

# Apple Science

## Science

### Materials

- ◆ Apples, one per group
- ◆ Knife or apple slicer
- ◆ Iodine
- ◆ Plastic bags, one per student or group
- ◆ Seed starting medium (1/3 soil, 1/3 sand, 1/3 peat moss)
- ◆ 2–4" inch pots, one per group or student

### Background: When are apples ripe?

Apple growers try to pick their apples at precisely the right time. They have several ways to test for ripeness that students can try in the classroom. With younger students, you may want to demonstrate the tests. Older students might work in small groups and then compare their results. Begin by asking students to look at the color of the apple. Has it turned red or yellow or is it still partly green? A ripe apple will be colored. Ask them to check the skin of the apple. Does it have a waxy (natural) coating that permits it to be shined? Or is the skin dull? A ripe apple will shine. In a taste test, if the flesh of the apple tends to wad up or if it seems cottony when it is chewed, it is not fully ripe. A ripe apple tastes good and feels good when it is eaten. These tests may be subjective, so here are some “scientific” tests you can try.

### Activity 1: Flesh Color Test

Check the flesh color of the apple by holding a very thin slice (about one-sixteenth of an inch) up to a bright light. A ripe apple has almost no green flesh. Apple growers use the following scale:

- 1 = flesh all green
- 2 = some loss of green from center of fruit
- 3 = heavy green band 1/2 inch thick under skin
- 4 = heavy green band 1/4 inch thick
- 5 = heavy green band 1/8 inch thick
- 6 = green essentially gone from under skin

Have students give their apple a rating from 1 to 6. Remind students that these tests for ripeness involve a skill that scientists must develop—the ability to make careful observations.

### Activity 2: Starch Test

Divide class into groups. Give each group an apple, and have them cut the apple in half at a right angle to the core. Apply iodine to the cut surface, drain away any excess, and allow it to stand for a few minutes. (If students are doing this test, emphasize that iodine is poison and is not to be taken internally.) The apple will turn a dark purple or blue-black wherever starch is present. Remind students that in a ripe apple the starch has changed to sugar, so a ripe apple will have very little dark stain. Have students give their apple a rating from 1 to 6 based on the amount of dark stain on the apple. A rating of 6 indicates a perfectly ripe apple.



**Time:** 10–30 minutes per activity, plus observation time

### Grade Level: 6 Science

Standard 5—Students will understand that microorganisms range from simple to complex, are found almost everywhere, and are both helpful and harmful.

Objective 2—Demonstrate the skills needed to plan and conduct an experiment to determine a microorganism’s requirements  
Indicator a—Formulate a question about microorganisms that can be answered with a student experiment.

Indicator c—Plan and carry out an investigation on microorganisms.

Objective 3—Identify positive and negative effects of microorganisms and how science has developed positive uses for some microorganisms and overcome the negative effects of others.

Indicator a—Describe in writing how microorganisms serve as decomposers in the environment.

Indicator e—Observe and report on microorganisms harmful effects on food (e.g., causes fruits and vegetables to rot, destroys food bearing plants, makes milk sour).

### Health

#### Grade Level: 6

Standard 4—The students will understand concepts related to health promotion and disease prevention.

Objective 1—Compare viruses to other microorganisms

Indicator a—List several types of microorganisms.

Apple growers commonly use the following rating system:

- 1 = all blue-black (full starch)
- 2 = all blue-black except in seed cavity and halfway to vascular area (oval area around core)
- 3 = all blue-black except in seed cavity and vascular area
- 4 = half blue-black
- 5 = blue-black just under skin
- 6 = no blue-black (free of starch)

### Activity 3: Seed Color Test

Rate the color of the seeds in the apple. A ripe apple has brown seeds. Apple growers use the following scale:

- 1 = clear (no color)
- 2 = trace of color (tips of seeds are brown)
- 3 = 1/4 color
- 4 = 1/2 color
- 5 = 3/4 color
- 6 = fully brown

### Activity 4: Browning in Apples

Do some apples turn brown quicker than others when cut? Why do they brown? Here are some simple observations your class can try. Start by cutting up various types of apples to see if some brown quicker than others. Apples do not turn brown until the flesh is exposed to oxygen. You can also try sealing apples in plastic or other containers to see if that minimizes the browning.

