

Air

What's Growin' On?

Elements for Life



Water



Sun



Soil



California Foundation for
Agriculture in the Classroom

**Extra!
Extra! Classroom Extensions**

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Introduction

Welcome! Thank you for your interest in California Foundation for Agriculture in the Classroom's (CFAITC) student activity newspaper, *What's Growin' On? Elements for Life*. Developed by educators like you, *What's Growin' On?* offers fun and engaging ways to teach and practice core academic skills while demonstrating the importance of our food and fiber system.

This *Extra! Extra! Classroom Extensions* guide contains ideas and opportunities for extending the content presented in the student activity newspaper. It includes inquiry-based lab ideas for incorporating agriculture throughout the curriculum. Activity ideas are varied to help you meet the different learning styles of students in your classroom. Opportunities for group work, hands-on activities, and visual displays support the needs of ELL students. GATE students will enjoy the challenge of the advanced lesson ideas, such as dissecting fish, designing a school compost plan, and experimenting with water displacement to find the volume of fruits.

The agriculture-themed examples and activities found in *What's Growin' On?* are designed to motivate and inspire your students, connecting classroom lessons to real-life experiences and circumstances. This is accomplished by weaving **agriculture** into academics so students can better relate to food they eat, clothes they wear, homes they live in, and the open spaces they enjoy. Additionally, using the **newspaper** as an instructional tool allows young people to discover the relevance of their classroom studies by reading news stories, acquiring knowledge, forming opinions, and broadening their understanding of the world they live in.



California Foundation for Agriculture in the Classroom is dedicated to increasing the awareness and understanding of agriculture among California's educators and students. CFAITC provides educators with resources and programs that enhance agricultural literacy. To request a free teacher resource packet or a classroom set of the current edition of *What's Growin' On?* contact CFAITC via e-mail (info@LearnAboutAg.org) or phone (800-700-2482).

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Something's Fishy

Extension Ideas

1. **A Master of Disguise.** Kelp may look like a plant, and in many ways it acts like a plant by making its own food through photosynthesis, however, kelp is considered an algae because it lacks true leaves and does not have a vascular system to transport nutrients to its different structures. Kelp absorbs nutrients and carbon dioxide from the surrounding ocean water. Algae are in the Kingdom Protista while plants are in the Kingdom Plantae. Kelp forests off California's coast provide important habitat for many marine organisms and also provide food for people. Give students a visual of kelp by viewing the Kelp Webcam from the Monterey Bay Aquarium.



www.montereybayaquarium.org/efc/efc_kelp/kelp_cam.aspx?view=2

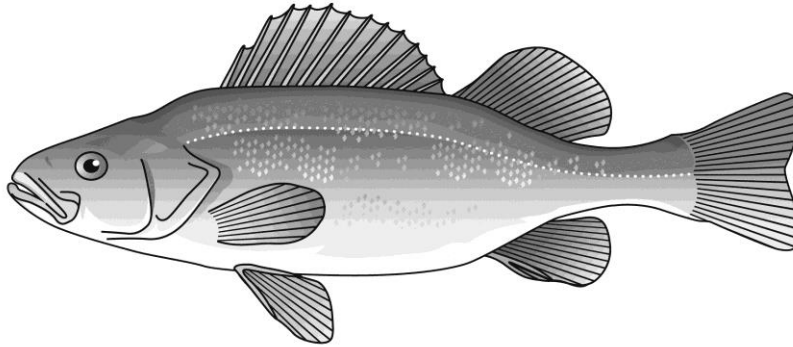
Introduce the structure of kelp and have students draw and label the function of each part of the kelp including the blade, stipe, holdfast, and air bladder. An online kelp diagram can be found at: <http://ccber.ucsb.edu/collections-botanical-collections-algae/ecology-seaweed-and-its-environmental-significance>

Students can use the Venn diagram from page three of *What's Growin' On? Elements for Life* as a resource to write an article informing others of the differences between plants and kelp. **Fascinating Fact:** The giant kelp off California's coast can grow as much as 1-2 feet per day!

2. **Timber.** The ocean is full of forests, but these 'trees' would be calling "timber" without the swaying of the ocean to hold them up. Build a model kelp 'tree' in class to demonstrate how these amazing structures work by attaching string to an air-filled balloon and tying a weight to the other end. After being submerged in a clear sided container, the balloon will keep the string upright in the water, just as the bladder or pneumatocyst of the seaweed keeps the kelp afloat. Ask students what they think would happen if the kelp did not have gas filled bladders.
3. **No Forks Allowed.** Students can get to know the taste, texture, and smell of seaweed by using it to make sushi. Seaweed sheets, called nori, can be found in the Asian food aisle in many grocery stores. By using wax paper as a mat, students lay out a sheet of nori, fill it with sticky rice and various meats or vegetables, and roll it up. Adhere the end of the nori sheet to the roll with a little soy sauce. The roll can be cut into small slices and enjoyed by everyone!

Students may not know just how common seaweed is in the foods they eat. Ingredients from seaweed act as thickeners, stabilizers and coloring in many of our foods. For homework, ask

students to do an inventory of foods in their homes that contain *carrageenan*, *alginate*, or *beta carotene*. Students should make a list of foods that contain any of these ingredients and should research the source of carrageenan, alginate, or beta carotene. Examples may include yogurt, margarine, mayonnaise, salad dressing, whip cream, egg substitutes and ice cream.



4. **Picasso Pieces.** In this activity, students will create beautiful artwork for your classroom bulletin board with fish prints and kelp made out of tissue paper. To make the kelp, give students brightly colored tissue paper and ask them to create their own unique underwater seaweed by cutting or tearing a silhouette of kelp.

Creating fish for the bulletin board will be a lot of fun! Purchase inexpensive fish from the market and provide a variety of paint colors for your students. Cover one side of the fish with paint and have students use the fish as a stamp on paper. When the paint dries the fish can be cut out and attached to your bulletin board.

Have students research the different creatures that may be found living in a California kelp forest and make a list of these creatures on the board. Students can make cutouts of these creatures and place them in your kelp forest. A few important facts about each creature should be listed on its corresponding cutout.

