

# SCIENCE READ AND LEARN: BROWNING APPLES

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

Apples can be a delicious snack as long as they are not brown. The inside of an apple usually has a delicious center that is free from brown spots. The skin of the apple protects it from the oxygen in the air.

## Oxidation

When an apple is cut, its flesh becomes unprotected. When the apple's flesh meets the oxygen in the air, a chemical reaction called oxidation occurs. Oxidation causes the apple's flesh to turn brown. Then, the fruit spoils. Oxidation makes fruit spoil much faster than it normally would. Other fruits such as bananas, pears, and peaches can also become a victim of oxidation.

## Preventing Oxidation

Oxidation can be avoided by covering the fruit with ascorbic acid. Ascorbic acid is another word for Vitamin C. Vitamin C can be found in many citrus fruit like oranges, grapefruit, and lemons. It must be applied right after the fruit is cut in order to work. Here is an example with lemon juice. First, cut the lemon, so it will be ready. Then, cut the apple. As soon as you cut the apple, squeeze the lemon juice over the apple slices. This will prevent the slices from turning brown.

If you prevent oxidation, you will never have to eat brown fruit again.

1.) Explain the process of oxidation.

2.) What is the connection between ascorbic acid and oxidation?



# APPLE OXIDATION EXPERIMENT

Name: \_\_\_\_\_ Date: \_\_\_\_\_

They say that an apple a day keeps the doctor away. Our beloved apples are full of vitamins. Unfortunately, they also have a tendency to turn brown very quickly after being sliced. Who wants to eat an icky, brown apple? Not me!

## Why does this happen?

Like all fruit, apples contain an enzyme (PPO or polyphenol oxidase) that works within the cells to keep them alive. When we cut open an apple, we damage the apple cells and let in oxygen from the surrounding air. The enzyme reacts with the oxygen, turning the apple brown. This process is called oxidation.

## How can we prevent this?

There are some liquids, like fruit juices and soda that contain ascorbic acid. This harmless acid can stop the oxidation process. Let's test some liquids and see if they are able to stop the oxidation process.

## Materials Needed for the Experiment

- apples
- a knife or apple slicer
- a variety of liquids
  - plain water
  - salt water (1/8 tsp of salt, 1 cup of water)
  - sugared water (1 tbsp of sugar, 1 cup of water)
  - honey water (1 tbsp of honey, 1 cup of water)
  - pure lemon juice
  - lemonade
  - apple juice
  - orange juice
- one small bowl, cup, or baggie for each liquid
- labels for your liquids
- a large platter or plate

## Directions:

1. Prepare and pour each liquid into its own bowl, cup, or baggie. Be sure to label the liquids.
2. Write down your predictions for each liquid.
3. Carefully slice your apple into small pieces.
4. Immediately place one apple piece into each liquid. Make sure the liquid is covering the white part of the apple.
5. Leave one piece untouched for the control variable.
6. After three minutes, remove the apples from the liquid and place them on a platter.
7. Make a note of how the pieces have changed after three minutes and then again after six minutes.
8. Were your predictions correct?

Are you brave enough to taste them? Do the apple pieces still taste yummy after absorbing those liquids?

APPLE JUICE	ORANGE JUICE	PLAIN WATER	SUGAR WATER
LEMONADE	PURE LEMON	HONEY WATER	SALT WATER

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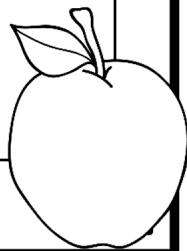
APPLE JUICE	ORANGE JUICE	PLAIN WATER	SUGAR WATER
LEMONADE	PURE LEMON	HONEY WATER	SALT WATER

# OXIDATION EXPERIMENT PREDICTIONS

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Directions:** Make your predictions about how the liquids will affect the oxidation process.

Liquid	Prediction

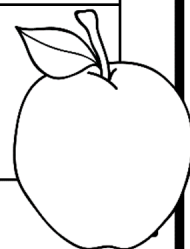


# OXIDATION EXPERIMENT DATA

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Directions:** Use the table to record your observations after three minutes and again after six minutes.

Liquid	After Three Minutes	After Six Minutes

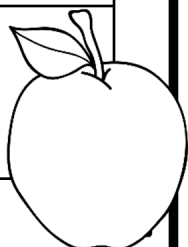


# OXIDATION EXPERIMENT REFLECTIONS

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Using the results of the experiment and what you learned about preventing oxidation, what conclusions can you make about the liquids used for the experiment?

Liquid	Conclusion



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