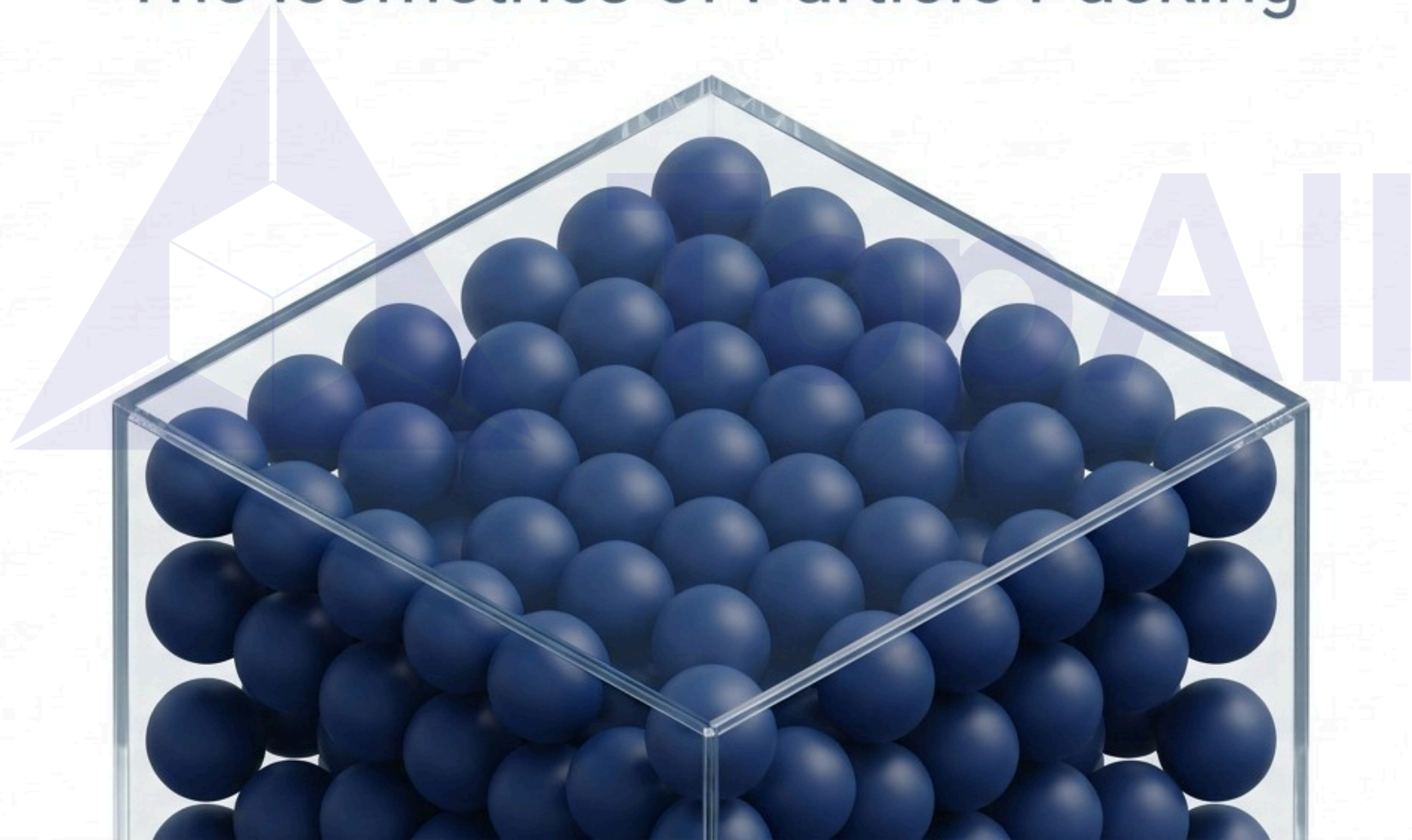


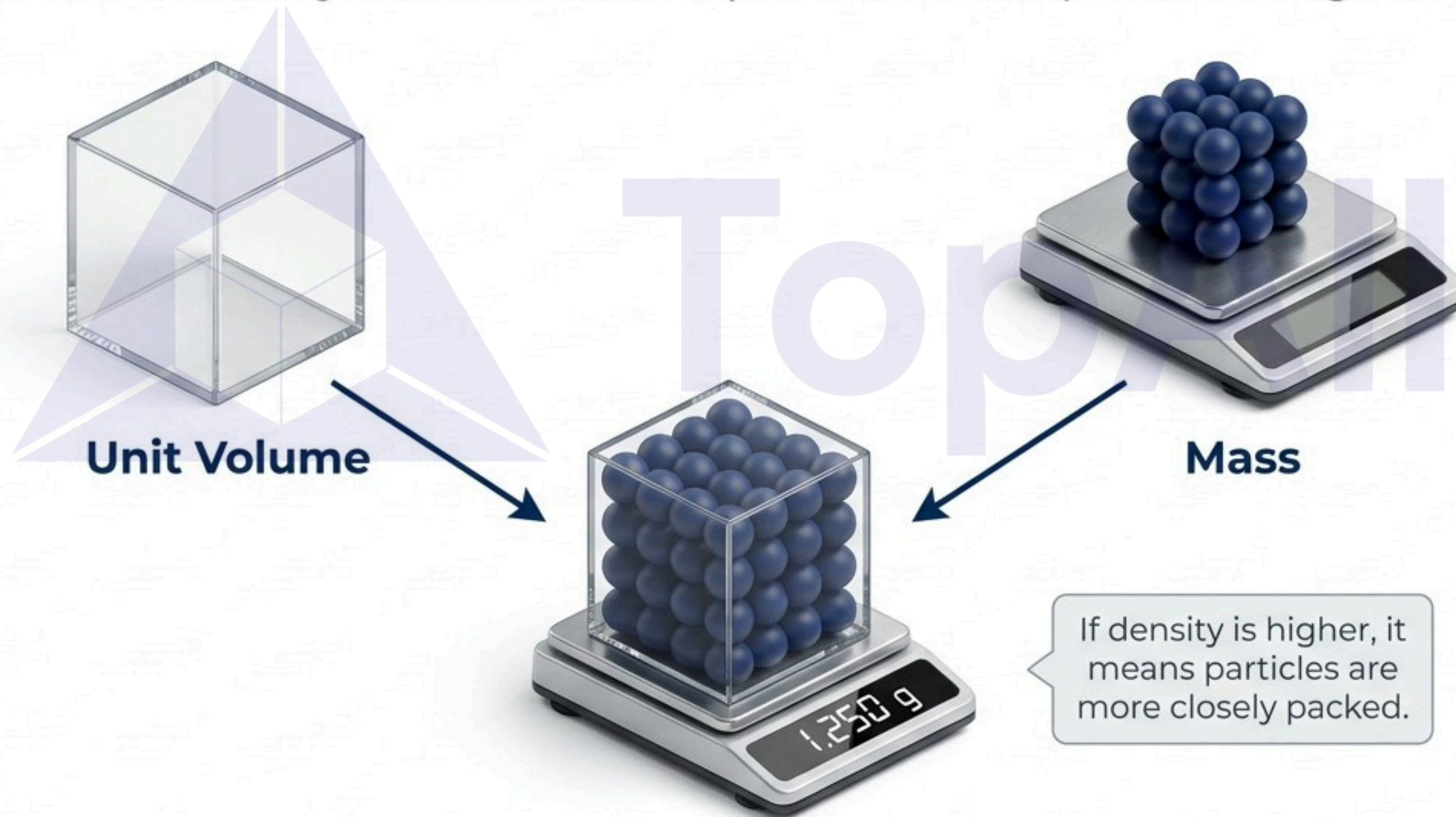
