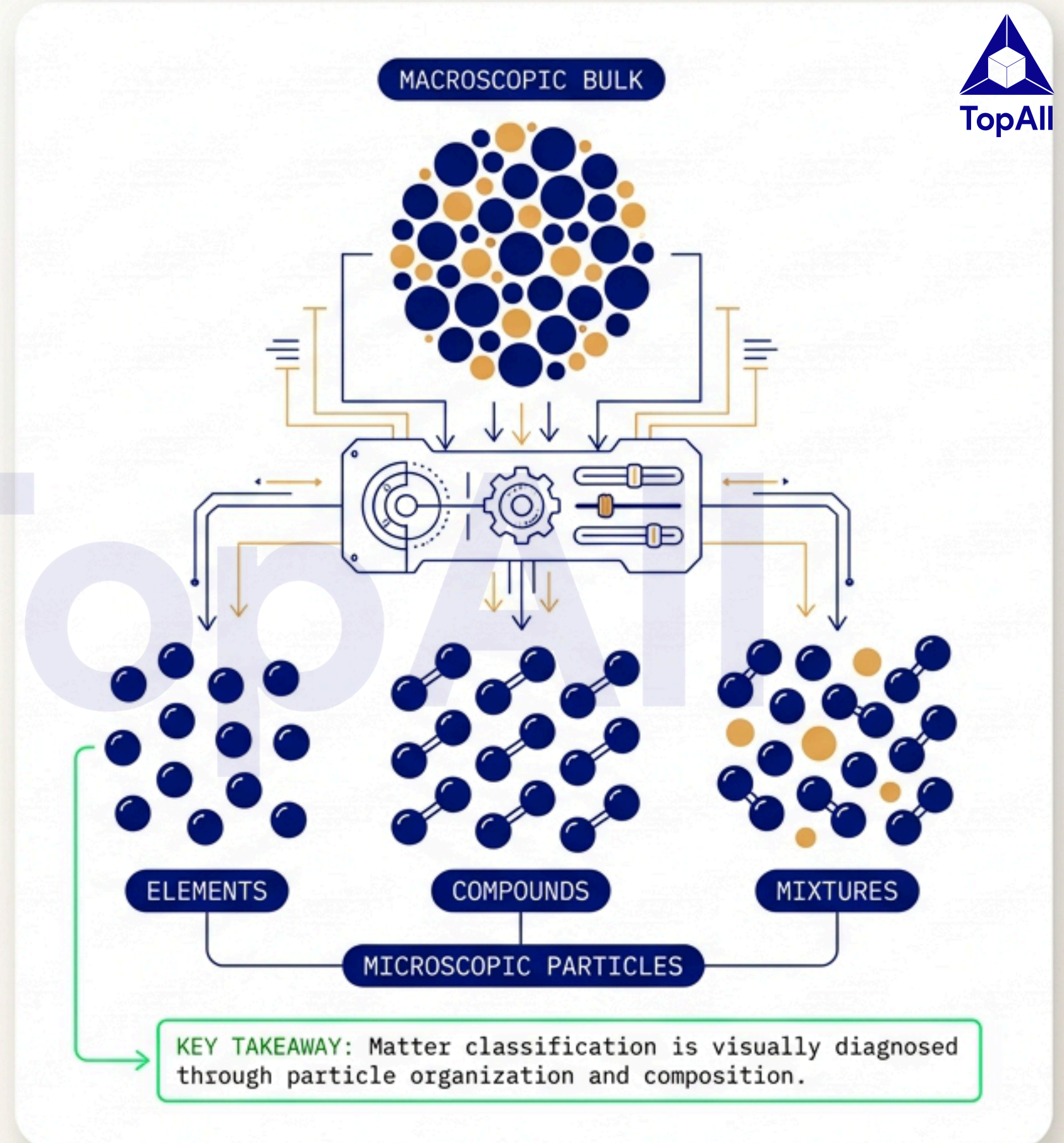
