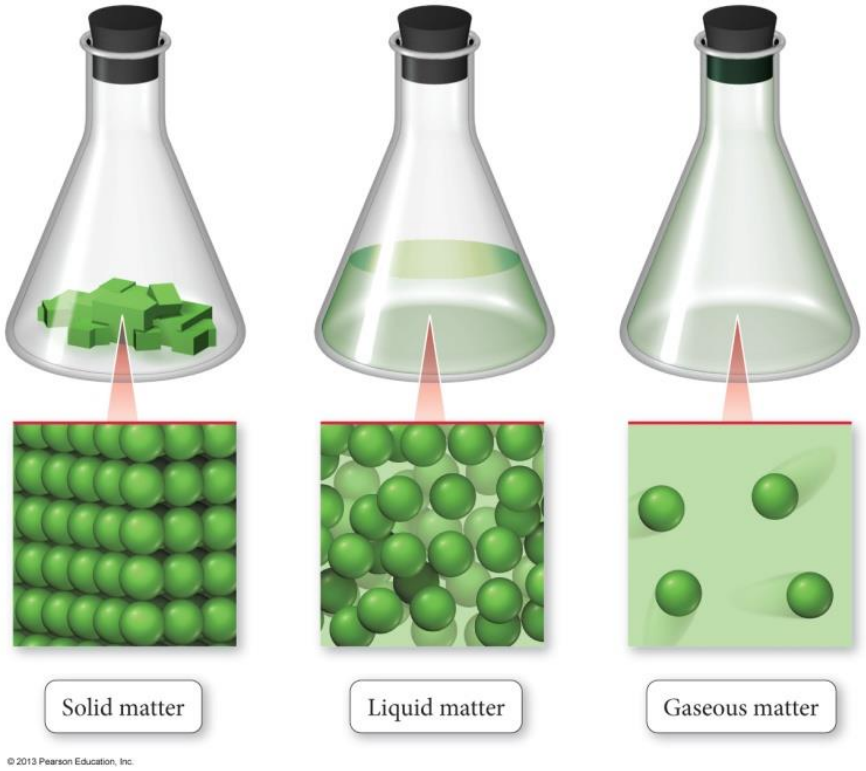
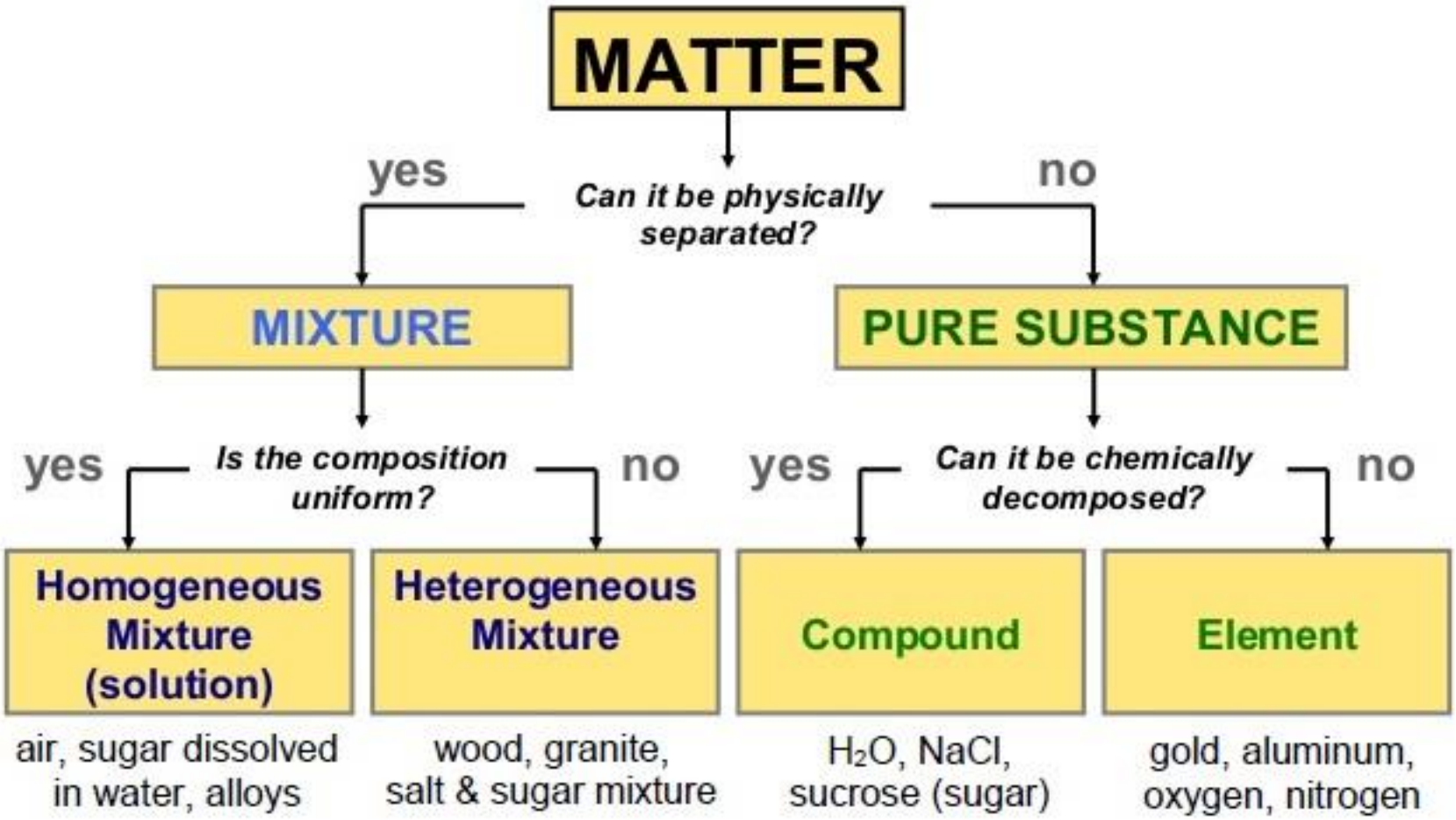
Chapter 2