Virtual Field Trip Idea

Shore-side Farm Produces Awesome Abalone. This six-minute video will take students on a tour of a California abalone ranch. www.californiabountiful.com/features/article.aspx?arID=404

Guest Speaker Idea

Aquaculture is active in nearly every California county. Invite a guest to give a presentation on aquaculture to your class. Contact the California Aquaculture Association for a farmer in your area. www.caaquaculture.org

GATE Adaptation

Be a Biologist. The best way to learn something is to take it apart! Students can dissect a catfish, crayfish, or clam to study their various structures and systems. Dissection directions for many different organisms can be found online. Some examples are found at:

- www.biologyjunction.com/clam_dissection.htm
- www.biologyjunction.com/crayfish_dissection.htm
- www.biologyjunction.com/perch_dissection2.htm

Have students draw and label the anatomy of the organism as they dissect it. You may purchase these specimens at your grocery store or fish market.

Students should research the organism they have dissected and create an informational brochure or fact sheet on the species of fish they dissected, including its habitat requirements, whether it is native to California, and any special adaptations for surviving in its environment.

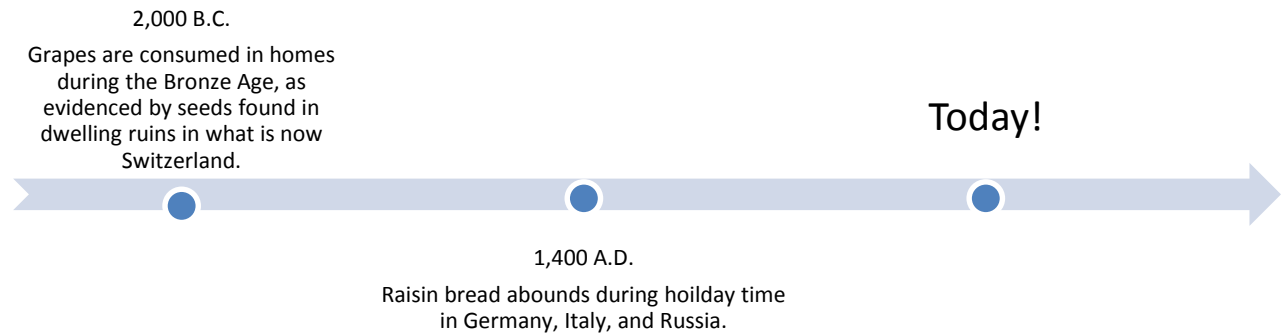


Raisins - A Simple & Sweet Snack

Extension Ideas

1. **Making History!** Have students create a timeline of interesting facts about raisins. Visit www.sunmaid.com/history-of-raisins-and-dried-fruit.html for facts about this amazing dried fruit.

Example:



2. **I Heard it Through the Grapevine.** Idioms are a form of figurative language. Have students identify context clues in the lyrics of Marvin Gaye's classic song, *I Heard it Through the Grapevine*, to determine the meaning of its title idiom. Students will use their background knowledge of how grapes grow to infer the origins of the idiom. There are many more idioms that refer to agriculture, some examples include: *apple of my eye*, *don't cry over spilled milk*, *don't put all your eggs in one basket*, and more. Brainstorm idioms in class and pair students up to research meanings and origins of different idioms. Students should share their findings with the class.
3. **Taste the Rainbow.** Raisins come in many sizes, colors, and varieties. Have students create an accordion book outlining traditional, sultana, golden, currant, muscat, and flame seedless raisins. The book should include how or why the raisins acquire their color, their uses, and a comparison of their general taste. *A number of instructional videos on YouTube show how to make an accordion book.*

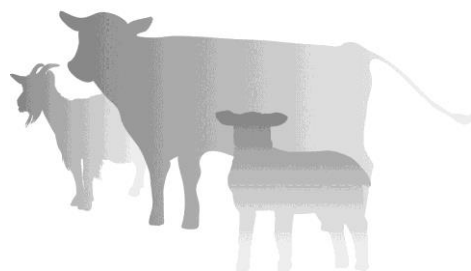
Inquiry Opportunity

What's Missing? Students will learn how raisins are made inside this edition of *What's Growin' On?* Ask students if they have ever wondered what disappears when a grape transforms into a raisin? Students will answer several research questions about this process by conducting their own experiments. For example, how much water is in a grape, how long will it take for a grape to become raisin, and is a serving of grapes or a serving of raisins more filling? Organize students into groups and instruct each group to come up with two questions about grapes or raisins that they can test in an experiment. Groups should write a summary of their hypothesis and experimental design before beginning their experiments. Results can be shared with the class.

Get Cultured

Extension Ideas

1. **Greek or Not Greek?** Greek yogurt sales have increased in popularity over the past few years. How does Greek yogurt compare to traditional yogurt? Have students compare the two products by reviewing the nutrition labels, serving size, cost, flavor, and texture.
2. **Share a Dairy Story.** Did you know that California is a leading producer of yogurt and other dairy products? How do dairy products get from the farm to your fridge? Watch *The Journey of Milk* www.moomilk.com/teachers-resources/88-video-the-journey-of-milk , and have students record facts about dairy farming that they will use to create a comic strip. The comic strip should include illustrations and captions that describe the journey of their favorite dairy product from the cow to their kitchen.
3. **Get Buggy.** Part of what makes yogurt beneficial are the live active cultures. Have students study yogurt through a microscope with a 400x lens to see the active bacteria. Students should place a small drop of yogurt and a drop of distilled water on a clean slide. Instruct students to place a cover slip on top of the slide before examining under the microscope. Students should sketch what they see on their slides and may compare several brands of yogurt to investigate any differences in the concentrations of bacteria.



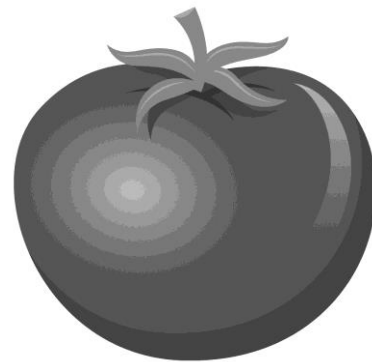
Inquiry Opportunity

Building Better Bones. Our bodies need calcium to build and maintain strong teeth and bones. Show students the vital role that calcium plays in bone strength by removing it from a chicken bone. Save a couple of chicken drumstick bones from dinner and wash them with soapy water. Pass the bones around the class for students to examine. Tell students that you will be submerging the bones in a jar of vinegar as a class experiment. Ask them to write down a hypothesis about the experiment. Soak the chicken bones in vinegar for several days. Have student volunteers check the chicken bones daily in front of the class. By day three, the bones should be pliable. Vinegar is mildly acidic and dissolves the calcium from the bone, thus making it pliable and easy to break. Ask students to revisit their hypothesis. Was their hypothesis proved or disproved? Recap what happened in the experiment. Have students compare calcium content from nutrition labels on milk, various juices, and soda. Which beverage provides the most calcium? Students should see that dairy products like milk are a good source of calcium.

