

Ideas with

IMPACT

HEALTH & WELL-BEING

**Fruits and Vegetables
Are Alive!**

IDEA PACKET SPONSORED BY:



Fruits and Vegetables Are Alive!

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Goals and Objectives:

My project involves training teachers to teach their students how to understand and care for produce from their garden products.

This project can be used by all age levels and across many disciplines. The ideas included will provide an interactive way for students to learn about this topic.

Produce has a shelf life, no matter if they come from the school garden or from the grocery store. Postharvest physiology is the science that handles how to harvest, handle, package, commercialize and to a certain extent, grow and care for horticultural products. If a school is growing fruits and vegetables, it is important to know the basics of produce physiology to maximize shelf life. It all starts with a good understanding of plant physiology, cellular respiration and photosynthesis.

This workshop will offer students the opportunity to experiment and realize that produce is still alive, breathing and subject to infection and decay. Students and teachers will learn to handle their harvest in the best way possible as well as properly store produce from the grocery stores at home.

Florida Standards:

SC.912.L.14.7

Relate the structure of each of the major plant organs and tissues to physiological processes.

SC.912.L.18.8

Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.

SC.912.L.18.9

Explain the interrelated nature of photosynthesis and cellular respiration.

SC.1.L.14.2

Identify the major parts of plants, including stem, roots, leaves, and flowers.

SC.912.L.14.31

Describe the physiology of hormones including the different types and the mechanisms of their action.

SC.8.P.9.3

Investigate and describe how temperature influences chemical changes.

Course Outline and Overview:

This activity is for groups of students and can be completed in one class-hour and the experiments can be conducted over a few days or over the course of two weeks. For demonstration purposes a plant physiology and plant respiration set of cards will be provided and the material is attached to this packet for your use while conducting the plant physiology review and the respiration game.

Participants will be presented a brief introduction of the STEM topic involved in this lesson. They will then set up a couple of experiments, then be divided into groups, and practice with the cards provided on how to play the respiration game. After completing the experiment and games, there will be a discussion and feedback on potential ways these activities can be adapted to different situations.

Lesson Plan and Step-by-Step Instructions:

Lesson Title: Fruits and Vegetables Are Alive!

Background Knowledge: notions of cellular respiration, photosynthesis, cell respiration, plant storage, factors affecting respiration rates.

Phase One:

For phase one, review the major physiological processes associated with plants, focusing on cellular respiration and photosynthesis. This review can be done as a presentation or using the attached cards as an interactive concept map activity.

1. Students are given one deck of cards pertaining to the topics addressed earlier.
2. Each group arranges the deck of cards in a way that makes sense to them.
3. Optional: Each student or as a group write down 5 sentences linking the cards' contents as they are arranged.

Phase Two:

For phase two, introduce the postharvest concepts such as terms such as produce and perishability. Explore how produce can be from different plant parts, and how that affects how they behave after harvest.

Please see this free resource about plant parts here:

<https://ucanr.edu/sites/default/files/2014-04/187894.pdf>

Have a class discussion using students' ingrained knowledge and life experience about perishability, what have they observed at home, cafeteria or when they go out to eat?

Here you can perform experiments such as:

1. Observing how a fresh fruit/vegetable behaves - experimentation by placing a fruit and/or vegetable in a Ziplock-type bag and comparing it with our body's physiology. Observe the release of water inside the bag due to cellular respiration.
2. Storage experiments: understand factors that affect fruit/vegetable shelflife. Experiment storing a fruit/vegetable at different temperatures and packaging and observe outcomes. Examples:

- a. Using unripe bananas, place one in a fridge and another in a classroom table - observe how they develop.
 - b. Using lettuce leaves: place some in an open container and some inside a sealed bag on a classroom table, and some in a fridge with and without a plastic bag. Compare the quality of the leaves after a few hours or a day.
 - c. Using zucchini: place some in an open container and some inside a sealed bag on a classroom table, and some in a fridge with and without a plastic bag. Compare the quality of the fruit after a few hours or a day.
3. Promote decay by injury - conduct an experiment where a fruit/vegetable is damaged and observe how decay develops compared to an undamaged fruit/vegetable.
4. Play a Produce Respiration Game - students will play a game where they try to categorize produce on their respiration rates and correlate with how perishable they are (see attached).