Matter

- **matter** – anything that has mass and takes up space
  - A "chemical" is everything! …except for energy



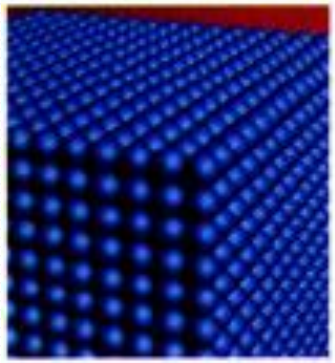

MATTER
Can it be physically separated?
yes
no
MIXTURE
PURE SUBSTANCE
Is the composition uniform?
yes
no
Can it be chemically decomposed?
yes
no
Homogeneous Mixture (solution)
Heterogeneous Mixture
Compound
Element
air, sugar dissolved in water, alloys
wood, granite, salt & sugar mixture
H_2O, NaCl, sucrose (sugar)
gold, aluminum, oxygen, nitrogen

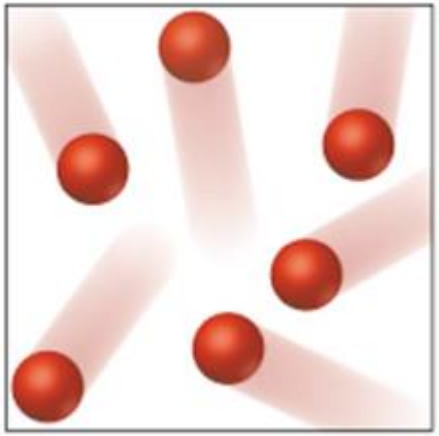
What is an element?

Look on the periodic table!!

MATTER

Examples:





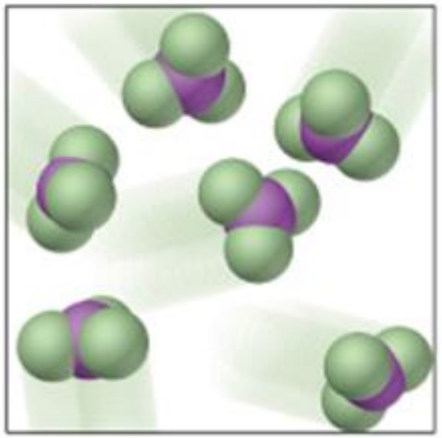
PURE SUBSTANCE

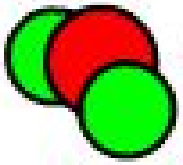
Element

gold, aluminum, oxygen, nitrogen

What is a compound?