Density: Mass per Unit Volume

The Isometrics of Particle Packing

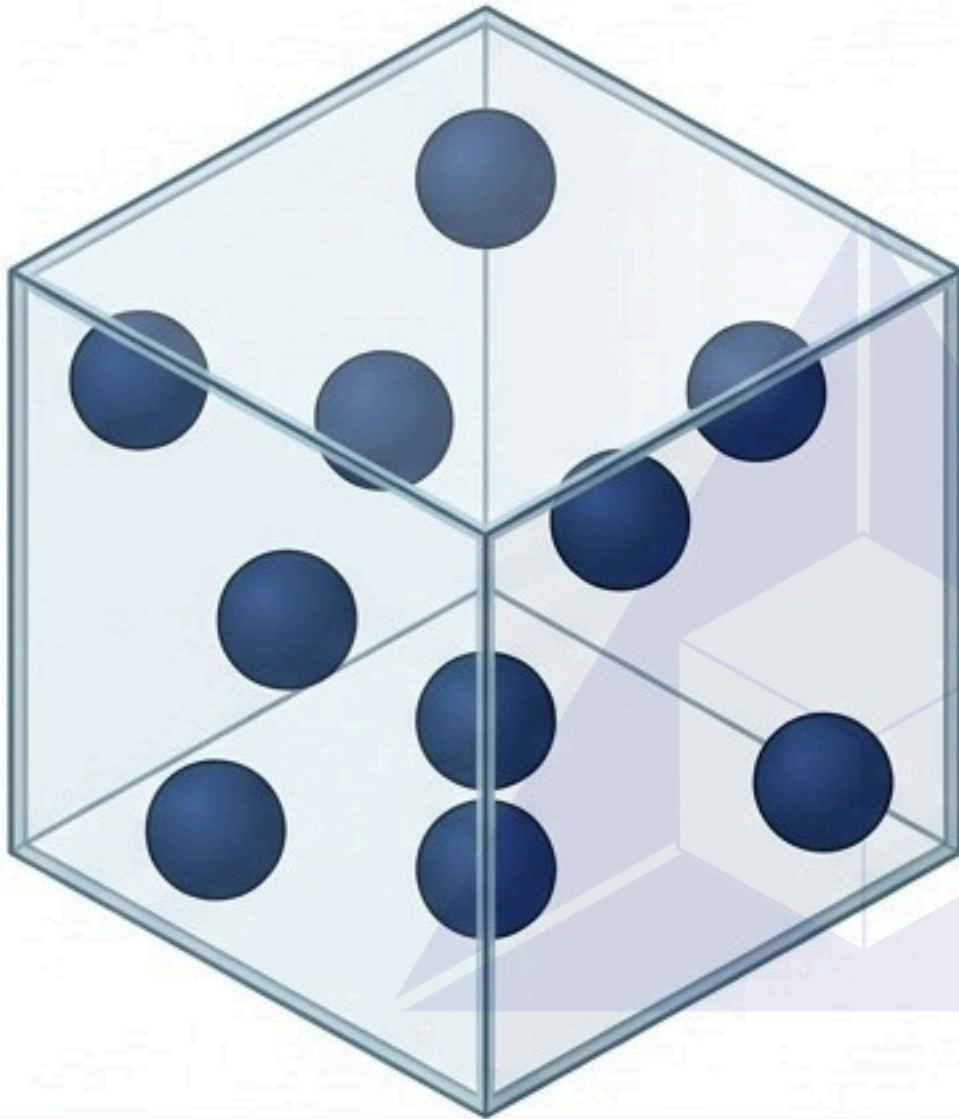


