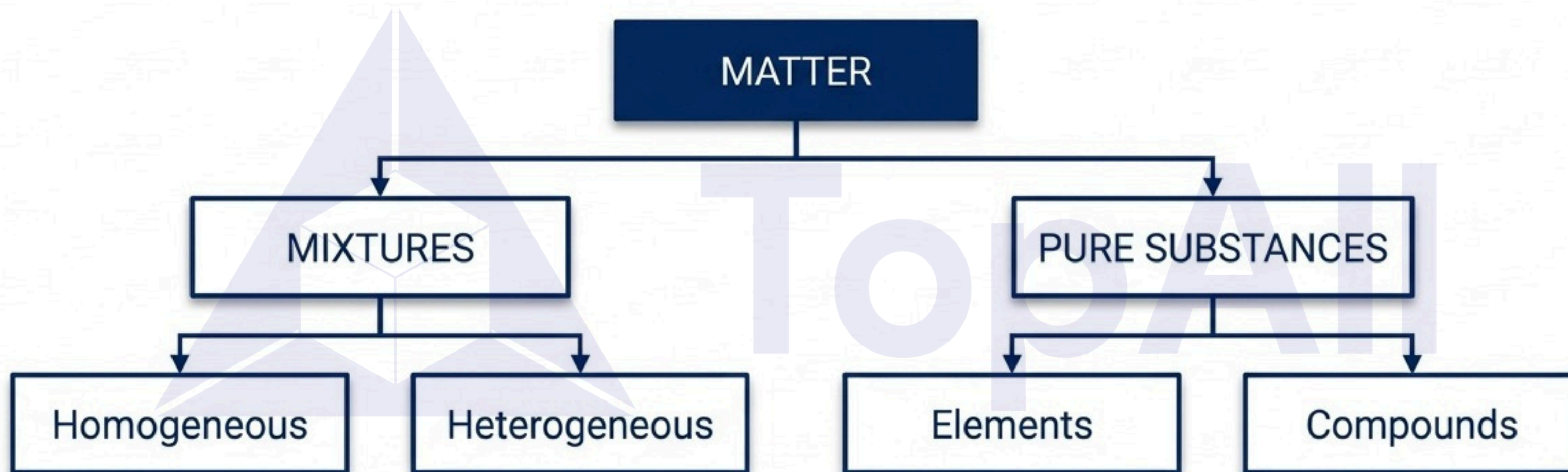


Classification of Matter

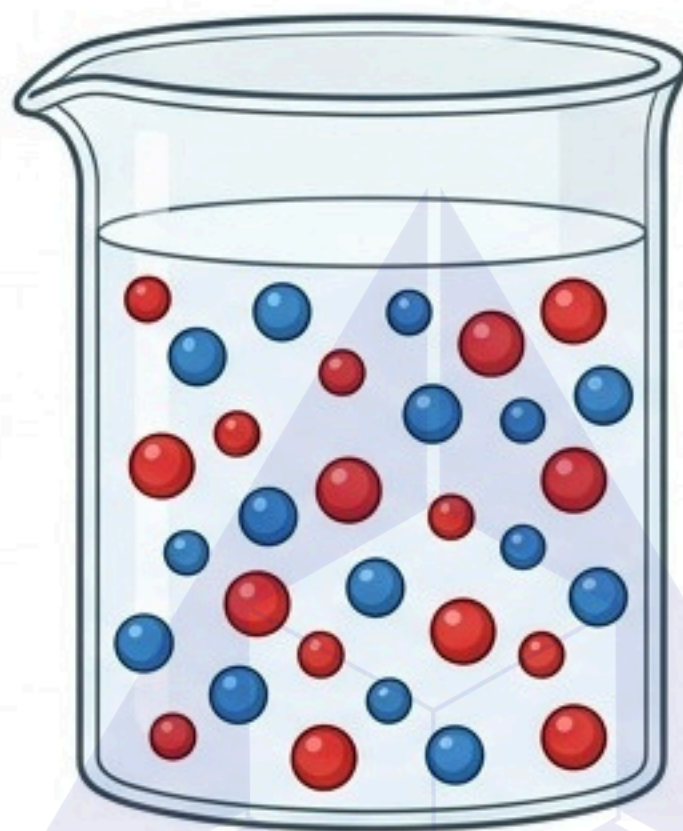
The Diagnostic Algorithm of Chemical Systems (Reference: NCERT 1.2.2)