CFAITC Resource

Check out CFAITC's Agricultural Fact and Activity Sheet on Dairy. This publication features facts on the dairy industry including information on history, production, top producing regions, products, and economic value along with lesson ideas for teachers. Fact Sheets can be downloaded at no charge from www.LearnAboutAg.org/factsheets

The Tomato Trek



Extension Ideas

1. **Imagine This.** Have your class travel along with harvested tomatoes through the daydream story, *Once Upon a Delicious Dream* that explains the steps of tomato travel from farm to ketchup. The story is found in an archive of winning stories from the Imagine this... Story Writing Contest: www.LearnAboutAg.org/imaginethis/

For homework, instruct students to accompany their parent to the grocery store or farmer's market for a weekly shopping trip. In the produce section, students should inventory the different varieties of tomatoes available and where each was grown. Make a chart on the board representing the results of the supermarket investigation.

Example:

Tomato Variety	Where it was Grown

2. **Wordy Birdy.** How many adjectives can students think of to describe a tomato? Display a tomato for students to examine. Then divide the class into teams and have them write as many adjectives as they can that describe a tomato. Students can be rewarded with delicious grape tomatoes for brainstorming the most adjectives. Adjective ideas include:

Juicy	Thin	Red	Plump	Round	Glossy
Smooth	Shiny	Firm	Sweet	Acidic	Ripe

Technology Opportunity

Using the Internet, students can explore www.thetomatozone.co.uk/ to learn about growing tomatoes, garden pests, and plant structures. This website is interactive and includes educational games. While exploring this British website, have students write down questions about the differences and similarities between growing tomatoes in California and Britain. Use information from the University of California to help students make these comparisons. www.ucanr.edu/sites/gardenweb/Vegetables

GATE Opportunity

Bugs are Beautiful! Not all bugs are bad, and many can be beneficial to gardens. Have students design a garden on graph paper that shows where certain types of vegetables and flowers will be planted. Use the Internet to research various plants and insects that can help reduce garden pests. Students should draw and label the plants in the garden and include at least three beneficial insects and the plants that will attract them. Students should summarize how each of their three featured insects are beneficial to the garden.



The Master Gardener program has a list of plants and the beneficial insects that they attract:
www.mastergardeners.org/projects/ninepalms/2006/beneficials.html

It may be helpful for students to organize information in a chart:

Beneficial Insect Name	How it Benefits the Garden	Plants that Attract the Beneficial Insect
1.		
2.		
3.		

CFAITC Resource

Check out CFAITC's Agricultural Fact and Activity Sheet on Processing Tomatoes. This publication features facts on tomato history, production, top producing regions, products and economic value along with lesson ideas for teachers. Fact Sheets can be downloaded at no charge from www.LearnAboutAg.org/factsheets

Home on the Range

Extension Activities

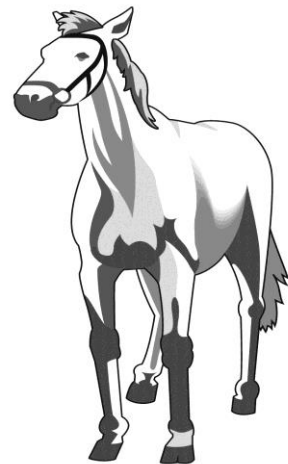
1. **Hay is Not Just for Horses.** Did you know that many people like to eat alfalfa too? Alfalfa sprouts are often added to salads or sandwiches, and they are very easy to grow. Your class can cultivate sprouts for the school salad bar or just for your classroom. Germinate alfalfa seeds by soaking overnight in a food-safe container that has been covered with cheesecloth and secured with a rubber band. Rinse and drain excess water through the cheesecloth the next day. Add water and rinse daily to keep seeds damp and fresh. Store the growing plants in a cupboard. After four days enjoy all of the health benefits alfalfa has to offer! Detailed instructions can be found here: www.extension.unh.edu/it-easy-grow-sprouts



2. **Make Your Mark.** Livestock branding has a rich history that students will enjoy learning about. Reading a brand is like reading a book, left to right. The second step in reading a brand is top to bottom, and finally from the inside out. The CFAITC website provides an activity on brands at www.LearnAboutAg.org/agbites, along with a handout on different brand symbols.

Once students learn how to read a brand, they can design their own. Students should design their custom brands and explain their reasoning for choosing different symbols in a short paragraph. Student brand designs and descriptions can be displayed as art around the classroom.

3. **Round Up.** This lesson will provide an exciting twist for your P.E. class. Have students grab their horse - stick horse that is, and gather for a round up. Use multicolor large balloons as cattle on the range for students to round up. Students can learn the importance of cooperation by trying to gather their cattle (an assigned color or number written on the balloon) by themselves and then as a part of a team. Instruct students to take good care of their balloons to demonstrate good animal handling skills and to protect the revenue they have invested in their cattle herd.



Guest Speaker Idea

Cowboy Up! Contact your local Cattlemen's or CattleWomen's Association to invite a rancher to talk with the students about their business. Encourage them to bring in the tools of their trade to share with students. Students will enjoy learning about a saddle, rope, boots, spurs, medicine bag, hat, herding dog, a stock trailer, and more.

Prior to the visit from your guest speaker, have students research different brands of beef cattle. After the visit, have your students work on their writing skills by composing thank you letters to your guest speaker. For follow-up lessons, select activities from *"Steer" toward STEM: Careers in Animal Agriculture* from the California Foundation for Agriculture in the Classroom.

www.LearnAboutAg.org/lessonplans

CFAITC Resource

Check out CFAITC's Agricultural Fact and Activity Sheets on Beef and Alfalfa. These publications feature facts on beef and alfalfa production, top producing regions, products and economic value along with lesson ideas for teachers. Fact Sheets can be downloaded at no charge from www.LearnAboutAg.org/factsheets

What Goes Around... Comes Around

Extension Activities

1. **Walking Field Trip.** You and your class can investigate how plants gather nitrogen from their environment by taking a walk to a nearby field. In the field, students should look for a clover patch to unearth. When clover is found, carefully dig it up and shake the excess soil from the roots and carefully rinse under water. In the classroom, examine the root system to look for nodules. These root nodules are home to a type of bacteria that fix nitrogen into forms that can be used by plants.

Younger students can take a closer look with a hand lens and then draw detailed pictures of the root nodules along with a few sentences that describe how the bacteria in the root nodule benefit the plant.