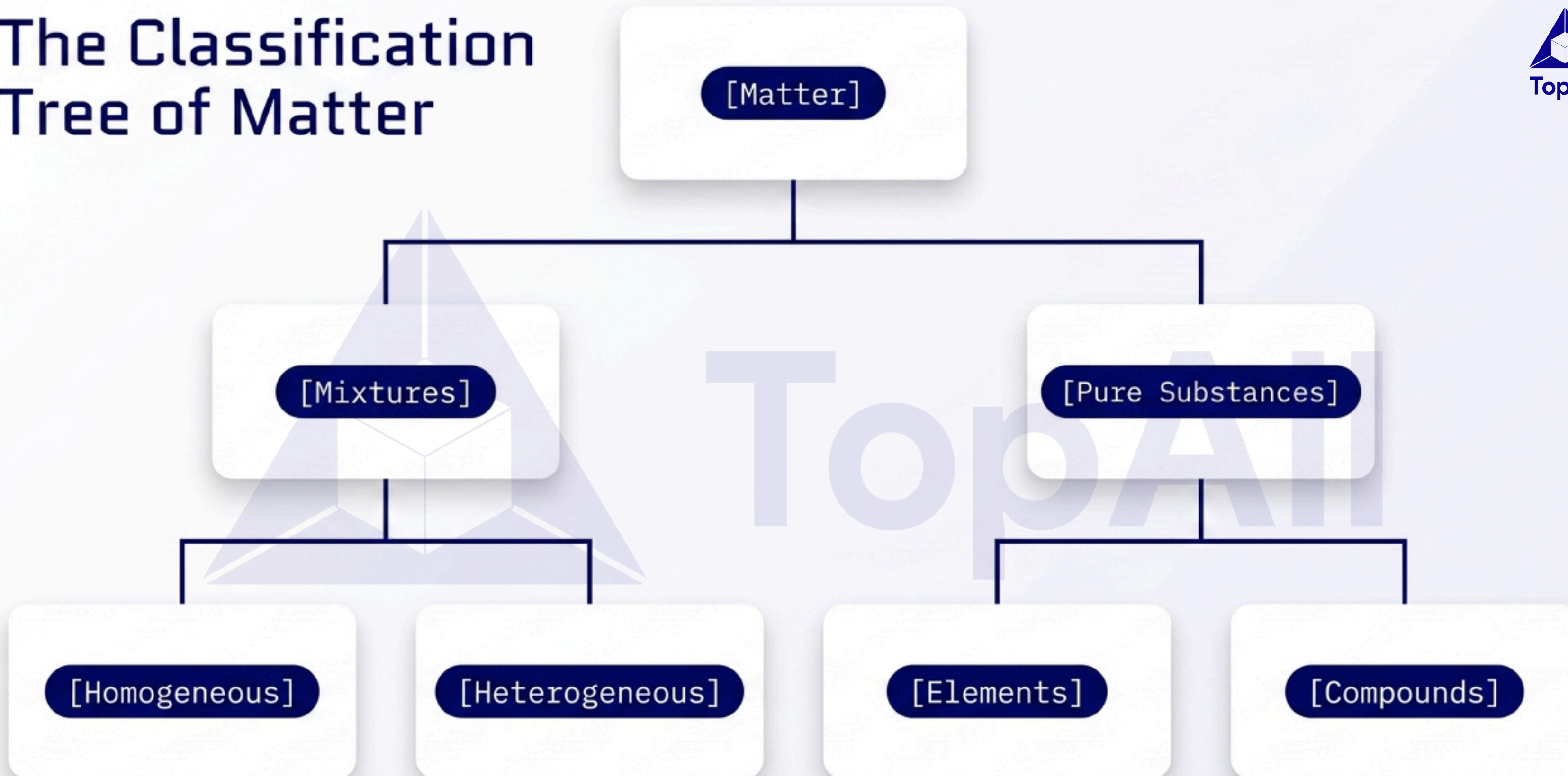


