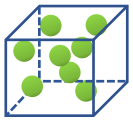
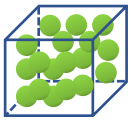
INTRO TO DENSITY

● LIQUIDS and GASES are types of _____. So we use the term to refer generally to both Liquids AND Gases.

● The DENSITY of a material is a measure of how tight the molecules are packed →



_____ Density



_____ Density

- Density **ρ =** —— **(Units:** ——**).** Volume V **=** _____ **(**_____**).**

- If given density & dimensions, you can find mass → m = _____.

- Objects of the same material have the same _____.

- For 2+ liquids in a container, HIGHER density liquids will be at the **(TOP | BOTTOM)** →

EXAMPLE**:** What is the total weight of air molecules inside a large warehouse that is 100 m wide, 100 m deep, 10 m high? (*Assume the density of air is 1.225 kg/m³, and g = 10m/s²*)

COMMON DENSITY VALUES AND CONVERSIONS

● Some common density VALUES and UNITS you should know**:**

CONVERSIONS

1 cm^3 = 1 mL ; 1m^3 = 1,000 L

- Fresh Water 1,000 kg/m^3 = 1.0 kg/L = 1.0 g/cm^3 (lake, river, house water, etc)
- Salt Water ~1,030 kg/m^3 (seawater, ocean, etc)
- Whole Blood ~1,060 kg/m^3
- Air (at sea level) ~1.2 kg/m^3 (~800x less dense than water)
- Oil & Wood are usually slightly less dense than water**.**

EXAMPLE**:** How much does 500 mL of a 2.2 g/cm^3 liquid weigh**? (**Use g = 10m/s^2**)**

SPECIFIC GRAVITY

- Specific Gravity (SG) is a term related to density. SG of any material = $\frac{\text{of material}}{\text{of freshwater}}$ (no units!):

$$SG_x = \frac{\quad}{\quad} = \frac{\quad}{1000}$$

- SG is a relative number for how many times _____ a material is than freshwater.

EXAMPLE: What is the volume of wooden cube with specific gravity 0.8 that weighs 16,000 N? (Use g = 10m/s^2)

PRACTICE: DENSITY / WOODEN DOOR

PRACTICE: A wooden door is 1 m wide, 2.5 m tall, 6 cm thick, and weighs 400 N. What is the density of the wood in g/cm^3? (use g = 10 m/s^2)

PRACTICE: DENSITY / MASS OF BLOOD IN BODY

PRACTICE**:** Suppose an 80 kg (176 lb) person has 5.5 L of blood **(**1,060 kg/m^3**)** in their body. How much of this person's total mass consists of blood? **(**BONUS**:** What percentage of the person's total mass is blood**?)**

PRACTICE: DENSITY / IS CROWN MADE OF GOLD

PRACTICE**:** You want to verify if a 70-g crown is in fact made of pure gold **(**19.32 g/cm^3**),** so you lower it by a string into a deep bucket of water that is filled to the top. When the crown is completely submerged, you measure that 3.62 mL of water has overflown. Is the crown made of pure gold**?**