Older students can make a slide of a root nodule to examine under a microscope. To make a slide, have students crush a clean root nodule between two slides. Remove the top slide and add methylene blue stain to the root nodule material on the bottom slide. Place a cover slip on top and view under the microscope. Students should draw what they see under the microscope and write a paragraph explaining the symbiotic relationship between the clover plant and the *Rhizobium* bacteria living inside its root nodules. If clover is not available, other examples of plants with root nodules include peas and alfalfa.

2. **Your Neighborhood.** Have students draw the nitrogen cycle featuring animals, plants, and ecosystems found in your surrounding area. For example: deer eating grass, deer manure on the grass, grass growing, and the sun shining.
3. **Act it Out.** In this CFAITC classroom lesson, students will portray the role of nitrogen in the nitrogen cycle. *Chemistry, Fertilizer and the Environment Unit, Lesson 3: Matter of Fact* www.LearnAboutAg.org/lessonplans
4. **Scientific Detective.** Have students research different types of fertilizer and compare the differences in percentage of nitrogen content. Start this activity by teaching students how to read a fertilizer label on page 8 of the 6th Edition of *What's Growin' On?* www.LearnAboutAg.org/wgo

GATE Opportunity

Turn trash into treasure! Start a compost bin for your school lunchtime green waste. You can build your own, or buy a pre-made bin that will aid in making compost that is full of usable nitrogen for your school garden or plants around your school. Organize the class into groups. Explain that each group will research a solution for turning waste into compost. Groups will present their solutions to the class. Collection methods, building design for the compost area, how compost will be used, and instructions for making compost should be addressed by each group.

Ideas for composting resources include:

UC Master Gardener Program

The UC Master Gardener Program is a public service and outreach program under the University of California Division of Agriculture and Natural Resources, administered locally by participating UC Cooperative Extension county offices. Your local program is available to answer gardening and composting questions.

www.mg.ucanr.edu/

Create from Waste!

This activity guide has 20 hands-on activities designed to educate students to find ways to reduce the amount of waste they send to landfills. Some activities include investigating food, exploring soil, and worm composting.

Grades K-3

\$19.95

Life Lab Science Program

www.lifelab.org

The Worm Cafe: Mid-Scale Vermicomposting of Luncheon Waste

This detailed manual, by Binet Payne, describes a school-wide program for integrating the recycling of glass, cans, milk cartons, and paper wastes with a cafeteria food-waste recycling program using redworms.

Grades K-adult

\$29.95

Flowerfield Enterprises, LLC

www.wormwoman.com

Worms Eat My Garbage

This 176-page book, written by Mary Appelhof, is a guide to vermicomposting, a process using redworms to recycle food waste into nutrient-rich food for plants.

Grades K-adult

\$12.95

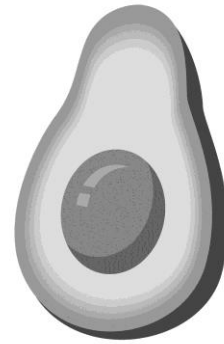
Flowerfield Enterprises, LLC

www.wormwoman.com

A is for Avocado

Extension Activities

1. **Word Work.** Avocado anatomy includes an exocarp, mesocarp, and endocarp. Students will think, pair, and share to build new words using the prefixes exo, meso, and endo. Have students determine the meaning of the new words based on the meaning of the prefix and the meaning of the base word.



Example:

Exo-	Meso-	Endo-
Meaning outside, external...	Meaning middle...	Meaning inside, within....
Possible new words: Exotic, etc.	Possible new words: Mesosphere, etc.	Possible new words: Endocrine, etc.
Meaning of new word:		

2. **Be a Marketing Specialist.** Tell students that they will be taking on the role of a marketing agent in charge of designing a brochure to sell avocados. Begin by having students brainstorm ideas that would interest consumers in purchasing avocados. Important selling points could include nutrition information, photos of avocado orchards and freshly picked avocados, a story from an avocado farmer explaining how avocados are grown, and appealing recipes. Have students sketch a design for their brochure that shows the placement of text and photos or illustrations. Once their designs have been approved students should research information and produce the final version of their brochure. The California Avocado Commission provides information that will be helpful for student research. www.californiaavocado.com

Harvest of the Month, *Educator's Corner* provides nutrition information and recipes for a number of vegetables and fruits, including avocados.

www.harvestofthemonth.cdph.ca.gov/EdCorner/index.asp

Inquiry Opportunity

The Science of Guacamole! The visual appeal of freshly made guacamole is often diminished by how quickly the flesh turns brown after being exposed to air. There are several theories on how to prevent the flesh of an avocado from turning brown. Instruct students to write a hypothesis, then divide the class into groups and have them carry out the experiment. Have students test the following methods for preventing the browning effect:

- a. leave the pit in the guacamole
- b. add lemon or lime juice
- c. tightly seal with plastic wrap

Try each method and determine which method is most effective. Ask students if their results proved or disproved their hypothesis. Research and test additional methods if desired. The process of oxidation causes a cut avocado to turn brown when exposed to the air. The citric acid from lime or lemon juice acts as an antioxidant to slow down the oxidation or browning of the avocado when exposed to air.

CFAITC Resource

Check out CFAITC's Agricultural Fact and Activity Sheet on Avocadoes. This publication features facts on avocado history, production, top producing regions, products and economic value along with lesson ideas for teachers. Fact Sheets can be downloaded at no charge from www.LearnAboutAg.org/factsheets

Walnuts - Health in a Nutshell

Extension Activities

1. **Get Crafty!** Walnut shells can be transformed into a number of items with a little glue and some craft paint. As Halloween approaches, students can make mini jack-o-lanterns by painting the shell orange and then adding a spooky face with a layer of black paint. Students can also make walnut shell sailing boats with toothpicks, modeling clay and paper. Ask students to brainstorm other household, game, or artistic uses of shells from walnuts they have consumed. Students should build models to demonstrate their idea to the class.
2. **The Price is Right.** Make grams and ounces tangible for students by using a digital scale or a balance scale. Provide students with a bag of in-shell walnuts to answer the following questions:
 - How many grams is a walnut in-shell versus just the meat?
 - How many shelled walnut halves equal one ounce?
 - Estimate how many shelled walnuts are in a pound? (16 ounces = 1 pound)
 - Estimate how many shelled walnuts are in a kilogram? (1000 grams = 1 kilogram)
 - Discuss the difference between the metric system and the standard system of measurement.
 - Discuss the cost differences between in-shell nuts, shelled, halved, chopped, etc.To wrap up the activity, post prices for the various products and have students guess which item goes with each price. Their prize can be a tasty and nutritious walnut snack!
3. **Woosh, Eek, Boom.** These aren't just silly words for sounds, they are onomatopoeias. Onomatopoeia (*on-uh-mat-uh-pee-uh*) is fun to say all by itself, but it is a word that sounds like what it is. Start the discussion about these words by noisily breaking open a walnut shell and asking students to describe the sound with an onomatopoeia. Encourage students to get creative and think of other words for sounds that are related to their different experiences.