Defining Density

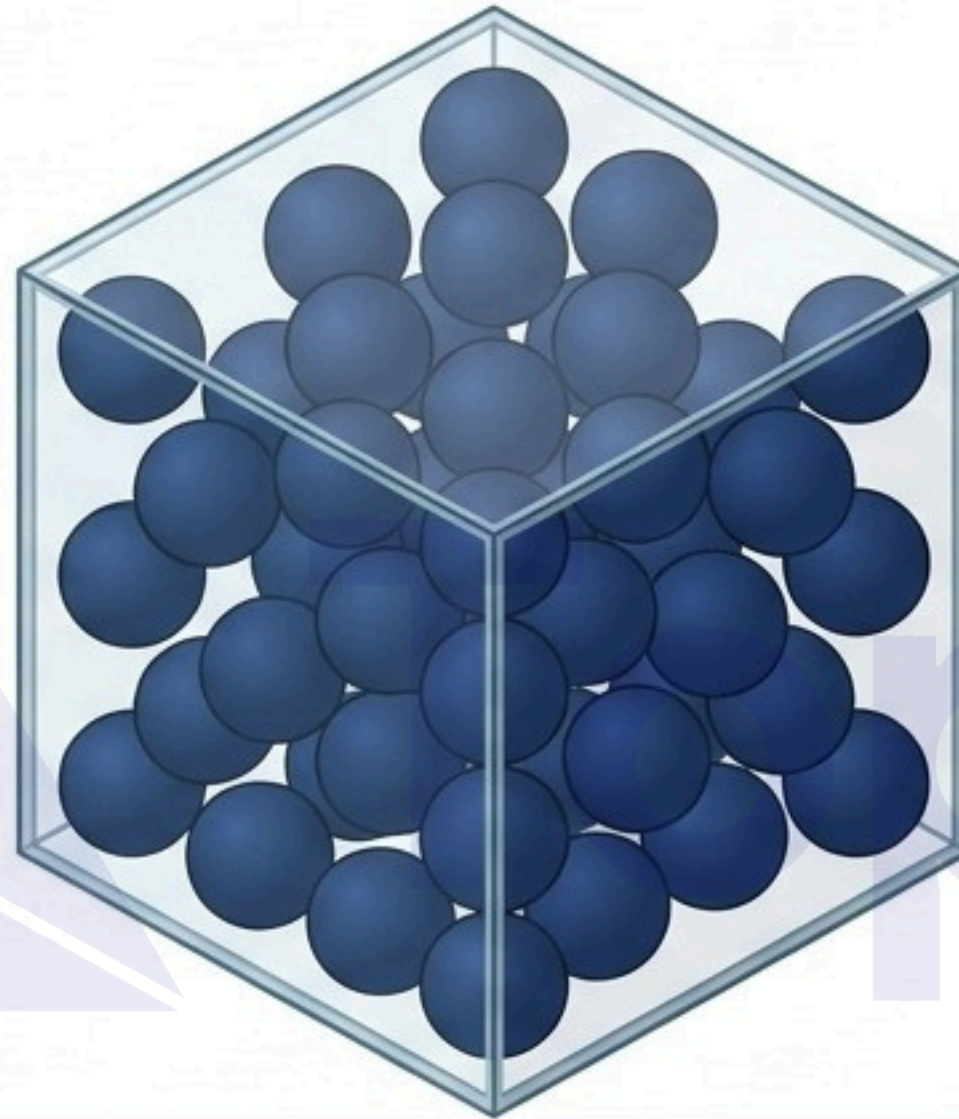
Density is the amount of mass per unit volume. It fundamentally describes how closely a substance's particles are packed together.



