

Grapes of Class

Investigative Question: What changes take place in plant material (fruit, leaf, seed) when the water inside changes state?

Goal: Students will investigate the differences between frozen, dried and ‘untouched’ grapes using measurements and observations.

Objectives: Students will develop skills of observation and will practice their measuring skills. They will describe how changes in the state of water (liquid, gas, or solid) inside plants affects the physical properties of the plant, and will list at least one way that plants protect themselves against freezing or dehydration.

Knowledge: The physical properties of plants change when the water within the plants changes state. Water can be a solid, liquid, or gas.

Skills: Make observations of physical properties of plant materials. Practice selecting and using appropriate measuring tools. Create and interpret graphical displays of data.

Values: Students will appreciate the force that water can exert on a living thing. They will recognize that adaptations help organisms (specifically plants) survive when exposed to some of these extremes.

Virginia SOL: Science 3.1, 3.3 c, 3.9; Math 3.17

Materials

- Grapes, fresh and frozen
- Cooler
- Raisins
- Weight Scale/balances, rulers, other measuring tools
- Hand lenses
- Visual aid of water expansion (see page 4)
- Giant and small sticky notes
- Permanent marker
- Data sheets
- Pencils

Special Safety

Instruct students to not eat the materials.

Procedure

1. Introduction (5 min)
 - a. Divide students into groups of 3 and assign a letter each group (A, B, C, etc.). This will be their team for this project.
 - b. Connect back to plant/tree needs: soil, air, sun, water. This activity focuses on water. Plants need water to make their leaves and stems stiff (like a full waterbed or water balloon). Plants need water to mix with carbon dioxide to make sugars using energy from the sun. They also need water to move those sugars and other nutrients through their entire plant body.
 - c. *Inquire*- What are the three states of water? (Solid – ice, liquid – water, gas – steam). Ask students to describe liquid water (make sure to point out that it doesn’t hold a shape and fills a container). How does water become steam? (heat it up, evaporation) How is steam different from liquid water? (floats in the air) How does water change into a solid ice? (temperature is lowered and it freezes) How is ice different from liquid water? (cold, hard, doesn’t change shape, floats) Explain that water is special because most things shrink when they get cold, but water actually expands. Use visual aids to assist (see page 4).



- d. There is a *lot* of water inside plants. Ask students to predict: Based on our discussion, what do they think will happen to the water in a TREE when the air is very hot? What about when the air is really cold (especially below freezing)? Record these ideas on their data sheet.
2. Explore and observe (~10 min)
 - a. Grapes grow on woody vines. Ask students if they have seen wild or cultivated vines in the forest (You might use images.). Explain why we are using grapes: because they are easy to get, observe, and measure. What part of the plant is the grape? [It is the fruit—has seeds in it.]
 - b. Each group of three will get a raisin, a whole grape, and a frozen grape. Each student specializes in one form of the fruit.
 - c. In these groups, students observe the three forms of grapes. They should make and record physical observations on their data sheet.
 3. Measure (~10 min)
 - a. Ask what tools could be used to learn more about the grapes. What would those tools measure? As a class, select a specific aspect to measure (e.g. weight or height) and choose the unit of measurement. With student input, create a graph or chart to analyze the data.
 - b. Student groups may choose from available tools (rulers, weight scale, string to measure “fatness” [perimeter]) to record data about their grapes. First they need to measure the agreed upon aspect (Example, all must weigh the grape first), report this data on class data sheet, and then they can explore other measurements.
 - c. As soon as each person has measured the agreed upon aspect (first) of their grape, they record it on their data sheet and then write the number and unit on an appropriate colored sticky note. (All raisins get one color, all grapes another, and so on). Place the sticky note in the appropriate ‘FORM’ area of the table.
 - d. They may then measure and record other aspects until all groups have reported their measurements.
 4. Wrap up (5)
 - a. Ask for observations of trends – what do they notice about the thing they measured in each type of grape? (Likely that the frozen one and the regular one were similar, but the raisin was different). What about the physical characteristics? Have any properties changed at all? (Frozen grape should now be mushy).
 - b. What does this tell them about their predictions on what would happen to trees in very hot places or very cold places? (See Procedure, #1d) What kind of adaptations must trees have to survive in very hot or very cold places?

Possible Extensions: (optional)

- Make a class list of adaptations plants have for different weather.
- Raisins are made by dehydrating, or taking the water out of grapes. These raisins were made commercially; how could we make them at home? What would we need to dry out a grape? (heat, moving air) What tools could we use? (Brainstorming could come up with oven, sun, microwave...) If microwaved, that would heat up the water very, very quickly inside of the grape. The tight skin tries to hold the water in – what do you think will happen if the water inside turns to steam and pushes against the skin?