Example words:

Snap	Crack	Bang	Smash	Crunch	Honk
Bonk	Pop	Cuckoo	Knock	Plop	Meow

4. **Through All Seasons.** Throughout the year, English walnut trees transform as they progress through the different growing stages. These changes make up the tree's fruit cycle. Have students research the different stages and present the cycle on a poster to share with the class or school. The cycle should include pollination, bloom, hibernation, harvest, and fertilization.

Visit the California Walnut Commission for a 2 minute video on how walnuts are grown
www.walnuts.org/about-walnuts/how-walnuts-are-grown

5. **Nut-tastic!** Students will learn about some of the wonderful health benefits of walnuts in *What's Growin' On?*, but there are many more! Continue learning by encouraging students to research additional nutrients found in walnuts, including copper, zinc, thiamin, vitamin E, and omega 3 fatty acids. Have students explain why their assigned nutrient is important for a healthy diet.

This nutrition brochure from the California Walnut Commission provides helpful information.
www.walnuts.org/walnuts/assets/File/NutritionBrochure-3_10.pdf

Technology Opportunity

Farmer Fuel! Farmers are some of the most efficient recyclers around. They are always looking for new uses for the byproducts from their harvest, and walnut farmer Russ Lester is a great example. Show students this three minute video from *California Heartland* that highlights Lester's use of walnut shells to create fuel for his farm.

Instruct students to take notes that will allow them to summarize the process of turning walnut shells into energy. After the movie, ask students to brainstorm the benefits of creating fuel from walnut harvest byproducts. Make a list on the board as students share their ideas.

www.americaheartland.org/episodes/episode_402/dixon_ridge_farms.htm

Have students work in teams to research in-depth information on one walnut byproduct. Instruct students to create a poster or PowerPoint to share their walnut byproduct information with the class.

CFAITC Resource

Check out CFAITC's Agricultural Fact and Activity Sheet on Walnuts. This publication features facts on walnut history, production, top producing regions, products and economic value along with lesson ideas for teachers. Fact Sheets can be downloaded at no charge from
www.LearnAboutAg.org/factsheets

Cotton - More than Your T-shirt

Extension Activities

1. **Not Just for the Sunday Paper.** Have your class create a comic strip that illustrates the process of growing and processing cotton. Students will need pencils, colored pencils, rulers, paper, and some creativity. This activity can be a fun way to pair art with informative writing. The following website includes a number of resources that explain cotton farming including an online presentation: *Cotton- From Field to Fabric in Forty Frames* www.cotton.org/pubs/cottoncounts/resources.cfm
2. **What's in a Bale?** Ask students to guess how much one bale of cotton weighs. A bale of cotton typically weighs 480-500 pounds! In *What's Growin' On?* students learn the dimensions of a bale of cotton. Continue the lesson with a math worksheet on the number of items that can be made from a bale of cotton and the cost of the raw materials for those items. You can use the *How Much Cotton Does it Take?* page on the California Cotton Ginners & Growers Association website www.ccgga.org/cotton_information/how_much.html
3. **Textile Time.** Cotton is a universal fabric. In fact, you and your students are likely wearing something made out of cotton right now! Explain to students that cotton is hypo-allergenic, breathable, durable, soft, and highly absorbent. Have students create a chart to compare cotton's attributes to other fabrics like linen, wool, polyester, and silk. Students should include information on the origin of each material, how it is produced, its texture, how it should be washed, and different uses.
4. **Lovely Looms.** Explain to students that prior to the Industrial Revolution, cotton fibers were woven by hand. Today, large machines speed up the process and cotton is woven in factories around the world. Have students read the labels on their clothing and use a tally chart to keep track of where their garments were made. Combine the class information and transfer to a bar graph or pie chart. Analyze how both graphs present the same information in two different formats.



GATE Opportunity

Be an Inventor. Eli Whitney dramatically improved the production of cotton when he invented the cotton gin, a machine that could separate the cotton lint from the seeds. An animation of his simple machine can be viewed on this website: www.eliwhitney.org/cotton.htm Ask your students to come up with a model of a cotton gin using inexpensive household objects.

CFAITC Resource

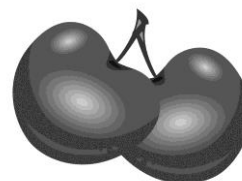
Check out CFAITC's Agricultural Fact and Activity Sheet on Cotton. This publication features facts on cotton history, production, top producing regions, products and economic value along

with lesson ideas for teachers. Fact Sheets can be downloaded at no charge from www.LearnAboutAg.org/factsheets

It's the Pits - California Grown Stone Fruit

Extension Activities

1. **Inspirational!** The aroma, texture, and flavor of a perfectly ripe stone fruit can be the perfect inspiration for an English Haiku. Explain to your students that this style of poetry is based on using our five senses to explain our experiences. To write this poem effectively, it is good to rely on a sensory description. Students should avoid rhyming and break their poem into three lines that are 5 syllables, 7 syllables, and 5 syllables. Students can share their Haikus with a partner.
2. **U-Pick!** The latest trends in food are bringing consumers and farmers together. Instruct students to make a video or comic journal of their unique shopping experience at a local farmers market, fruit stand, or u-pick farm. Prior to their trips to the market or farm, students should create a list of questions about their preferred stone fruit and how it is grown. Questions can include where the fruit was grown, who works on the farm, types of care throughout the growing season, harvest methods, uses, and more.
3. **Back to Basics.** Home canning of fresh fruit is a valuable skill to teach students of all ages. Stone fruits lend themselves nicely to the canning process. With a few simple supplies, you and your class can give food preservation a try. The following website from the University of California Cooperative Extension provides a variety of links to help you get started:
www.ucfoodsafety.ucdavis.edu/Home_Food_Preservation



GATE Opportunity

Math Marvelous. Continue learning from the *What's Growin' On?* activity on page 13 by determining the volume of a variety of stone fruits with and without their seeds. Use water displacement to find the volume.

