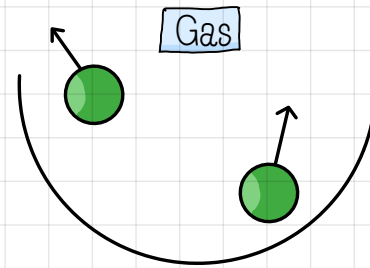# Density

States of matter

👑 There are three states of matter: Solid, liquid and gas

| Solid | Liquid | Gas |
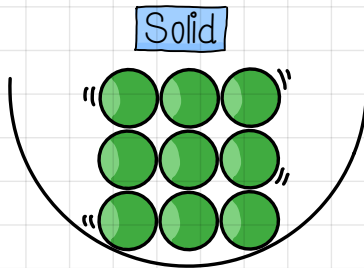
Particles are close together
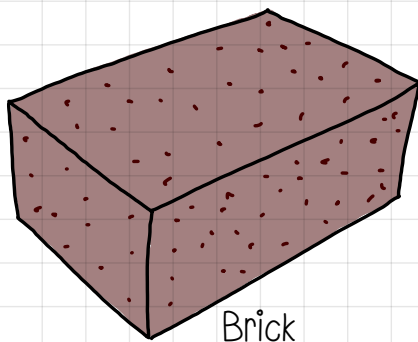Arranged in a fixed pattern
Vibrate but do not move
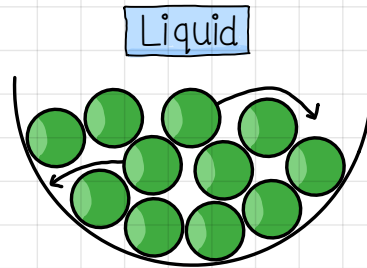
Particles are close together
Arranged in random pattern
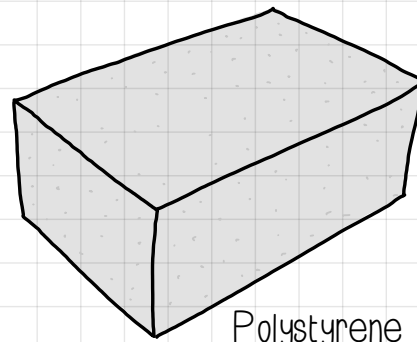Can slide over each other

Particles are far apart
No pattern
Move very rapidly

Density

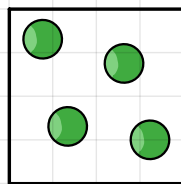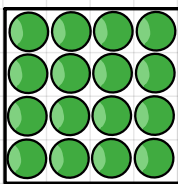👑 Density is the amount of matter (stuff) in a given volume.
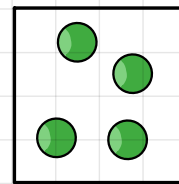
Brick

Polystyrene block

👑 The brick has a large mass in a given volume so it has a high density.
The polystyrene brick has a lower mass for the same volume so it has a
low density.

Same volume : Different mass   Different volume : Same mass

Density...

👑 The equation linking mass, volume and density is:

$$\text{density} = \text{mass} \div \text{volume} \qquad \rho = m / v \qquad \rho = \text{rho}$$

density (kg/m³)   mass (kg)   volume (m³)

You need to learn this equation for the exam

Calculating density

1. Calculate the density of a pure gold statute with a volume of 0.0000622m^3 and a mass of 1.2 kg.

2. Use the equation $\rho = m / v$

3. Substitute the values from the question: $\rho = 1.2\text{kg} / 0.0000622\text{m}^3$

4. $\rho = 19{,}300 \text{ kg/m}^3$

Standard units

The standard unit for mass is kilograms and the standard unit for volume is m^3 .
In the laboratory, mass will usually be measured in grams and volume in cm^3 .
To convert g/cm^3 into kg/m^3 : x 1000
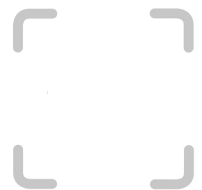To convert kg/m^3 into g/cm^3 : ÷ 1000

Practice question #1

Iron has a density of 7.87 g/cm^3. Calculate the density of iron in kg/m^3 .

To convert g/cm^3 into kg/m^3 : 7.87 x 1000 = 7870 kg/m^3

Practice question #2

1. What is the volume of a piece of metal that has a mass of 300g and density of 6g/cm^3

2. Use the equation $\rho = m / v$

3. Rearrange equation to calculate v: $v = m / \rho$

4. Substitute values from the question: $v = 300\text{g} / 6 \text{ cm}^3$

5. $v = 50 \text{ cm}^3$

▶ watch video