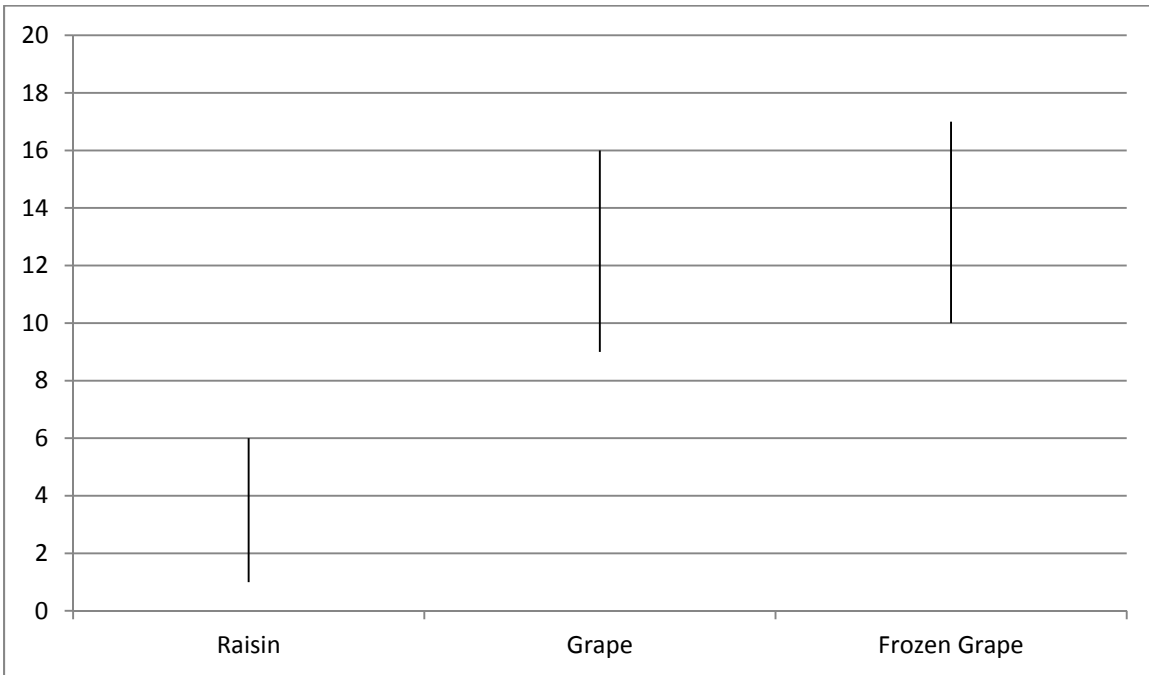


Class Data Example

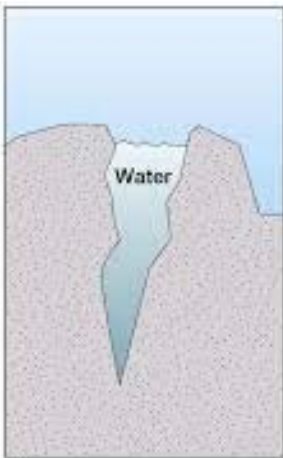
Ask class to add to this graphic:

What was measured?

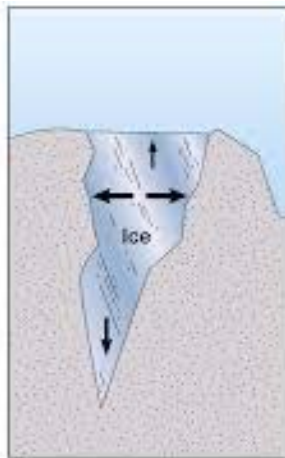
What do we put on the Y axis/ What units do we use?



ICE EXPANDS!



(a)




(b)



Grapes of Class

Student Name _____ Group _____

What do you think will happen to a plant when the air is very hot ?	What do you think will happen to a plant when the air is very cold ?

My sample is a (circle one): raisin, grape, frozen grape.	
Describe or draw with detail 	

As a class, we decided to measure the _____ of our samples. Record your group data below:

Sample:	Value:	Observation:
Grape		
Raisin		
Frozen Grape		

(If you finish and want to measure more things about your samples, there is another table on the back)



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Grapes of Class

In what ways did the physical properties of the grapes change when heated or cooled? Use numbers, and words or pictures to explain.


	Look at the measurements in the class data table	Look at your samples and describe your observations .
How did <i>freezing</i> change the grape?		
How did <i>drying</i> change the grape?		

How do you think plants in very hot, dry habitats keep from drying out?

How do you think plants in very cold habitats keep from freezing?



After making the measurements we decided on as a class, you may measure more things about your samples.

<p>In this row, write what you are measuring:</p> 				
	Value:	Observation:	Value:	Observation:
Grape				
Raisin				
Frozen Grape				



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