CFAITC Resource

Check out CFAITC's Agricultural Fact and Activity Sheets on Cherries and Cling Peaches. These publications feature facts on cherry and cling peach history, production, top producing regions, products and economic value along with lesson ideas for teachers. Fact Sheets can be downloaded at no charge from www.LearnAboutAg.org/factsheets

Stalks - The Edible Petiole

Extension Activities

1. **Off the Chart.** Have students summarize the data from the graph in a paragraph form.

California Celery Production

Year	Rank	Value (in \$1,000)
1990	29	175,922
1995	20	251,212
2000	19	340,347
2005	26	270,119
2010	24	436,252

2. **How Does it Work?** Students are introduced to the structure and function of celery vascular bundles in *What's Growin' On?* Students can see the vascular bundle in action with a few simple supplies. Mix several drops of red or blue food coloring into a glass of water. Place a fresh cut celery stalk into the glass of dyed water and monitor over several hours to see how the xylem draws the water up from where the roots would be, through the stems, to the leaves. Students can measure the progress with a ruler and track it on a graph. After 24 hours, the celery will have drawn the colored water all the way to the leaves. Slice open the celery to see the vascular system.



3. **Celebrate it!** Food festivals such as the Stockton Asparagus Festival are a great way for farmers, chefs, and local vendors to highlight locally grown foods. Have students learn about a food festival featuring petioles in your community or imagine their own, and create a brochure that entices people to take part in the festivities. Be sure to include information about the crop, how and where it is grown, its nutritional value, festival activities, competitions, and maybe a special recipe. To find fairs and festivals in your area, view www.LearnAboutAg.org/programs/calendar.cfm

Remind students that the plant part that attaches the leaf to the stem is called the petiole. In plants such as rhubarb, celery, and bok choy, the petiole is unusually large and is harvested as a crop.

4. **Garden Greens.** Add some color and flavor to your school's winter vegetable garden by growing an edible petiole like rainbow chard. This festive veggie has stalks that come in a variety of beautiful colors including purple, red, orange, and yellow. Once students have grown and harvested their own chard they will want to prepare it in a recipe. Students can browse the web for options, or bring a recipe from home. Organize a taste test in the classroom. This is a great way to introduce your class to a new vegetable! Take this lesson one step further by having students research and compare the nutritional value of celery, chard, and fennel. Nutrition facts may be found on www.nutri-facts.com/index.php

Additional Resources:

The California Foundation for Agriculture in the Classroom has an extensive website, designed to connect teachers with a wealth of resources that bring agriculture education to life by teaching students where their food and fiber comes from.

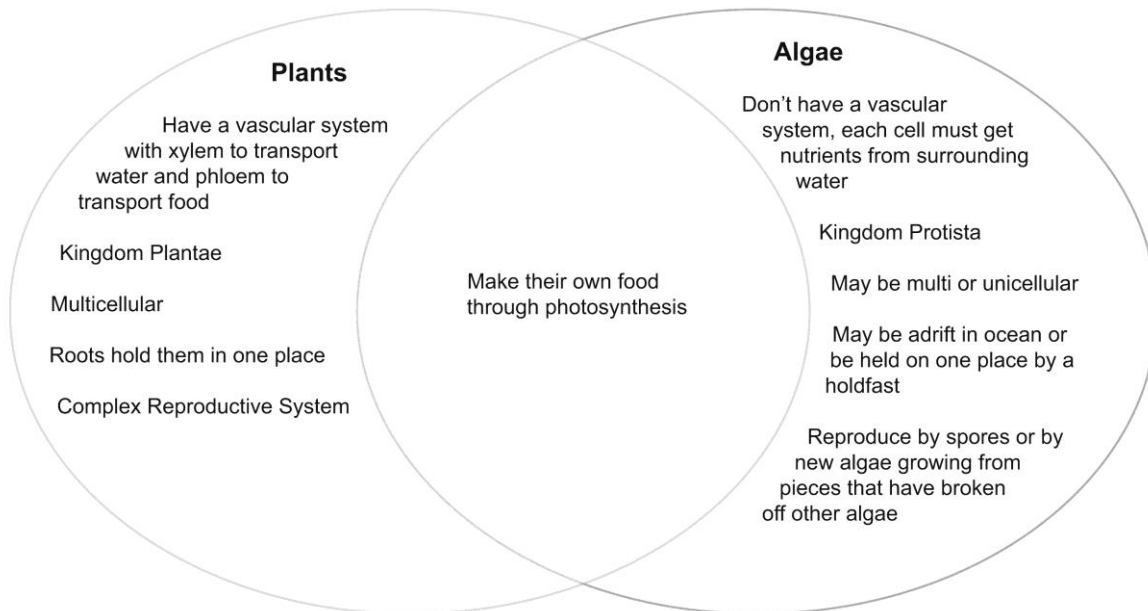
At www.LearnAboutAg.org you will find:

- **Lesson Plans** and comprehensive units aligned to California State Content Standards and the Common Core. Our newest units will also be aligned to the Next Generation Science Standards. These resources are available for grades K-12 as a free download from the website.
- **Searchable Database** providing a listing of recommended books, websites, educational materials, and organizations that relate to agricultural topics of interest.
- **Agricultural Fact and Activity Sheets** specific to California topics from agricultural water to invasive species and beyond. One side of the fact sheet includes information about various commodities, production, history, nutrition information and economic value. The other side provides specific lesson and activity ideas for the classroom.
- **Teacher Resource Guide** provides an overview of CFAITC programs and materials, agricultural facts and information, field trip ideas, agriculture-related books and websites, and recommended educational resources. Request a free copy while supplies last, or visit the website's searchable database.
- **Information** about events, e-newsletter and blog posts, and links to your county Farm Bureau.