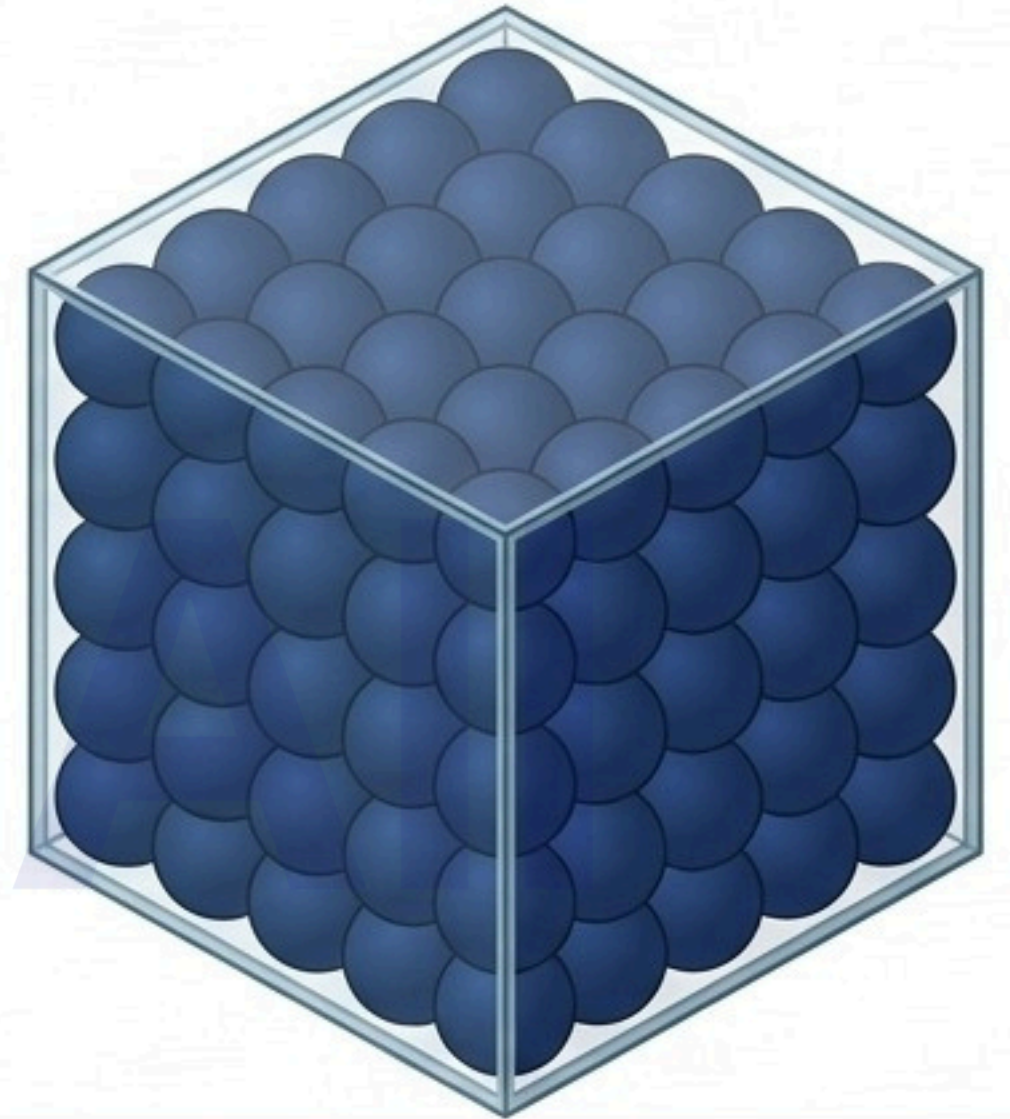
The Isometrics of Packing



Low Mass = Low Density



Medium Mass = Medium Density



High Mass = High Density

When **Volume** (V) remains constant, an increase in **Mass** (m) signifies tighter particle packing, resulting in higher **Density** (ρ).



