Wolf Creek Public Schools
Creating Success For All Learners

Alberta Health Services

Super Foods

Pillar: Healthy Eating
Division: III and IV
Grade Level(s): 7, 9, and 10
Core Curriculum Connections: Science

I. Rationale:

Our very survival can be traced back to three regions of the world, where people living thousands of years ago figured out how to optimize the nutritional value of three basic foodstuffs -- corn, wheat and soy. In New Mexico, Native Americans unlocked the essential vitamins in blue corn. The Chinese transformed the toxic soybean into a nutritious protein. The chemistry of yeast turns wheat into bread allowing students to explore chemical changes in basic food. Two separate lab activities are included that could be modified to suit grade level outcomes and linked to the suggested science units listed below.

II. Activity Objectives: *see descriptions below*

III. Curriculum Outcomes:

Science 7	Science 9	Science 10
Unit C: Heat and Temperature • thermal energy • heat transfer • temperature • change of state	***Unit B: Matter and Chemical Change:*** ***Unit C: Environmental Chemistry:*** • acids and bases	***Unit A: Energy and Matter in Chemical Change***: • evidence of chemical change

IV. Materials:

Activity 1: Pop Goes the Kernel

- hot plate
- goggles
- balance
- cooking oil
- 400ml beaker
- container for massing popcorn
- beaker tongs or a hot mitt
- tin foil (for lid)
- unpopped corn kernels

V. Procedure:

ACTIVITY 1: POP GOES THE KERNEL

Corn has been a key food in the Americas for thousands of years, but with the advent of microwave popcorn, we lost the experience of watching corn kernels pop. This popcorn lab helps enhance your observational, measuring and mathematical skills in a fun and tasty way!

Why do corn kernels pop? A large percentage of the composition of the kernel is water. As a corn kernel is heated, the water inside it increases in temperature. As the temperature rises, the pressure in the kernel increases, causing the kernel to burst open and form a piece of "popped corn."

With this lab, you will observe the popping corn and measure differences in the mass of the corn before and after heating.

1. Set up the hot plate and beaker.
2. Record the mass of the empty beaker in the data table. Measure approximately 8g of popcorn in a container. (If you don't have an electronic balance, subtract the mass of the corn from the total mass of container plus corn.)
3. Record the exact mass in the data table.
4. Place 5ml of oil into the beaker, measure the mass and record in the data table.
5. Add corn and place a 10cm x 10cm foil cover on the beaker.
6. Place the beaker on the hot plate, and slowly and carefully heat the corn. Use beaker tongs or a hot mitt to shake the beaker as the corn cooks. Record all observations (volume changes, condensation in beaker, detection of corn odor, etc.). Cook corn until as many kernels pop as possible without burning the corn.
7. Remove the cover and allow the beaker to cool. Mass and record in the data table. If you are using food-safe glass, eat and enjoy!

DATA TABLE:

MATERIALS	MASS IN GRAMS
empty beaker	
unpopped corn	
beaker and oil	
beaker, oil, and popped corn	

CALCULATIONS:

Find the mass of the oil.

Find the mass of the beaker, oil and unpopped corn.

Find the difference in mass of the beaker, oil and corn before and after popping.

QUESTIONS:
What happened to the mass of popcorn after popping?
What happened to the volume of popcorn during popping?
Is it necessary to use oil when making popcorn? Explain.

ACTIVITY 2: TESTING FOR pH: ACID-BASE MINI-LAB

When lime water, a basic solution, is added to blue corn batter, an acidic mixture, the batter turns a particular shade of blue as it reaches the desired pH. The Native Americans who made piki bread did not realize it, but they were conducting an acid-base experiment. The blue corn acts as an indicator that changes to a different shade of blue as the batter becomes more basic (lime water equals calcium hydroxide Ca(OH)2). (You may want to review the definitions below before doing this activity.)

In this activity, you will make your own indicators using fruit, flowers or vegetables. The indicators become different colors in acidic or alkaline conditions.

MATERIALS:

- fruit, vegetables (apples, plums, peaches, blueberries, strawberries, raspberries, onions, beets, etc.)
- containers for boiling fruit and vegetables
- 2 dropper bottles: one filled with an acidic solution (vinegar, weak hydrochloric acid) and one with a basic solution (ammonia, weak sodium hydroxide)

PROCEDURE:

1. Pick a fruit or vegetable that you want to test. Peel it. Place peels in water (enough water to cover).
2. Boil the peels for 3 to 5 minutes to make a colorful juice. (You can do this in small beakers on a hot plate.) Repeat for each fruit and/or vegetable that you want to test.
3. Cool the juice. Once cool, place two separate drops of juice on filter paper.
4. Place one drop of the acid solution on the first drop of juice and one drop of the basic solution on the second drop. The juice will indicate one color under the acidic conditions and another color under basic conditions. Each fruit or vegetable indicator will react differently with the acid/base samples. For example, blueberries will indicate red in an acidic solution and blue in a basic solution. (You can also try this activity with flower petals.)

DEFINITIONS:

ACID: a substance that produces hydrogen ions in water solution. An acid donates protons (hydrogen ion equals H+).

BASE: an alkaline substance that produces hydroxide ions in water solution. A base is a proton acceptor (hydroxide ion equals OH-).

INDICATOR: a weak organic compound that is used to indicate the pH of a solution by a color change.

pH SCALE: a logarithmic scale expressing degree of acidity or basicity. A pH of 0 to 7 is acidic; a pH of 7 is neutral (distilled water); a pH of 7 to 14 is basic (or alkaline). Some common pH values: lemon juice equals 2.2 to 2.4; ammonia equals 11.

RED CABBAGE INDICATOR

Cabbage juice acts as a unique indicator -- you can create an entire spectrum of colors if you add the juice to a series of solutions ranging in pH from 1 to 14. Follow the same procedure as above to make the cabbage indicator. Use a pH meter if you wish to choose solutions with varying pH values. Next, add the cabbage juice indicator to each solution. You should see a rainbow of colors with each change in pH. Make your own indicator paper by dipping filter paper into cabbage juice. Hang the paper to dry, then use it to test as you would universal indicator paper.