



Title: WHAT'S BIG ABOUT NANO? (D4512)
Level: 5th Grade
Location: Chemistry Classroom Annex

Type: Single
Length: 90 minutes
Limit: 15 students

Program Description

A nanometer is one billionth of a meter, which is a difficult concept for most of us to understand. What's so special about nano? Materials can change chemical and physical properties at the nanoscale (1nm – 100nm). Examples of these size-dependent properties include color change, change in magnetism, different gravitational effects, and change in electrical conductivity. This program will allow students to use appropriate SI units for measurement and to explore physical properties of matter using nano materials.

Georgia Standards of Excellence

S5P1. Obtain, evaluate, and communicate information to explain the differences between a physical change and a chemical change.

- a. Plan and carry out investigations of physical changes by manipulating, separating and mixing dry and liquid materials.
- b. Construct an argument based on observations to support a claim that the physical changes in the state of water are due to temperature changes, which cause small particles that cannot be seen to move differently.
- c. Plan and carry out an investigation to determine if a chemical change occurred based on observable evidence (color, gas, temperature change, odor, new substance produced).

Students will use appropriate tools and units for measuring objects and/or substances. Student investigate how common items have parts that are too small to be seen without magnification.

Vocabulary

nano	Atom	chemical property
matter	Molecule	physical property
gravity	Element	magnetic field
standard units	Mixture	density

Post-Visit Activity

4512 What's Big About Nano? Post-Activity. This activity addresses GPS **S5P2(b-c)**.

What's Big About Nano – Post Visit Activity

Following are some definitions that teachers can use in the discussion of mixtures. This discussion can be done before the lesson or developed along with the lesson.

Heterogeneous Mixture

the different materials can be distinguished from each other;
unevenly distributed

Homogeneous Mixture

contains two or more gaseous, liquid, or solid substances evenly
distributed throughout

Suspensions

Heterogeneous mixture containing a liquid in which visible particles
will settle out

Solution

Particles are so small that they can not be seen with a light
microscope and will not settle to the bottom of their container.
Light will pass through without scattering.

Colloid

Like a heterogeneous mixture it contains varying proportions of
materials, like a solution its particles will not settle out, unlike a
solution it will scatter light.

Tyndall Effect the scattering of light when a light is sent through a colloid

Materials

- Classification Cards of various objects (one set per group)
- Containers of water, water and dirt, water and milk or starch, water with salt, and peroxide.
- Laser pointer
- Sheets of flip chart paper or butcher block paper and painter's tape
- Markers of assorted colors

Advance Preparation

1. Print out, laminate and cut apart enough cards so that you have a set for each group of 3-4 students.
2. Prepare containers (one set per lab group) Put numbers on the containers. (One ounce size bottles work well)
 - **Pure Substance (H_2O)** - Bottle of water
 - **Pure Substance (H_2O_2)** - Bottle that has been filled with hydrogen peroxide
 - **Solution** container will be small container of water with addition of small amount of salt.
 - **Suspension** will be small container of water with addition of small amount of dirt.
 - **Colloid** will be water with addition of a few drops of milk or starch.

Directions for the Activity

1. **Show containers** prepared in advance to groups. Ask students if they think that all of these containers belong together in the classification of matter? Give students an opportunity to provide some opinions. **Two of the containers contain substances and three contain mixtures.**
2. Tell the students that two of the bottles do not belong with the rest and today they will be deciding how they could use characteristics to separate these containers.
3. **Pass out sets of cards, markers and sheets of paper** to each group. Tell students to separate cards using some classification scheme that the group decides on. They are to list their groups on a sheet of paper and put what classification scheme they used to separate groups. Tell groups where to post their group's flip chart sheets.
4. After sheets have been put on walls **allow students to discuss** any similarities or differences that are shown on the sheets. **Let several groups discuss how they separated their cards.**
5. **Pass out student worksheets** and tell students to fill out information for part A.
6. **Tell them to gather up their cards** and now complete part B of the data sheet into two groups: Homogeneous Mixtures and Heterogeneous Mixtures.
7. After students have put new sheets on wall **allow students to discuss** if there are any differences in what is listed. Ask if any listed objects need to be moved. **Discuss** what they think a good definition of these two groups should be. **Answers are on student worksheet that follows in Teacher Prep**
8. **Tell students to complete Part C** on the worksheet for the Heterogeneous Mixture group of cards. Have students divide cards into colloids and other Heterogeneous mixtures. Have students post sheets on the wall. **Allow students to discuss** any differences. Discuss what a definition for these two groups could be. Make sure that students mention the size of the particles or ask if the size of the particles have anything to do with the separation of the groups. **Answers are on student worksheet that follows in Teacher Prep.**
9. **Have students look at the original containers.** Ask them to decide how these containers could be separated. Discuss: The bottle of water (1) and bottle of peroxide (2) are substances. The bottle with salt (3 solution), the bottle with dirt (4 suspension) and the bottle with milk (5 colloid) are mixtures. Solution is Homogeneous mixture and suspension and colloid are heterogeneous mixtures.
10. **Have students complete** Analysis questions and **discuss.** **Suggested answers follow on students worksheet.**
11. Pass out concluding activity sheet and have students complete for homework or during the next class period. **A suggested graph follows in the Teachers Prep .**

Student Worksheet

Mixtures and Nanotechnology

Modified from "Mixtures and Nanotechnology" from NNIN

Introduction

Mixtures do not always contain the same proportions of the substances that make them up. That makes them different from a substance. The classification of mixtures depends on the size of the particles that make them up and how these particles are distributed within the mixture.

Objective

After completing the data sheet you will be able to produce a graphic representation of all the information gathered.

Materials

- Set of cards
- Painter tape
- Large sheets of paper
- Assorted markers

Procedure

Part A:

1. Separate the cards you have been given into groups based on a classification scheme that your group decides on. List below your groups and the characteristic on which the divisions were made.

Characteristic_____

GROUPS

2. Using markers and a sheet of chart paper, list your classification groups and tape to the wall.
3. Compare your classification scheme with the other groups.