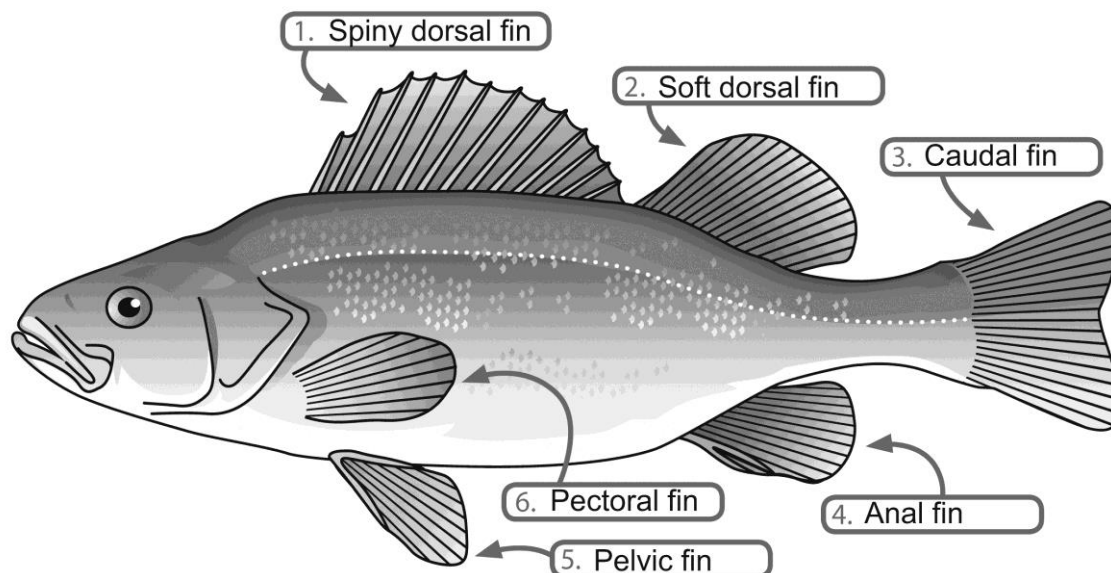
What's Growin' On? Activities Answer Key

Page 3: Something's Fishy

Example solutions – *student answers may vary*



Fish Fin Labels



Shrimp Activity

Answers will vary.

Page 4: California Raisins

Nutrition Facts

Nutrition Facts	
Serving size: ¼ cup	% Daily Value
Total Fat	0%
Potassium	9%
Cholesterol	0%
Dietary Fiber	9%
Iron	6%

Trail Mix Ratios

Activity

Express the following recipe ratios in simplest form.

Ingredients	Ratio
apricots : raisins	1:1
cereal : raisins	4:1
almonds : yogurt chips	2:1

Compare Weather in Fresno, Madera, Tulare, Kern and Kings Counties:

Answers will vary. Example: All have hot, dry summers and mostly mild winters.

Compare Soils in Fresno, Madera, Tulare, Kern and Kings Counties:

Answers will vary. Example: All have deep, fertile soil, well suited for growing crops.

Page 5: Get Cultured

Recipe Activity

1/8 package of cream cheese

2 oz. plain yogurt

½ ripe avocado

1/8 cup salsa verde

¼ teaspoon lemon or lime juice

Temperature in Fahrenheit for: (vary for winter, summer, etc. depending on location)

Yogurt Pasteurization = 185°F

Yogurt Fermentation = 110°F

Yogurt Storage = 40°F

A winter day = 50°F

A summer day = 90°F

A tropical climate = 65°F

A Mediterranean climate = 70°F

Your body = 98°F

Page 6: Tomato Trek

The Great Debate

Fruit	Vegetable
<i>The term "fruit" is applied in trade only to such plants or parts of plants that contain the seeds.</i>	<i>The term "vegetable" is defined as cabbage, cauliflower, turnips, potatoes, peas, beans, and the like. Tomatoes are covered by the phrase "and the like."</i>
<i>Botanically speaking, tomatoes are the fruit of a vine, just as are cucumbers, squashes, beans, and peas.</i>	<i>But in the common language of the people, all these are vegetables which are grown in kitchen gardens, and which, whether eaten cooked or raw, are, like potatoes, carrots, parsnips, turnips, beets, cauliflower, cabbage, celery, and lettuce, usually served at dinner in, with, or after the soup, fish, or meats which constitute the principal part of the repast, and not, like fruits generally, as dessert.</i>
<i>Note: Fruits are the edible part of the plant that developed from a flower.</i>	<i>The attempt to class tomatoes as fruit is not unlike a recent attempt to class beans as seeds, of which Mr. Justice Bradley, speaking for this court, said: 'We do not see why they should be classified as seeds, any more than walnuts should be so classified.'</i>

Tomato Timeline

- Early 1500s: Padres following Spanish conquistadors likely sent first tomato seeds from South American Andes Mountains to Spain.
- Mid 1500s: Tomatoes traveled from Spain to Italy then to England.
- Mid 1500s: English colonists brought tomatoes to northeastern U.S.
- Late 1700s: Tomatoes make their way to California likely with Spanish missionaries.
- 1893: The tomato went on trial.
- 1950s: Mechanical tomato harvester developed in California.

Page 7: Home on the Range

Activity – answers may vary for this opinion piece. Students must provide evidence to support their statement.

Tech Check – Popplet is free and fun! Use it to link some main ideas of the video including:

- History of ranching in California can be traced back to Spanish missionaries and the Gold Rush.
- Most ranches in California are family businesses, with knowledge and traditions passed down to each generation.
- Ranches provide a food supply, viewscape, and plant and animal habitats.
- Ranch land also is the site of collection for much of our state's fresh water.
- Each year, housing and commercial development along with new regulations removes many acres of rangeland from production.

Page 8: What Goes Around...

Determine the number of atoms in each compound

Nitrate: N = 1, O = 3

Nitrite: N = 1, O = 2

Ammonium: N = 1, H = 4

Match each term with its definition

Nitrogen Cycle: h. The continuous recycling of nitrogen.

Nitrogen: d. The primary gas in the atmosphere.

Bacteria: c. An organism in the soil that plays an important role in the nitrogen cycle.

Ammonia: b. A product of nitrogen fixation, used as a fertilizer in agriculture.

Denitrification: g. Bacteria convert nitrogen back to gaseous forms.

Deficiency: f. To lack something, such as necessary nutrients.

Nitrogen fixation: a. Nitrogen in the atmosphere is converted into forms of nitrogen useable by plants.

Nitrification: e. Bacteria convert ammonia into nitrites, and then to nitrates.

Determine the main idea of the farmer's letter and list the key points.

Farmers need to know a lot about their land in order to determine which nutrients their crops need.

1. Soil samples are needed to tell the farmer how much nitrogen is in the soil.
2. Soil samples can also tell the farmer what type of soil is on his or her land.
3. Certain types of crops like alfalfa and soybeans can fix their own nitrogen with the help of soil microbes.
4. The amount of crop a farmer wishes to grow also factor into the amount of nutrients needed.

Complete the chart by converting the percentages to decimal and fraction form. Create a pie chart to illustrate the amount of each element in the atmosphere.