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The Mathematical Framework

$$\rho = \frac{m}{V}$$

ρ = Density m = Mass V = Volume

Unit Breakdown Matrix

SI Unit System

kg m^{-3}

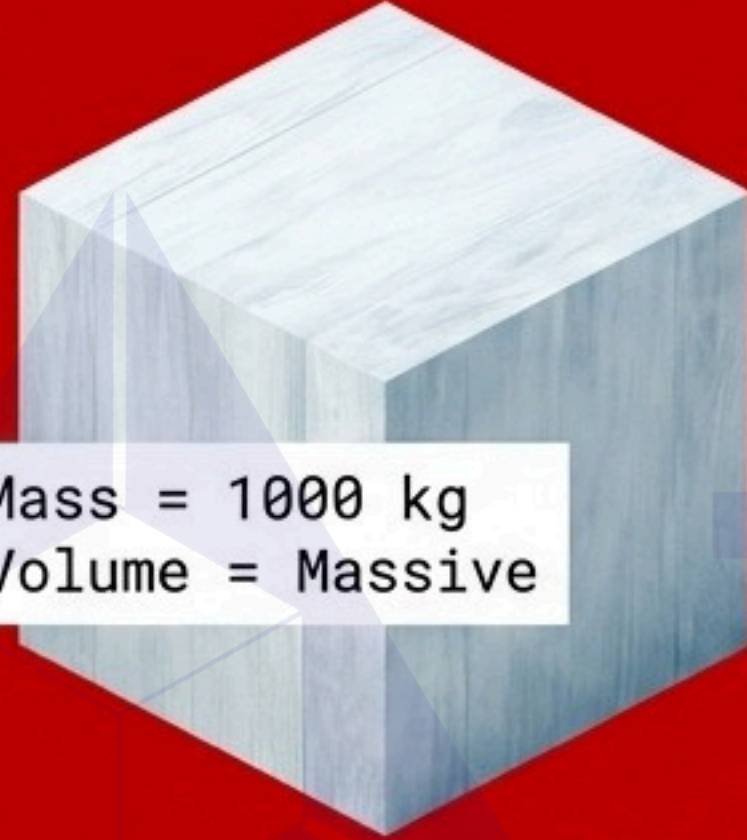
Used for large-scale physics and standard SI problems.

Chemist Standard

g cm^{-3}

Used in chemistry labs because the SI unit is impractically large for bench-scale experiments.

JEE Trap Alert: Mass vs. Density



Mass = 1000 kg
Volume = Massive



Mass = 10 g
Volume = Tiny

The Trap

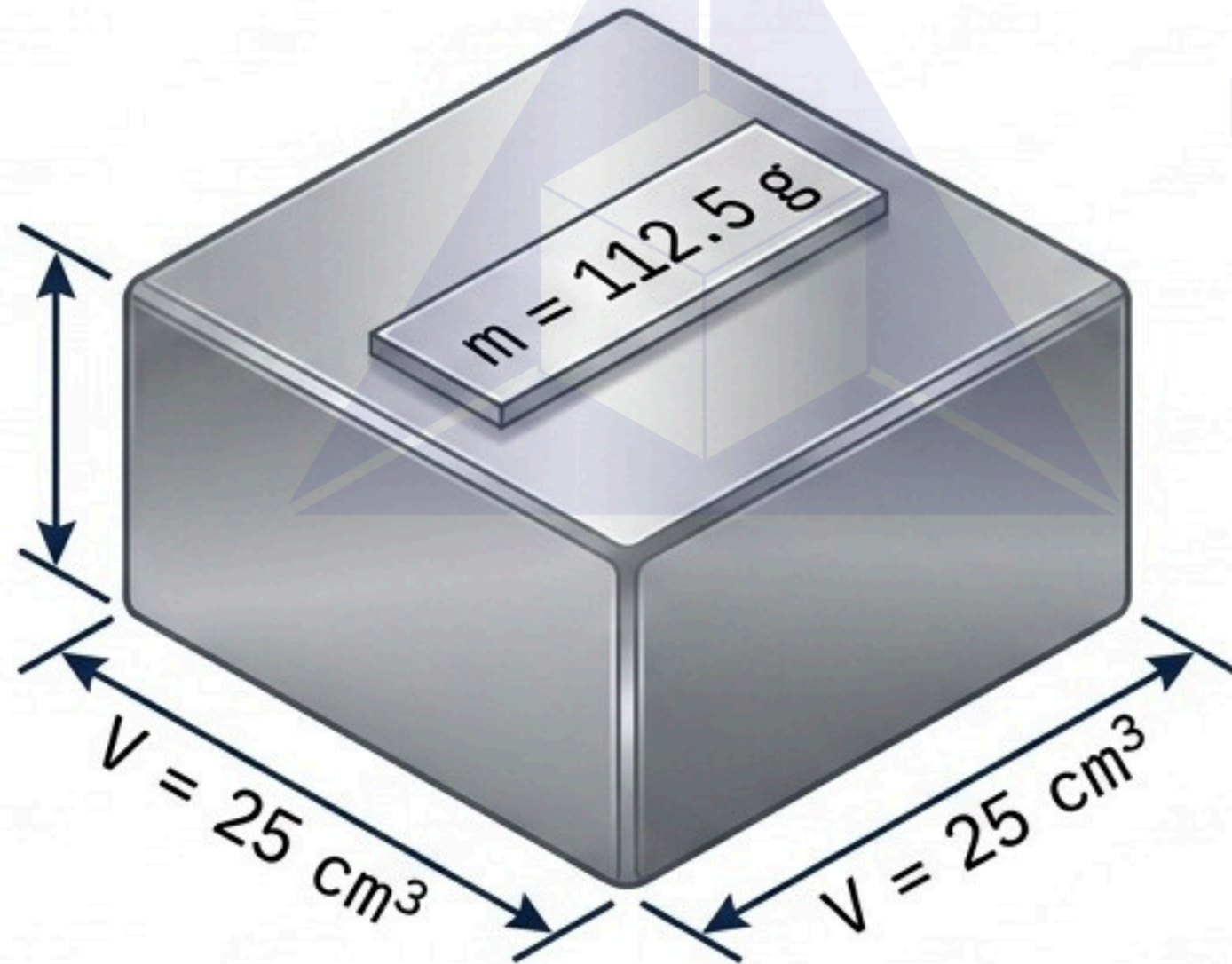
Thinking "Heavier = Denser."