Activity Reflection Questions:

1. How well can students understand plant physiology?
2. How well can students correlate plant physiology to produce perishability?
3. Can students infer how different plant parts have different perishability?
4. Can you connect produce respiration rates with the compositional and structural characteristics of produce?
5. Is there some topic(s) that needs reviewing?
6. What are the strong and weak points from the answers provided?
7. How can students correlate what they learned to how produce is stored in their homes and/or school garden situations?
8. Can students use this knowledge to better care for their produce at home and in the garden setting?

Resource List:

In order to complete this project teachers will need cardstock or index cards, a computer with a printer, scissors and a laminator (not essential). A board where the game can be played, a countertop area, Ziplock-type bags and access to a fridge for the experiments.

Plant parts free lesson:

<https://ucanr.edu/sites/default/files/2014-04/187894.pdf>

List of materials: computer, cardstock or index cards and writing materials (markers, crayons, colored pencils and pens), post it notes, a board with markers, printer, ziplock-type bags. Produce for experiments (bananas, zucchini, etc).

Variations:

- Have the students make their own set of cards
- Use magazines, catalogs, newspapers to provide words and images for the cards.
- Conduct experiments with produce from the garden or brought from home.

PLANT PHYSIOLOGY REVIEW CARDS

Cellular Respiration

Photosynthesis

Energy

Sunlight

Storage

Seed

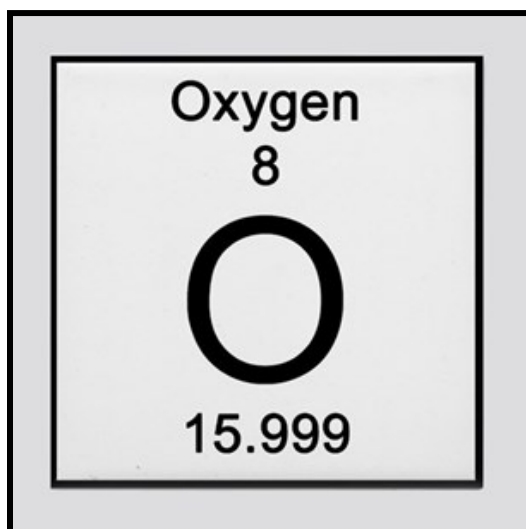
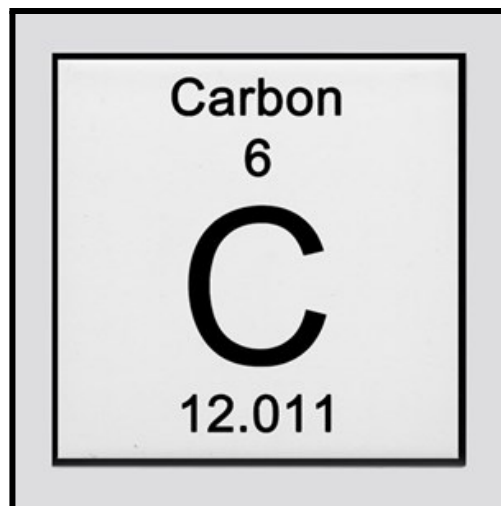
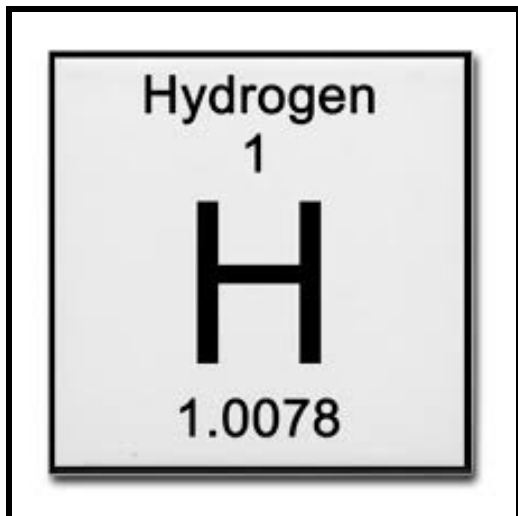
Carbohydrates