Examples:





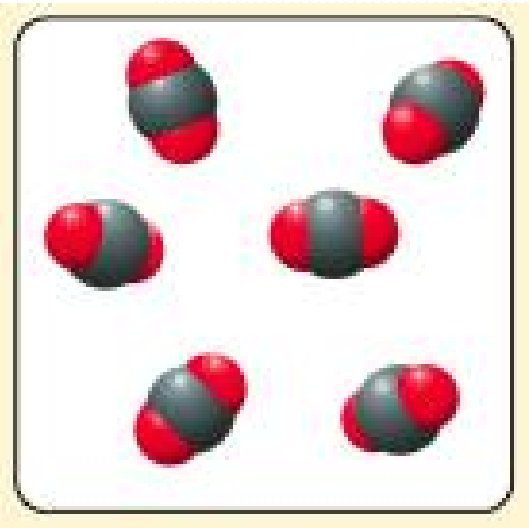
MATTER

PURE SUBSTANCE

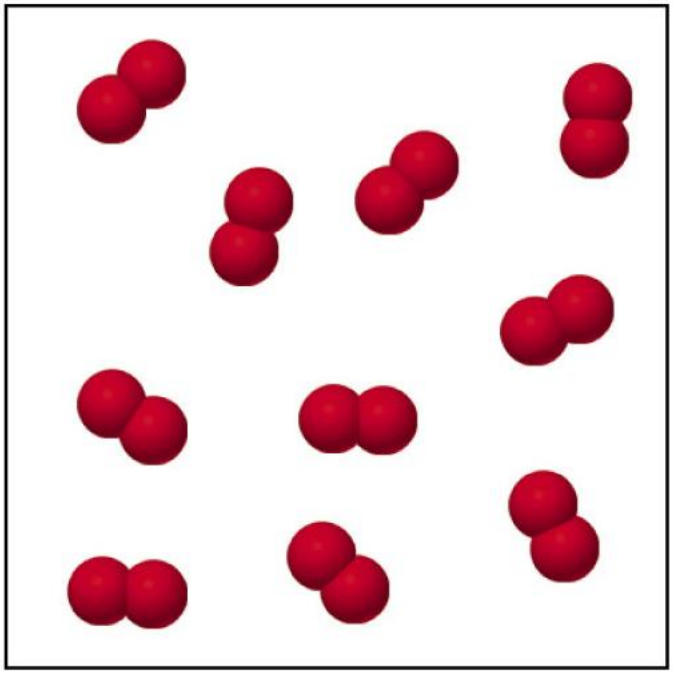
Compound

H_2O, NaCl,
sucrose (sugar)

Look for different elements BONDED together!
(a chemical formula)



Is this an element or a compound?



- Element!
- Only one type of element (one color of circle)
  - It is technically a “molecule” of an element.
  - Stay tuned for Chapter 9.

What is a mixture?

MATTER

Can it be physically separated?

yes

MIXTURE

Is the composition uniform?

yes

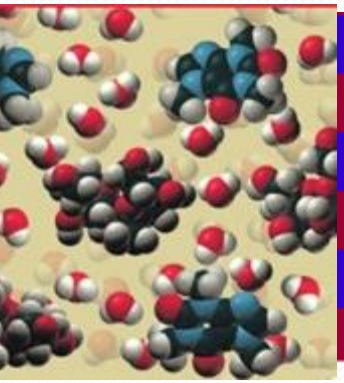
no

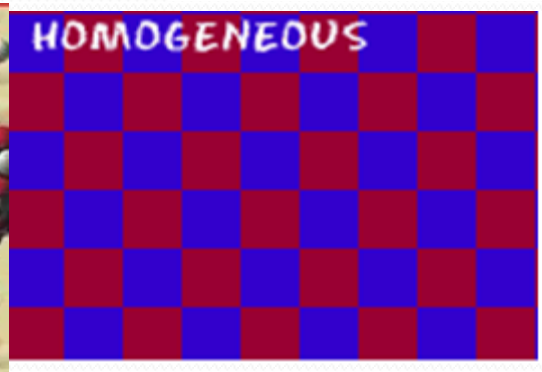
Homogeneous Mixture (solution)

