

Submitted by Glenn and Sylvia Kaizuka – Mystery Powders

Mission Concept (overview)

Introduce students to the chemical and physical properties of 5 ordinary white powders

Introduction of Indicators: heat, vinegar, water, iodine

Introduce students to the Periodic Table

Mission Objective (essential question)

Review Atom, show Periodic Table, explain numbers and alphabets on the table, discuss Compounds and Molecules.

Water = H_2O Salt = NaCl Sugar = $\text{C}_{12}\text{H}_{22}\text{O}_{11}$

Elements: Hydrogen (H); Carbon (C); Oxygen (O); Sodium (Na); Chlorine (Cl);

How can chemical and physical properties be used to identify substances?

Can you name the powder or powders that are soluble in water? Insoluble in water?

Which powder + water produced a chemical change?

Which powder produced a chemical change when heated?

Which powder + iodine made the greatest change? (standard test for presence of starch)

Which powder + vinegar made the greatest change? (chemical reaction; test for presence of baking soda)

Resources (lab materials; if there is a supply resource, list web site)

Materials can be obtained from supermarkets and hardware stores.

5 Mystery Powders: Cornstarch, Salt, Baking Soda, Plaster of Paris, Sugar

Indicators: Water, Heat Source (hot plate, candles, or cans of Sterno with wooden clothes pin and aluminum foil cup), White Vinegar, Iodine

Small paper cups, small plastic spoons, flat toothpicks, dropping bottles, hand lens, microscopes

Exploration (procedure)

1. Identify physical properties of the 5 Mystery Powders
2. Which powders are soluble in Water?
3. Which powders are insoluble in Water?
4. Which powder + Water cannot be changed back into its original state? (chemical change)
5. Which powder + Heat changed the most? (chemical change)
6. Which powder + Iodine reacted the most? (standard test for presence of starch)
7. Which powder + Vinegar reacted the most? (test for baking soda)

Mission report (outcome)

Supply each student group with an unlabeled powder from the original group.

Can you identify this powder?

What characteristics helped you in your identification?

After the students have successfully identified a number of powders, supply them with some mixtures. Suggested mixtures: baking soda + sugar; baking soda + cornstarch; baking soda + plaster of paris; sugar + cornstarch --- each mixture should consist of equal parts of each powder and be well mixed.

Mystery Liquids: fill 4 separate containers, one with iodine, one with vinegar, and two with water. Disguise the identity of the liquids by adding a few drops of red food coloring. Ask the students if they can identify the liquids using the 5 powders. Do not permit the students to smell the liquids. Vinegar and Iodine have distinctive odors.

Debrief (explanation)

The activities in Mystery Powders deal with the physical and chemical properties of ordinary white powders and the use of indicators in identifying them and in detecting their presence in mixtures.

The water, heat, iodine, and vinegar tests cause specific reactions with the powders. These are the indicators that identify the powder.

Mystery Powders introduce students to the detailed examination of some chemical and physical properties of familiar substances, to the use of indicators, and to other analytic techniques.

Useful for introducing students to investigatory science.

Chemistry: Matter and Change (Atoms, Molecules, and Compounds) --- Water = H₂O

Salt = NaCl Sugar = C₁₂H₂₂O₁₁

Elements: Hydrogen (H); Carbon (C); Oxygen (O); Sodium (Na); Chlorine (Cl);

*limit to no more than 2 pages

*include photos or diagrams if appropriate

*word document using Times New Roman, 12 point, single space, page layout (1 X 1 margins)

*we would like to submit some preliminary plans for review and posting by August 30 and add as we can later this year