CHEMWHIZ QUICK REFERENCE

TOPIC 02

Classification of Matter

Pure substances, mixtures, states of matter, and physical vs chemical properties.

01 Pure substances — CORE RULE

A pure substance has constant composition. Element = one type of atom; compound = 2+ elements chemically combined in fixed proportions.

Diatomic molecules (O_2, N_2, H_2) are still elements: all atoms are the same type. A compound contains more than one element.

02 Mixtures — CORE RULE

A mixture is a physical combination, separable by physical means. Homogeneous = uniform composition; heterogeneous = distinct regions/phases. Some colloids look uniform but are heterogeneous.

03 Classify these — CORE RULE

Stainless steel (a uniform alloy) = homogeneous. Sparkling water with visible CO_2 bubbles = heterogeneous (liquid + gas phases). Milk (a colloid) = heterogeneous, though it looks uniform.

04 States of matter — CORE RULE

Solid: definite shape and volume. Liquid: definite volume, takes the container's shape. Gas: takes the container's shape and volume, readily compressible. All states have mass.

05 The only liquid elements (25 °C, 1 atm) — CORE RULE

At 25 °C and 1 atm, mercury (Hg) and bromine (Br_2) are the only elements that are liquids.

06 Physical vs chemical — CORE RULE

Physical change/property: observed without making a new substance (melting, freezing, dissolving, dilution, color, temperature). Chemical: forms new substances (combustion, rusting, acidity, caloric content).

07 Extensive vs intensive — CORE RULE

Extensive: scales with amount and is additive (mass, volume, amount of substance, internal energy). Intensive: independent of amount (temperature, color, density, boiling point, melting point).

08 Solubility is intensive — CORE RULE

Solubility is intensive: stated per a specified amount of solvent/solution at set conditions, so it doesn't change with sample size. Don't confuse it with the total amount that dissolves (which depends on how much solvent there is).

09 Mass vs weight — CORE RULE

Weight (not mass) changes with location because weight = mass × local gravitational acceleration. Mass is a fixed quantity independent of location.