MYSTERY POWDERS

TEACHER NOTES

Materials needed

8 sets of white powers (see Substances Used, below) in 2 oz (60 mL) square, clear, screw-top bottles. Bottles are labeled 1 to 4.
8 sets of solutions (see Substances Used, below) in 2 oz (60 mL) square, clear, dropper bottles. Bottles are labeled W, V and I.
4 sets of unknown mixtures (see Substances Used, below) in 2 oz (60 mL) square, clear, screw-top bottles. Bottles are labeled 5 to 8.
Popsicle sticks
Disposable Petri dishes, 2 per group

Substances Used

The white powders used in this investigation are:

1. corn starch
2. salt, sodium chloride (table salt, plain)
3. sugar, confectionery 10X
4. baking soda, sodium bicarbonate

The three solutions used are:

W. water
I. iodine. Add some tincture of iodine (available at local pharmacy) dropwise to distilled or deionized water until it is light yellow in color. Test by placing a drop of the solution on some corn starch, the mixture should turn blue. This solution must be made up within 24 hours of use.
V. vinegar, 5% acetic acid

The mixtures used in this investigation are:

5. corn starch, salt, and baking soda
6. sugar and baking soda
7. corn starch and salt
8. corn starch, sugar, and baking soda

If desired, other mixtures may be used.

Results

1. Observations: Use of the senses

The object of this part of the experiment is to observe some of the physical properties of the four powders as provided by the physical senses. The properties being observed are:

Sight: color and crystalline form.

Smell: odor
Touch: relative hardness and some evidence of crystalline form.

Results:

Powder #1 can be discerned by careful observation of color and form (sight)
Powder #2 can generally be discerned by sight

Smell is of no use in discerning between these powders.

Touch is only a fair method of discerning between the powders. #2 is most easily discerned, #1, 3, and 4 are more difficult to decide between.

The results of this part of the experiment are summarized in Table 1

Table 1. Results of sensual observations of the powders.

Property	Bottle #1	Bottle #2	Bottle #3	Bottle #4
Color	Cream or off-white	White	White	white
Crystalline form	Powder (lumpy)	Crystalline (small cubes)	Powder (lumpy)	Microcrystalline (not as powdery as 1 and 3)
Odor	No discernable oder for all four powders.			
Hardness	Soft and smooth	Hard and coarse	Smooth, but not as smooth as 1	Hard, only slightly coarse
Taste (not used)	Bland	Salty	Sweet	Slightly salty

2. Observations: Use of Additional Substances

This part of the experiment deals with solubility (a physical property) and with some chemical -properties. The results are summarized in Table 2.

Table 2. Results of interactions of liquids with the powders.

Liquid	Bottle #1	Bottle #2	Bottle #3	Bottle #4
W	Forms milky mixture	Slowly dissoves to clear, colorless solution	Forms slightly cloudy solution	Forms slightly cloudy solution
V	Results similar to Liquid W			Bubbles (gas) given off
I	Dark blue mixture	Clear yellow solution	Yellow solution, slowly darkens to brown	Cloudy yellow solution

3. Identification of Mixtures

Using the properties of the four powders, as determined in the first two parts of this investigation, the identity of the components in some mixtures are determined. Some observations on the mixtures are summarized in Table 3.

Table 3. Results of investigations of the mixtures.

Property	**Bottle #____**	**Bottle #____**	**Bottle #____**	**Bottle #____**
Color/appearance	Fine powder, slightly crystalline	Fine powder, slightly lumpy	Powdery, slightly crystalline	Fine powder, slightly lumpy
Touch/Crystalline form	Smooth, slightly coarse	Smooth	Coarse	Smooth
Odor	No discernable odors			
Reaction with liquid W	Cloudy white	Cloudy white	Cloudy white	Cloudy white
Reaction with liquid V	Bubbles given off	Bubbles given off	Cloudy white	Bubbles given off
Reaction with liquid I	Blue solution	Turns brown	Blue solution	Blue solution