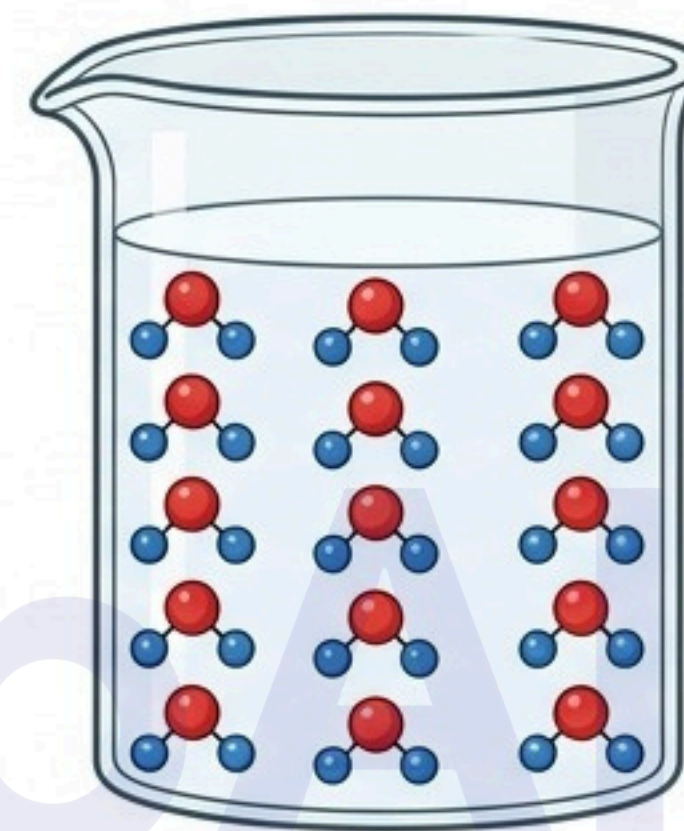
KEY TAKEAWAY

At the macroscopic (bulk) level, all matter around us can be systematically classified based on two diagnostic criteria: particle uniformity and separability.

The First Split: Mixtures vs. Pure Substances



Mixture (e.g., Sugar Solution)



Pure Substance (e.g., Water)

RULE 01: MIXTURES = Particles of two or more pure substances in ANY ratio. Variable composition.

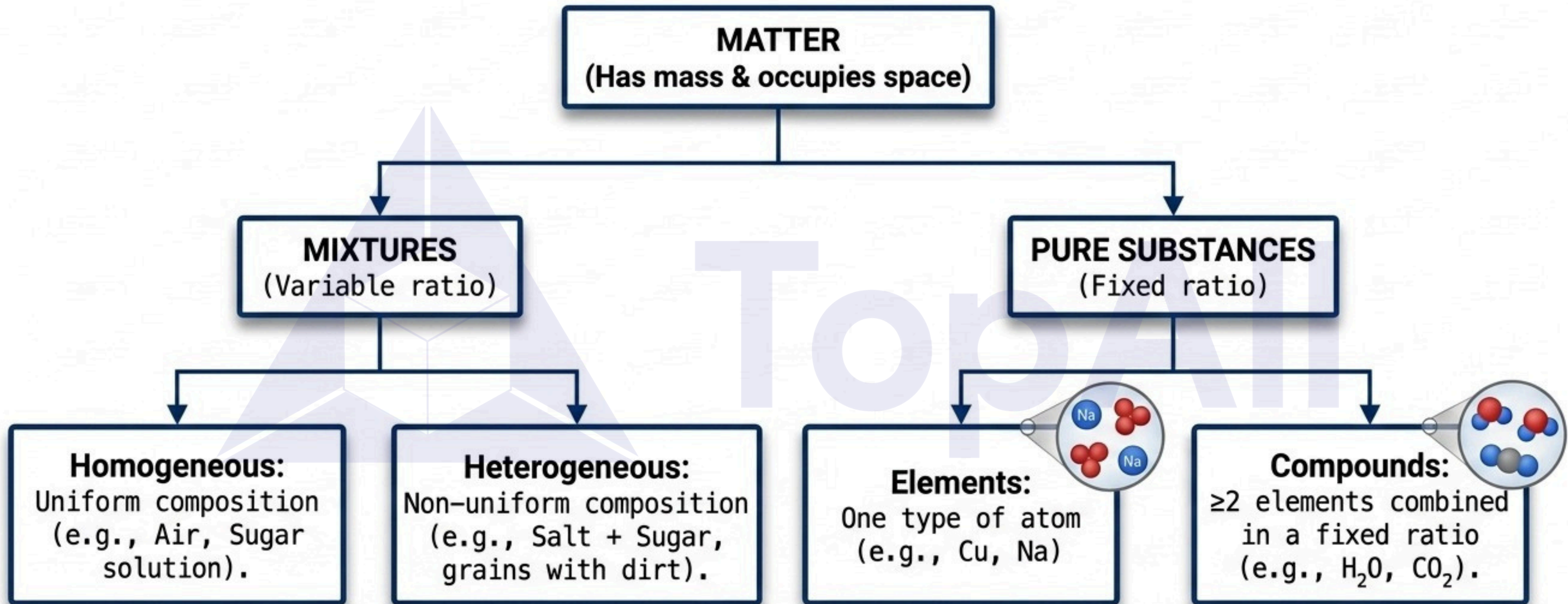
RULE 02: PURE SUBSTANCES = All constituent particles are identical in chemical nature. Fixed composition.