Starch

Enzyme

Reserves

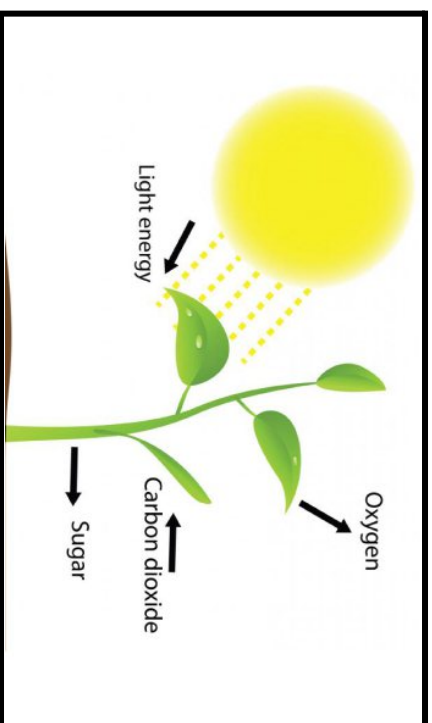
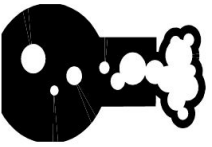
Breakdown



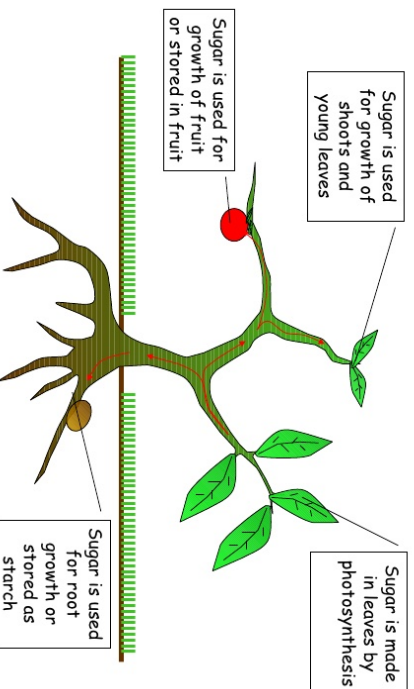


What is an Enzyme?

- Enzymes are types of Proteins!
- They end in "ase"
- They speed up chemical reactions...
 - Also Known As CATALYST