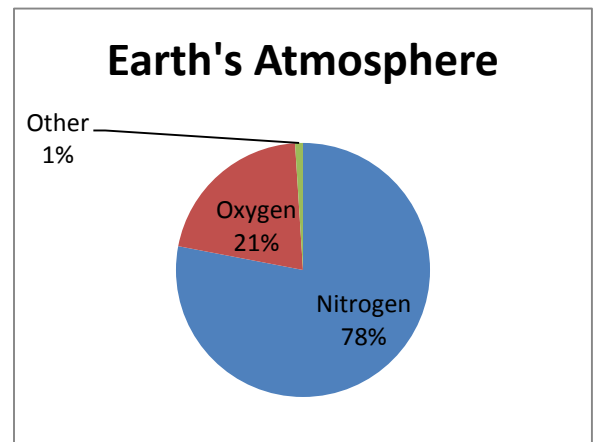
Element	Percent	Decimal	Fraction
Nitrogen	78	.78	39/50
Oxygen	21	.21	21/100
Other (argon, carbon dioxide)	1	.01	1/100

Element Symbol

Nitrogen = N

Phosphorus = P

Potassium = K



Page 10: A is for Avocado

Avocado Anatomy

Seed coat - *outer covering of the seed seen cracking in the illustration*

Embryo – seed which includes:

- Hypocotyl – connects radicle with cotyledons
- Radicle – will become the root
- Cotyledons – will become the first leaves

Avocado Smoothie Recipe:

Divide the number of students in your class by three then multiply each ingredient by that number to make enough to serve your class.

Bar Graph Activity:

Answers will vary depending on which five nutrients are chosen.

Page 11: Walnuts

Symptom

- Weak and wimpy = need magnesium
- Trouble seeing the board = need vitamin A
- Stomach ache = need fiber
- Can't think straight = need protein

Page 12: Cotton

10 items made from cotton and cotton byproducts: (*answers will vary*)

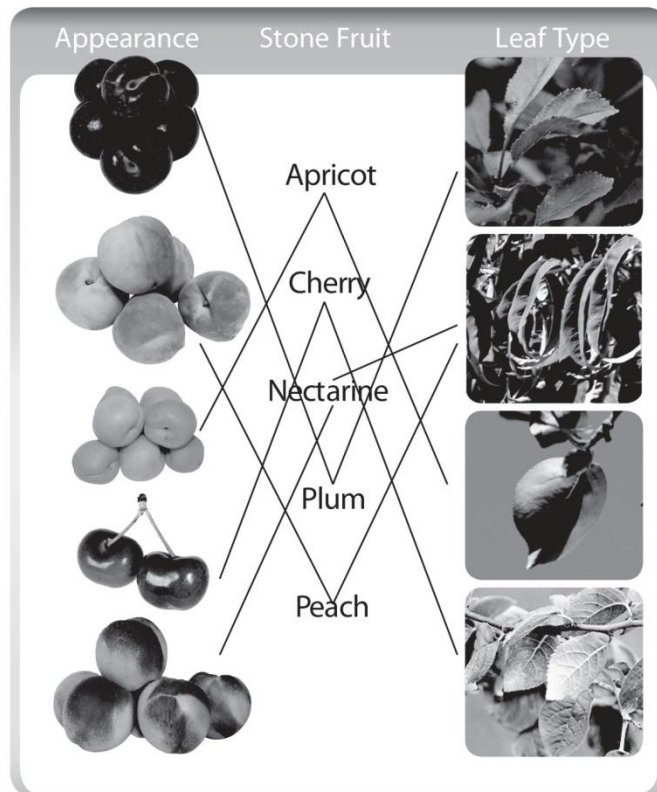
1. cloth napkin
2. t-shirt
3. cosmetic cotton ball
4. salad dressing (cottonseed oil)
5. potato chips (cottonseed oil)
6. cotton hulls and meal (animal feed)
7. paper and cardboard
8. jeans
9. swab
10. cellulose

Calculating a Cotton Bale's Volume

Width	Thickness	Height	Volume
21 in	32 in	54 in	36,288 cubic inches
1.75 ft	2.67 ft	4.5 ft	21 cubic feet

Page 13: It's the Pits

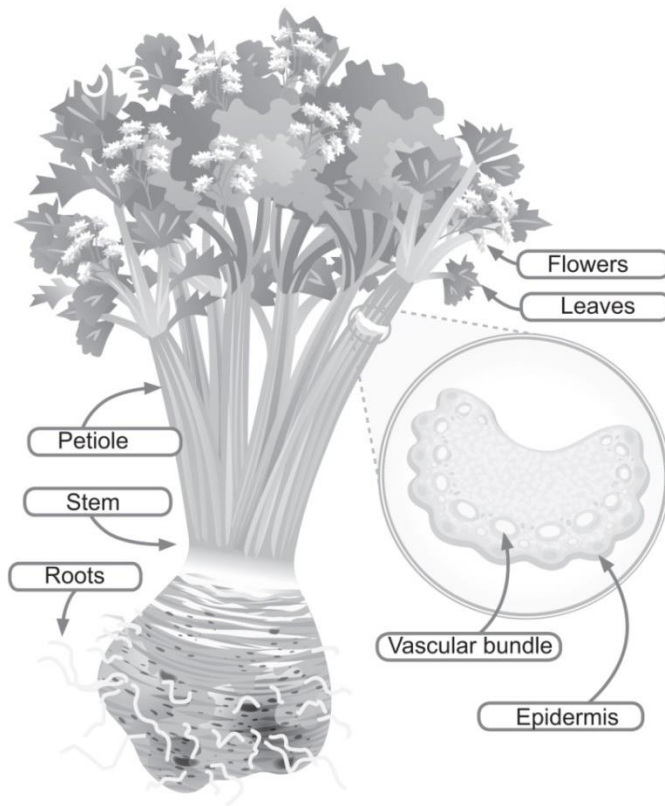
Matching Activity



Math Activity – answers may vary slightly

Peach (inches)	Cherry (inches)
Diameter = 1.5	Diameter = 1
Circumference = 4.71	Circumference = 3.14
Radius = 0.75	Radius = 0.5
Surface Area = 7.1	Surface Area = 3.14
Volume = 1.76	Volume = 0.52

Labeled Celery Parts



Celery Timeline

Activity

Place the historical events in chronological order by numbering them 1-6.

- 1 Archaeologists excavating an ancient Chinese village discovered evidence that bok choy has been cultivated for more than 6,000 years.
- 2 In 2700 B.C., rhubarb was cultivated for medicinal purposes in China.
- 3 Celery is believed to be originally from the Mediterranean basin around 850 B.C.
- 4 Celery was first used as a food by the French around 1632.
- 5 Rhubarb was first introduced to America by a Maine gardener in 1790.
- 6 After being grown for centuries in China, bok choy made its way to Europe in the early 19th century where it began to be eaten and planted by the Europeans.