JEE TRAP ALERT:

Trap: Assuming 'pure' in everyday language means 'pure' in chemistry.

Reality: Consumer 'mineral water' is considered pure for drinking, but to a chemist, it is a mixture of water molecules and dissolved mineral ions.

The Complete Matter Classification Tree



KEY TAKEAWAY: Elements can exist as individual atoms (Na) or molecules (O₂). Compounds only exist as **molecules** (H₂O) or ionic lattices (NaCl).



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The Classification Rule Bank

[VARIABLE COMPOSITION] + [PHYSICAL SEPARATION] = MIXTURE

(Separable by hand-picking, filtration, distillation).



[FIXED COMPOSITION] + [CHEMICAL SEPARATION] = COMPOUND

(Constituents separated only by chemical reactions; properties differ from constituents).



[FIXED COMPOSITION] + [NO SEPARATION] = ELEMENT

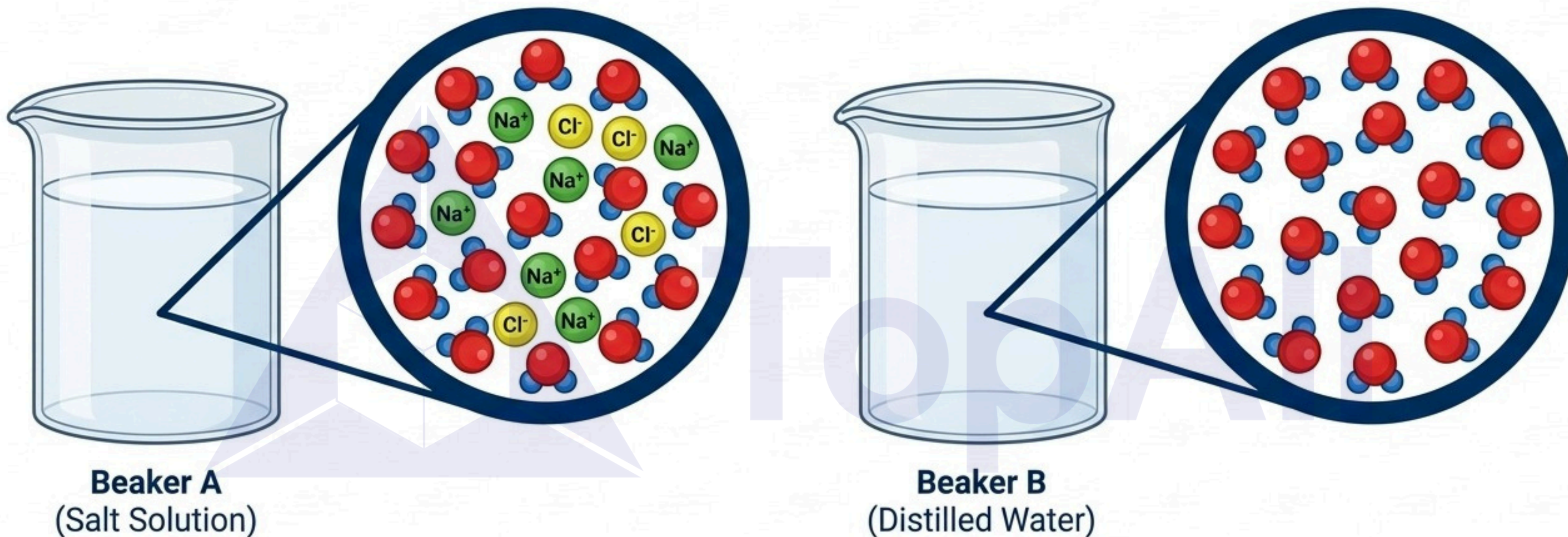
(Cannot be broken down into simpler substances).

JEE TRAP ALERT:

Trap: Believing physical phase changes alter a substance's fundamental classification.

Reality: Boiling salt water (a physical separation method) separates the mixture into salt and water, but it does not break the pure H_2O compound into H_2 and O_2 gases (which requires chemical decomposition).