Food Transport in Plants

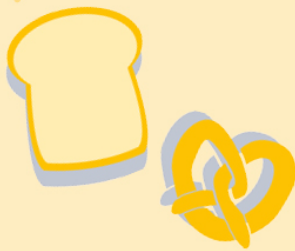






The 3 types of carbohydrates

Starches



Fibre



Sugars



POSTHARVEST TERMS

Produce Plant Part

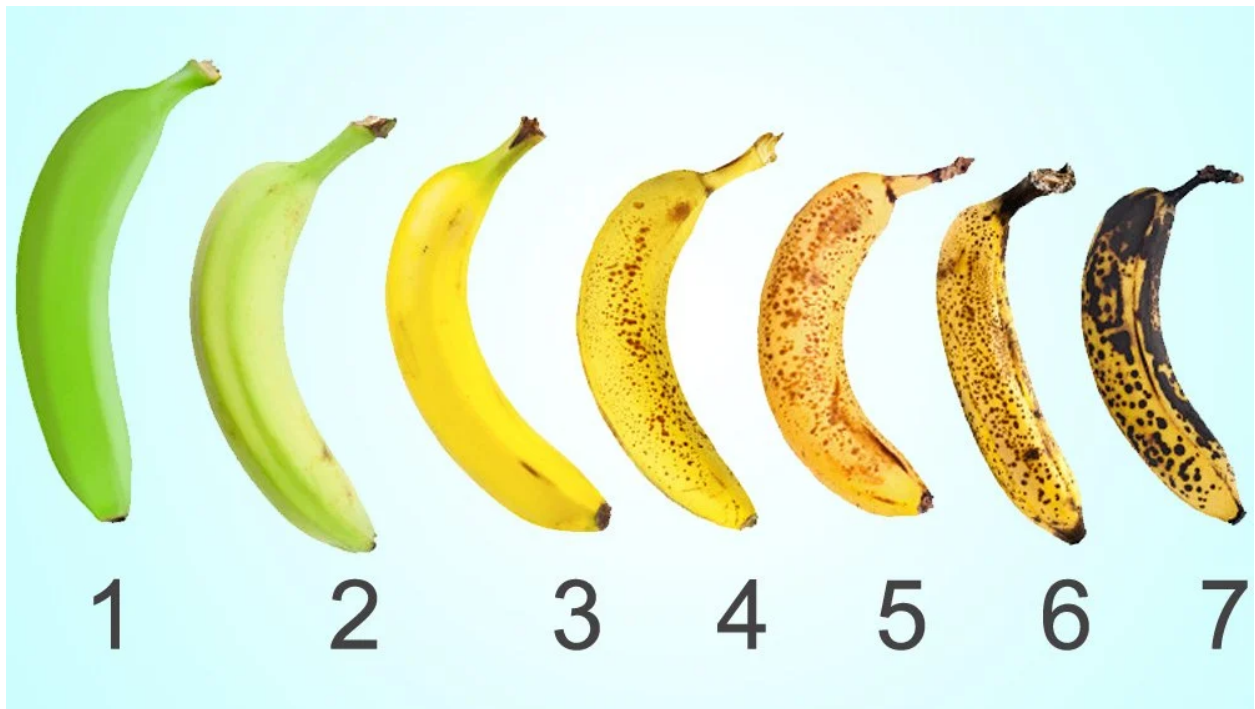
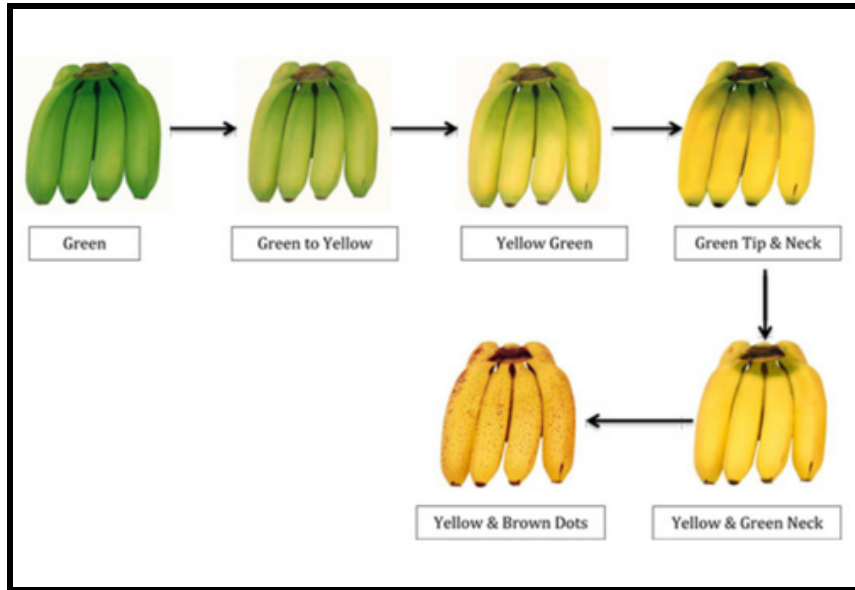
Surface Area Composition

Thickness/Hardness of Exocarp

Perishability Temperature

Relative Humidity

Maturity Ripeness



<https://www.scienceabc.com/nature/the-science-of-ripening.html>

Respiration Game Cards

Respiration Rate: Low and Very Low

Answer: Dried fruits and vegetables, nuts, coconut, cabbage

Respiration Rate: Moderate

Answer: Mango, potato, avocado, banana

Respiration Rate: High and Very High

Answer: Lettuce, broccoli, spinach, mushrooms

Dried fruits and vegetables Nuts

Cabbage

Mango

Potato

Avocado

Lettuce

Broccoli

Spinach

Coconut