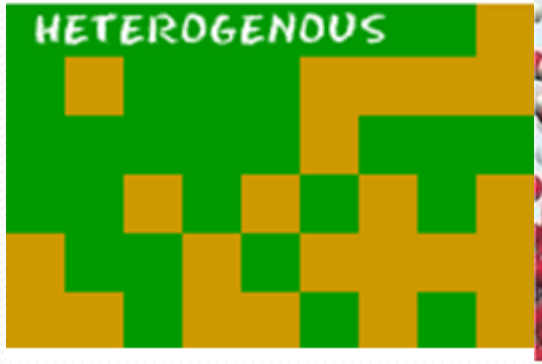
air, sugar dissolved in water, alloys

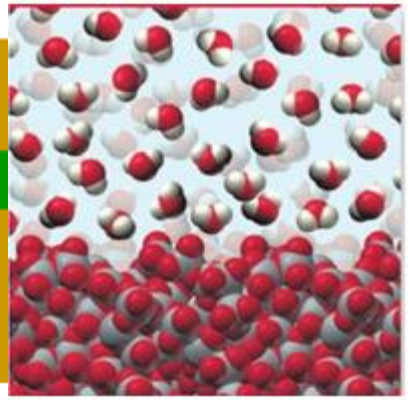
Heterogeneous Mixture

wood, granite, salt & sugar mixture





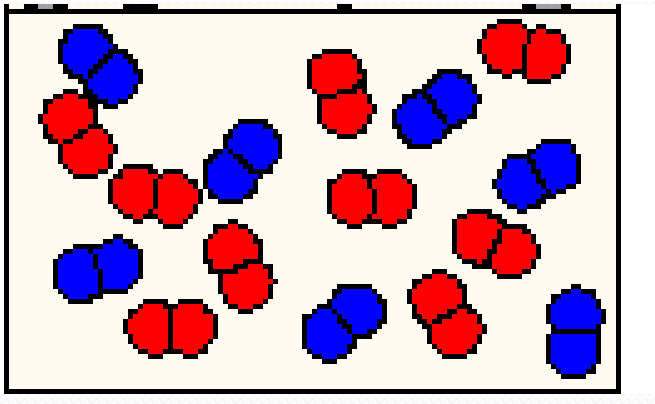


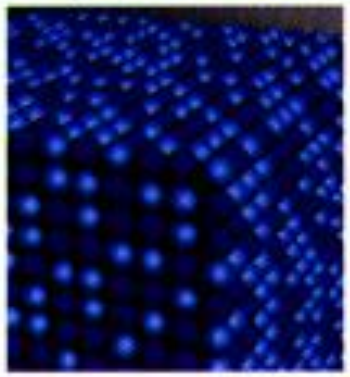


Other examples of…

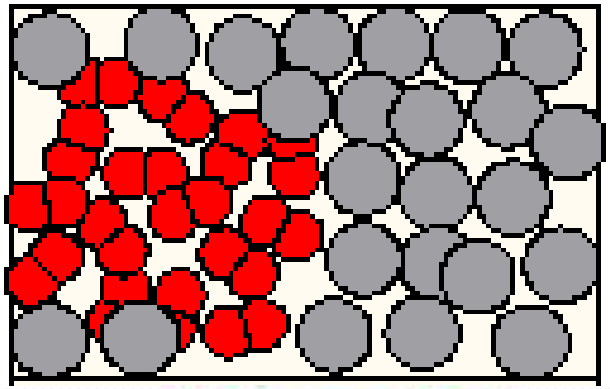
Is the composition uniform?