The Truth

Total mass is irrelevant to density. The tiny iron pebble is much denser than the massive wooden block because its mass per unit volume is higher. Density is an intensive property; mass is extensive.

Mini Application

Calculate the density of this metal block in standard chemistry units.



The Solution Walkthrough

1. Identify Variables:

$$m = 112.5 \text{ g}$$

$$V = 25 \text{ cm}^3$$

2. Apply Formula:

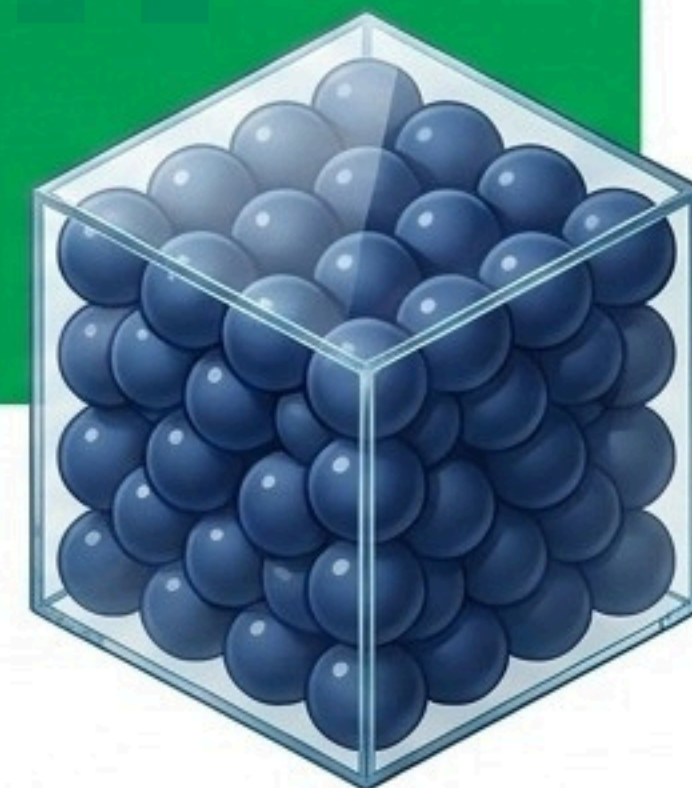
$$\rho = 112.5 / 25$$

3. Final Answer:

$$\rho = 4.5 \text{ g cm}^{-3}$$

Synthesis & Revision

1. **The Core Meaning:** Density describes the tightness of particle packing in a substance.
2. **The Law:** $\rho = m / V$
3. **The Units:** Standard SI is kg m^{-3} ; Lab standard is g cm^{-3} .
4. **The Trap Avoided:** High mass does not mean high density unless the volume is accounted for.





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