

Analytical Chemistry Basics

Identifying Unknown Powders



Analytical chemistry studies and uses instruments and methods to separate, identify, and quantify matter

How can we distinguish between different materials?

Qualitative analysis

Qualitative analysis determines the presence or absence of a particular compound, but not the amount (mass or concentration). We can use our senses to feel the powders, look at the color and crystal size and shape.

Chemical tests

Scientists can perform a series of reactions by adding various chemicals, like water, acid, etc. Different powders are composed of different molecules, so they will react differently with each chemical.

Real world examples: analytical chemistry knowledge is used widely in drug development, environmental sciences, and forensics. In forensics common examples include, the acid test for gold and the Kastle-Meyer test for the presence of blood.

Powders Mix-Up #1: Power of Observation

You have 5 powders: baking soda, cornstarch, vitamin C (ascorbic acid), citric acid, instant snow (hygroscopic polymer). Your job is to figure out which one is which. You must make careful observations of each powder to try to determine its identity.

You may observe them in any of the following ways:

- What do they look like? (Try using a magnifying glass.)
- What do they feel like? (Pinch some between your fingers.)
- What do they smell like? (Be careful not to inhale them up your nose.)
- DO NOT TASTE THEM!**

	Powder A	Powder B	Powder C	Powder D	Powder E
Feel 					
Smell 					
Look 					

Powders Mix-Up #2: Chemical Reactions

1. Take a small amount of each of the powders and place it in a small dish.
2. Add 5 drops of water to each powder.
3. Mix the liquid and the powder together and observe what happens.
4. Measure and record pH (with water only, why only measure pH with water?)
5. Write your observations in your table (did color change? did bubbles form?)
6. Repeat steps 1–4 for vinegar and iodine.

	Powder A	Powder B	Powder C	Powder D	Powder E
Water, pH	pH	pH	pH	pH	pH
Vinegar (acid)					
Iodine					
Based on observations, identity of the powder is					

Facts about powders and their reactions with liquids

Substance	Solubility in water	pH	Reaction to acid (vinegar)	Reaction to I ₂ (iodine)	Other observations
Baking soda	turns white and thick like glue	~9	Acid and baking soda fizzes, producing gas CO ₂	turns orange/brown	
Cornstarch	Turns sticky/lumpy	7	turns hard, like a broken cookie	turns black (no clumps)	pure white, feels slippery
pure Vitamin C (ascorbic acid)	soluble	2	unreactive	Reactive, clears iodine	
Citric acid	soluble	2	unreactive	unreactive	small clear grains
Hygroscopic superabsorbent polymer	Rapidly absorbs all the water	7	"melts"	unreactive	turns into a heap of fluffy white "snow"