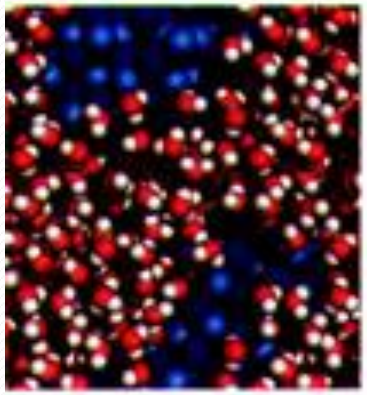
Homogeneous mixtures



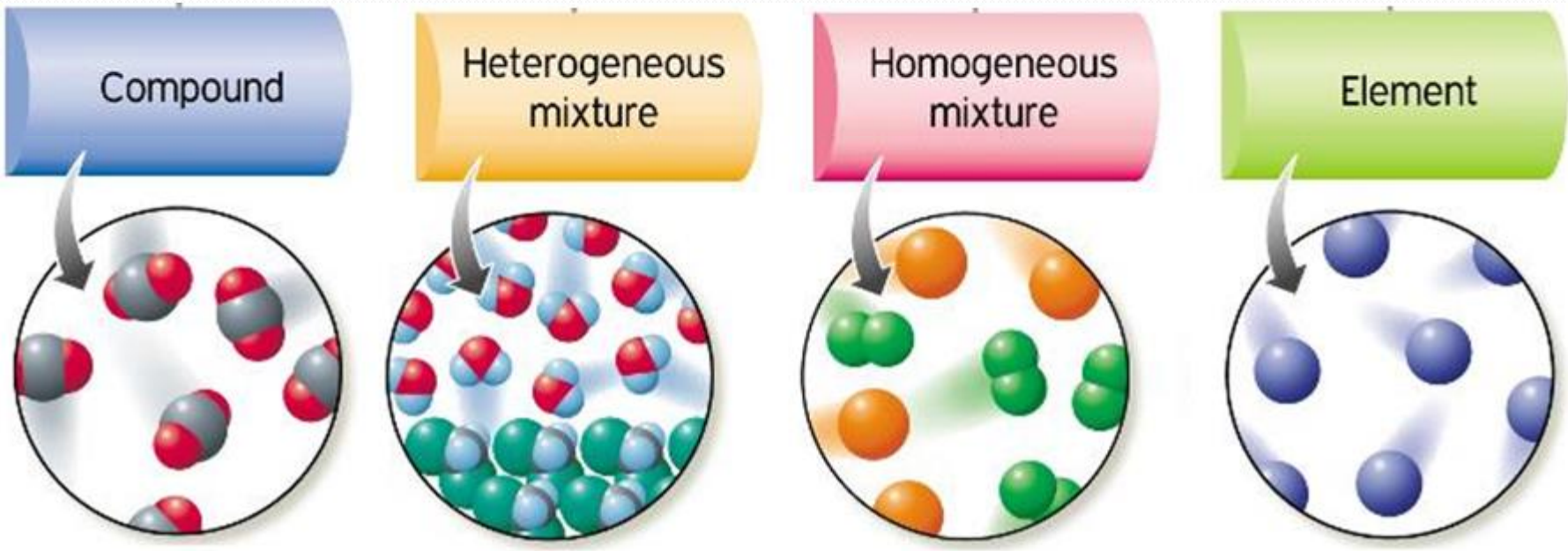


Heterogeneous mixtures





Quiz yourself!