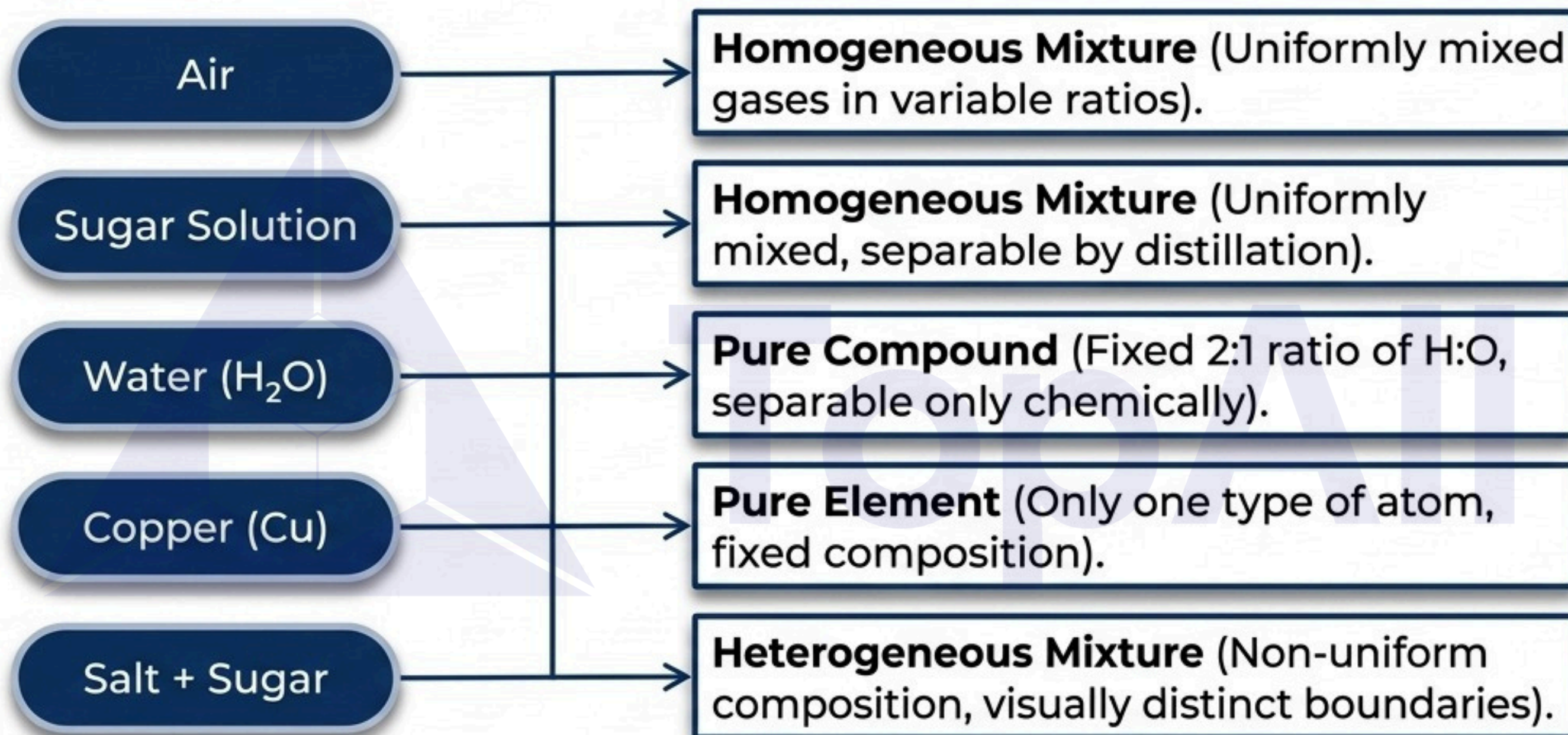
Visual Uniformity $\neq$ Chemical Purity



! THE HOMOGENEOUS TRAP: Homogeneous mixtures and pure compounds can look identical to the naked eye.

THE FIX: Run the **mental separation algorithm**: “Can I boil away one component and **leave another behind?**”
If YES = Homogeneous Mixture. If NO = Pure Compound.

Mini Application: Sort the Samples



Algorithm Check: Did you check for physical separability first?
If **YES** → Mixture. If **NO** → Pure Substance.

Composition Decides Classification

Variable Ratio = Mixture → Fixed Ratio = Pure Substance → Properties of Compound $\neq$ Properties of Constituent Elements

REVISION CARD

1. Is it physically separable?
Yes: Mixture. No: Pure Substance.
2. Is the composition uniform throughout?
Yes: Homogeneous. No: Heterogeneous.
3. Can it be chemically decomposed?
Yes: Compound. No: Element.

The ultimate differentiator in the classification of matter is composition. Matter is either a variable mixture of distinct pure components, or a chemically bonded pure substance with an absolute, fixed formula.



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