this telling you?

- There is starch in the solution.

What color was the solution in cup #2 after waiting 30 minutes?

- Red-orange - a negative result for starch

What is this telling you?

- There is no starch in the test tube

What chemical change took place in cup #2?

- The starch has been chemically changed into another substance

What sign of a chemical change is this?

- Color change

What caused the chemical change?

- The enzyme found in saliva

Where does this chemical change begin in your digestive system?

- The mouth

Procedure for Acid

Describe what happened and the final appearance of the lemon juice and milk in this space

The milk and lemon juice curdled, creating the curds (solids) and whey (liquid)

What happened to the milk when you mixed it with lemon juice?

- It got lumpy (curdled).

What sign of a chemical change is this?

- Formation of a precipitate (solid)

Where would this chemical change occur in the digestive system?

- The stomach

Part II: Physical Digestion and Surface Area



Use a metric ruler to determine the volume, surface area, and surface area to volume ratio for the two different sized cubes of sugar.

Number of Cubes	Volume	Surface Area	Surface Area to Volume Ratio
1 cube			
27 cubes			

Based on the data above,
complete the following statement:
The larger the object, the **greater**
its surface area to volume ratio.

Cube	% of cube at start	% of cube at stop	Total Time Lapse
Crushed	100%		
Solid	100%		

Which cube dissolved at a faster rate?

- The crushed sugar cube dissolved at a faster rate.

What was different about the two cubes?

- The surface area of the two cubes was different. The crushed cube had a much greater surface area.

What does this tell us about the role of physical change during digestion?

- The role of physical change is to increase the surface area of the food so that the chemicals can react faster to break the food down into absorbable nutrients.

Part III: Physical Changes for Digestion



My Question of Inquiry:

- Can I detect and identify if physical or chemical changes occur when water is added or when a cracker is broken?

The Hypothesis:

- If a cracker is broken or mixed with water, then it will test _____ for the presence of starch because _____.
- If a cracker is broken or mixed with water, then it will test positive for the presence of starch because the cracker will not have changed chemically.

Independent Variable

- AKA – Manipulated variable
- The action or change made to the cracker, like being broken or mixed with water.

Dependent Variable

- AKA – Responding variable
- The test for whether starch is present or not.

Control Group

- Whole cracker, because it is not broken or mixed with water.

Materials

- 3 crackers
- Iodine
- 50 mL beaker
- 250 mL beaker of water
- Dropper
- Napkins
- Plastic baggie

Safety

- goggles
- aprons

Collect, Record, and Organize Data

Cracker Conditions	Observations After Iodine Addition
Not Broken	Turns black (starch is present)
Broken	Turns black (starch is present)
Mixed with water	Turns black (starch is present)

What color was the iodine when placed on the unbroken cracker?

- **Black**

What color was the iodine when placed on the broken cracker?

- **Black**

Did both still contain starch?

- Yes

What was changed between the broken and unbroken cracker?

- The shape and size

What type of change is this?

- Physical change

What color was the iodine in the bag with the cracker and water?

- **Black**

What was changed between the crackers outside the bag and inside the bag?

- Shape, size, and texture

What type of change is this?

- Physical

What part of the digestive process did mixing the cracker and the water in the bag simulate?

- Stomach muscles mixing our food

Why are the changes to the cracker outside the bag and the bag considered physical changes?

- They have only changed shape, size, or texture but not chemical properties.

What is the significance of having both physical and chemical methods for breaking down food for maximizing nutritional absorption?

- It is important to have physical methods of breaking down food because it breaks the food down into smaller, more manageable sizes. It will not break it down to the microscopic or molecular level that the body needs it to be in order to be absorbed; therefore, it is necessary to have chemical methods to break it down into what the body needs.

Reflections and Conclusions



Is the hypothesis supported by the data? Explain.

- Yes, the hypothesis is supported by the data. When the cracker is only physically changed, the starch was unaffected and was still present.

How did the results reveal a relationship between the independent and dependent variable?

- As long as the manipulation of the cracker was physical, it tested positive.

Where could errors have been made while collecting or organizing data?

- There are few places for errors, but maybe the wrong amounts of water or iodine could have affected the results.

What do you conclude about this investigation?

- My conclusion is that the starch in crackers is unaffected chemically during a physical change of breaking it or adding water to it.

What would you do differently if you were to conduct this investigation again?

- could include using different types of crackers or starches.

What was the relationship between surface area and volume?

- The greater the surface area, the less the volume.

The ice cube with the greater surface area dissolved fastest. How does this relate to physical and chemical digestion?

- The breaking down of the food physically helps the chemical break down faster. This helps the body get the nutrients it needs.