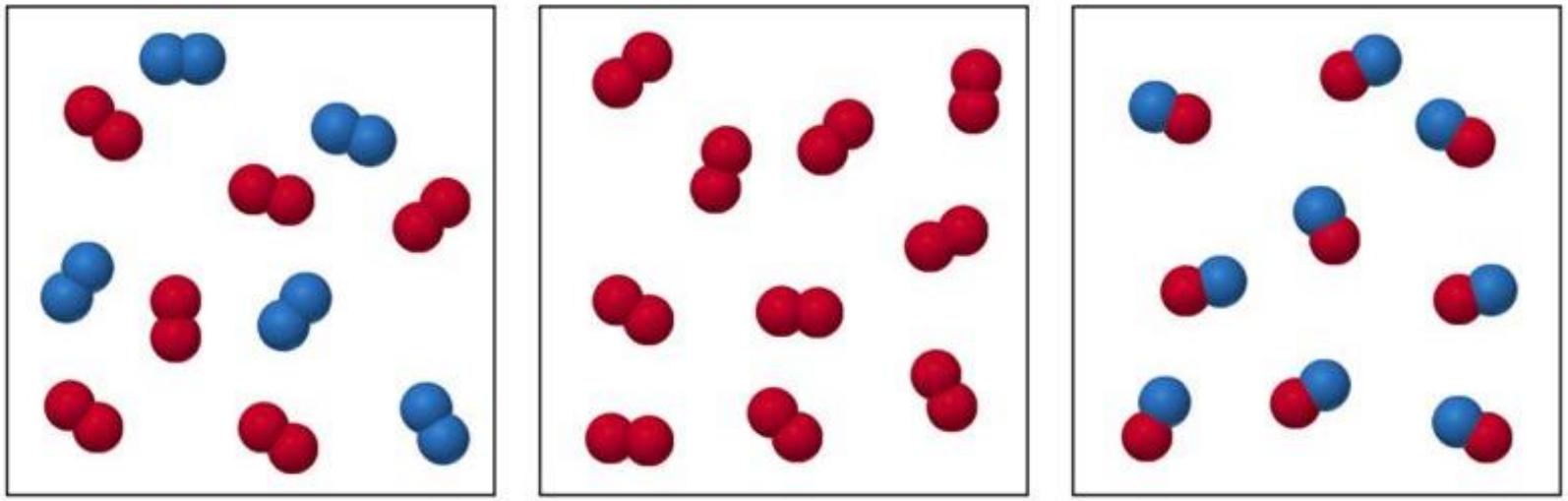
Mixtures

- **Note:** *Elements cannot be stirred together to form a compound. It requires a lot of heat and/or pressure to make a bond.*

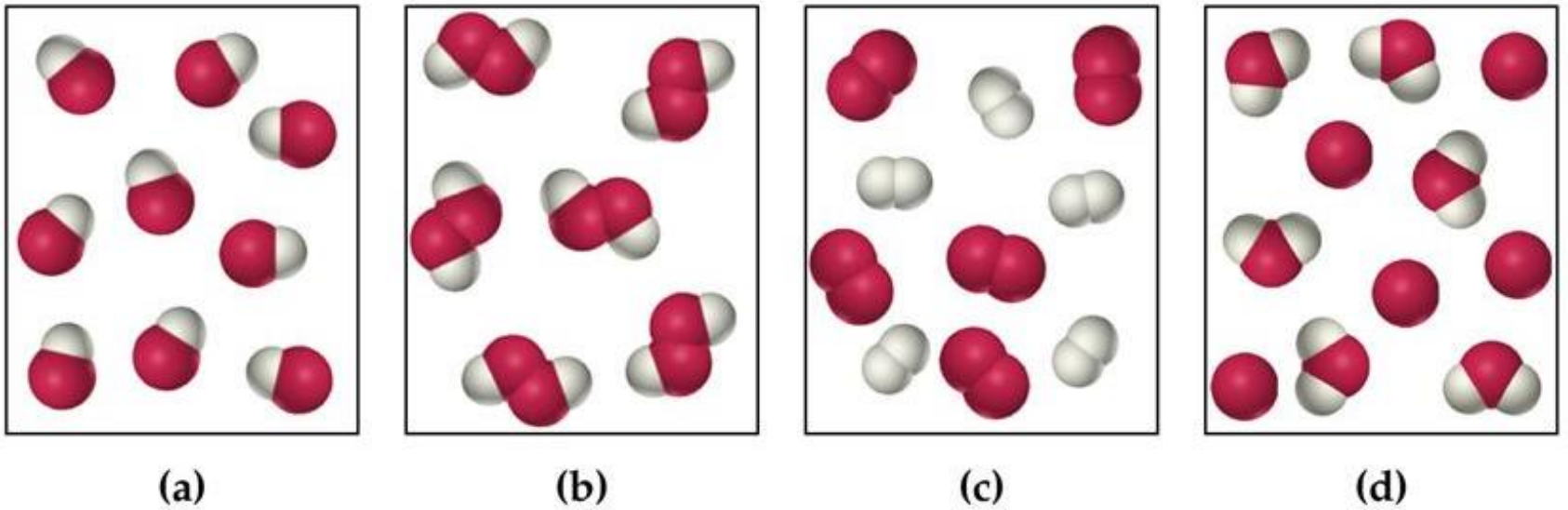
Mixtures

- Reflection:
- If you have a container with hydrogen gas and oxygen gas in it, do you have water?
- Why or why not?