Besides oxygen, two things cause apples to brown; enzymatic (polyphenoloxidase) actions, and phenolic compounds. Polyphenoloxidase is an example of an enzyme that can lower the quality of a food product. This enzyme produces brown pigment and may change the texture and flavor of food products. The enzyme activity may be minimized by reducing agents, heat inactivation, lowering the pH of the food product (adding lemon juice, ascorbic acid or salt), and the presence of enzyme inhibitors. Step by step procedures are outlined at <http://members.ift.org/NR/rdonlyres/F3535A91-9714-47F2-A6B4-DC9B5D3324B6/0/eif3std.pdf>.

### Activity 5: Grow an Apple Mold

Students can grow an apple mold to simulate a fungus disease that might attack an apple tree. (A mold is not a fungus disease which would attack an apple tree, but it is an example of a fungus for students to observe.) Give each student a slice of apple and a plastic bag. Let students wet their apple slices, seal them in the bags, and place them in a warm spot until there are signs of molding or rotting.

Next, ask students to pretend that they are apple growers and that this is a fungus disease that is attacking their orchards. Ask them to make up a name for the disease. Make a list on the chalkboard of the names of some actual fungus diseases, such as:

- apple crown rot
- apple blotch rot
- apple scab
- cedar apple rust fungus
- bitter rot
- blue mold rot
- apple powdery mildew

*Teacher Notes:*



Ask students to draw realistic pictures of the mold or rot that is on their apple slices and to label the pictures with the names that they made up. Then have them write how they, as apple growers, intend to get rid of the fungus diseases in their orchards. Allow time for students to discuss their ideas.

Have students work together in small groups to find information about harmful insects. Have each group focus on a specific type of insect. Provide insect guides and other reference books.

### Activity 6: Apple Sauce

Applesauce is easy to make. Five pounds of apples yield about two quarts of applesauce. Peel, core, and quarter apples. Place the apples in a pot and partially cover them with water (go easy, you can add more water later). Then boil the apples on a hot plate or in a crock-pot until they are soft. Using a potato masher or a blender let children help mash the apples into applesauce. Add sugar, if necessary, and cinnamon to taste.

### Activity 7: Plant an Apple Seed

An apple grower plants little apple trees in his orchard. Few apple trees are grown from seed, because the seeds develop from crossfertilization, which involves two different parent trees. The apples produced by a tree grown from seed have an unpredictable mixture of characteristics from both parents. Most growers want trees that bear a certain kind of apple, so they plant trees that have been grafted. A fruit-bearing branch from one tree is attached, or grafted, to a rootstock from another tree to make a new tree. If the branch came from a tree that produced Red Delicious apples, then the new tree will produce Red Delicious apples.

The apple grower buys the grafted trees from a nursery when they are only a year old. The trees are planted about seven feet apart in long rows; the rows are about 20 feet apart so that there is room for the trees to grow and so that the grower has room to use his equipment. The young apple trees will not produce apples until they are at least five years old. While the trees are growing, the grower fertilizes them, waters them, and watches for any signs of disease. But his work really begins when the trees begin to bear fruit. This “seed starting” activity takes about six to eight weeks, much slower than other seeds your students may be familiar with. They have to be patient. To get the benefit of long daylight hours, plant your trees in the spring or summer.

#### Directions:

1. Put tiny cuts in the apple seeds and soak them overnight in a towel.
2. To prepare the soil, mix together 1/3 soil, 1/3 sand and 1/3 peat moss. Put this mixture into two-inch or four-inch pots.
3. If you use 2-inch pots, plant one seed. In 4-inch pots, plant three or four seeds. After the trees come up in the 4-inch pots, remove all but the strongest from each pot.
4. Keep the trees in a warm, sunny (not direct sunlight) place.
5. Keep soil moist at all times, but do not over water. Fertilize the trees with a flowering plant fertilizer.



#### Apple Jokes and Riddles

Why is it dangerous to be an apple?  
*Because they are always out on a limb.*

Which animals didn't arrive at Noah's Ark in Pairs?  
*The worms, they came in apples*

What apple has a very short temper?  
*Crab apples.*

How can you evenly divide 6 apples among 7 people?  
*Make applesauce.*

What is worse than finding a worm in your apple?  
*Finding half a worm.*