Mixtures, Elements and Compounds

A diagnostic classification of matter from the macroscopic bulk to the microscopic particle.

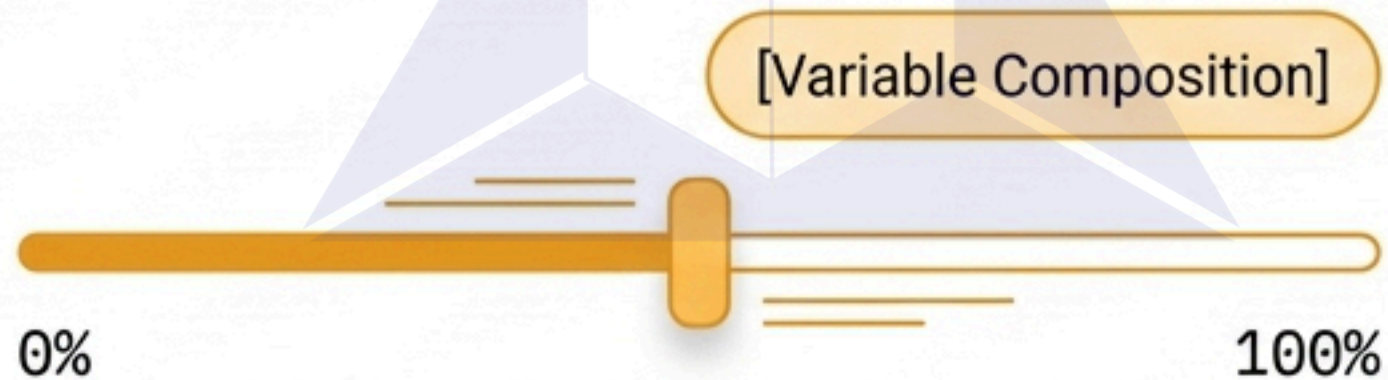


The Classification Tree of Matter



Mixtures: The Variable Combinations

Contains particles of two or more pure substances present in any ratio.



Physical Separation

Components can be separated by physical methods without altering chemical identity.

[Hand-picking]

[Filtration]

[Crystallisation]

[Distillation]



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$$E=mc^2$$



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Diagnosing Mixtures: Homogeneous vs. Heterogeneous

Homogeneous Mixtures

Property: Uniform composition throughout the bulk.

Visibility: Components completely mix; individual particles are not visible.

Examples: Sugar solution in water, air.



Heterogeneous Mixtures

Property: Non-uniform composition.

Visibility: Different components remain physically visible.

Examples: Salt + sugar mix, grains + pulses with dirt/stone pieces.



Pure Substances: The Fixed Reality

Substances where all constituent particles are the same in chemical nature.



[Fixed Composition]

Chemical Separation

Components cannot be separated by simple physical methods. Separation requires chemical methods.

[Copper]

[Silver]

[Gold]

[Water]

[Glucose]

Classifying Pure Substances: Elements vs. Compounds

Elements

Key Takeaway

Consist of only one type of atom.

Can exist as solitary atoms or diatomic molecules.

Na, Cu, H₂, N₂, O₂



Uniform Atoms

Compounds

Key Takeaway

Two or more atoms of different elements combined.

Key Takeaway

Atoms combine in a fixed and definite ratio characteristic of that specific compound.

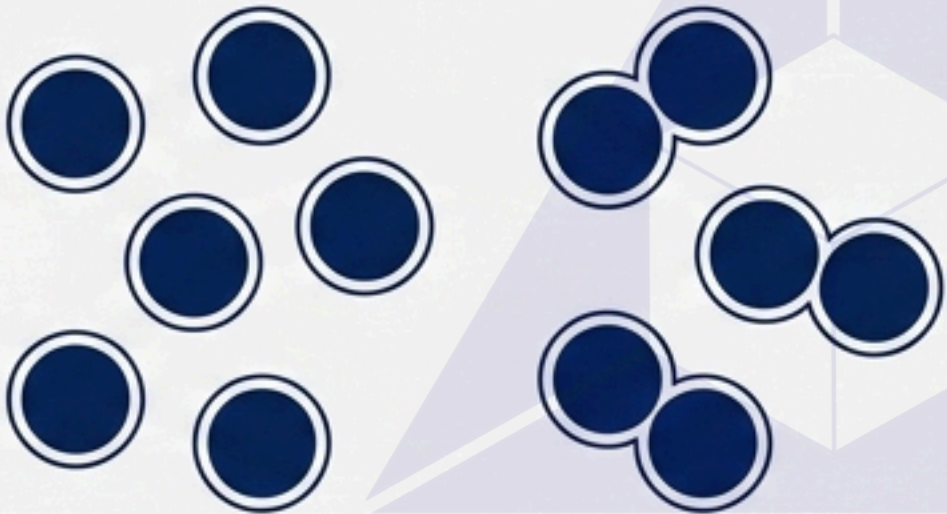
H₂O, CO₂, NH₃



Structured Molecules

The Microscopic Blueprint: Atoms & Molecules

Atoms & Element Molecules



[Atoms]

[Molecules of
an element]

Water Molecule



H_2O (2 Hydrogen : 1 Oxygen)

Carbon Dioxide Molecule



CO_2 (1 Carbon : 2 Oxygen)

Emergent Properties: The Compound Paradox



The properties of a compound are fundamentally different from its constituent elements. Chemical combination completely rewrites the identity of matter.



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