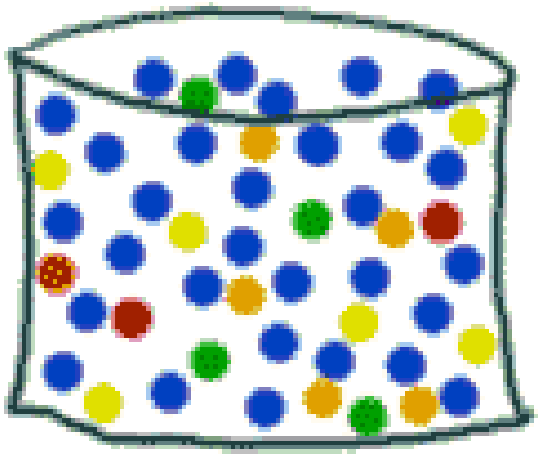
Set 1



Set 2

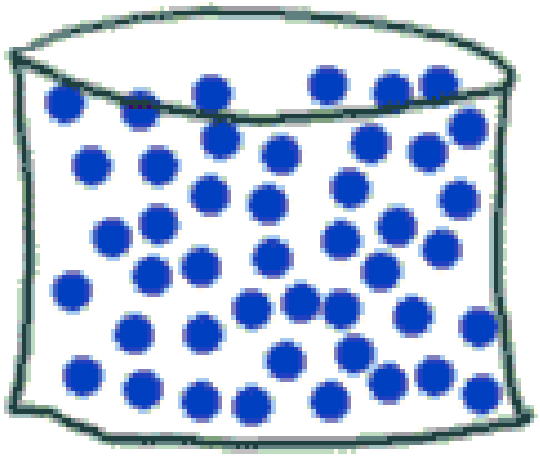


Is water an element, compound, heterogeneous, or homogeneous mixture?



Tap Water

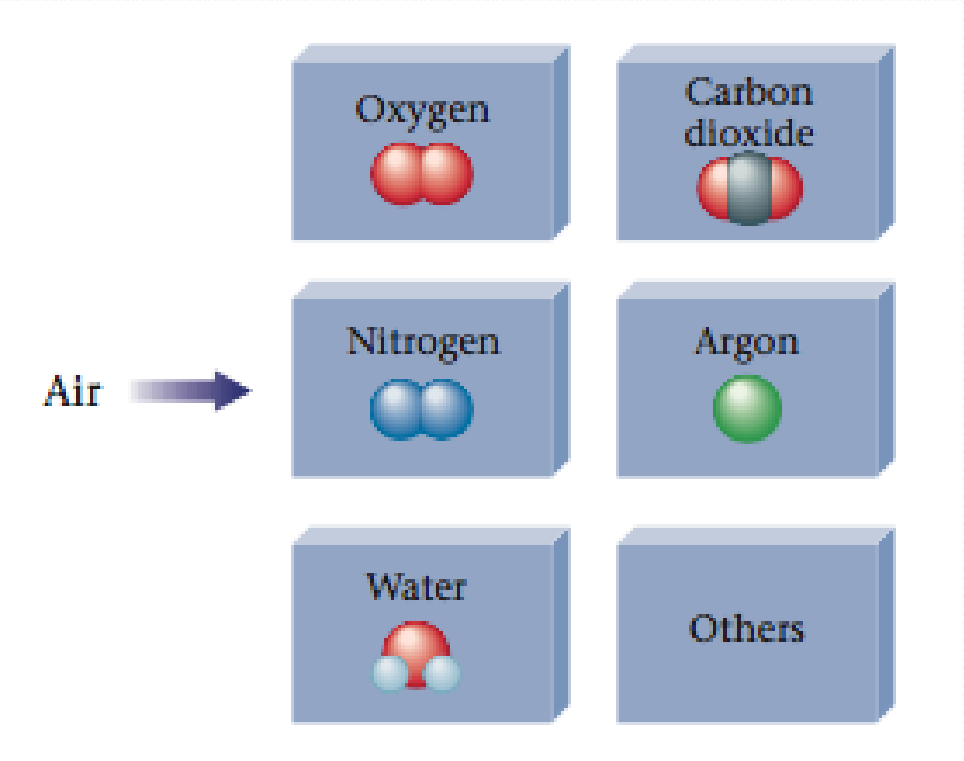
Homogeneous mixture



Distilled

compound (H_2O)

Is "air" an element, compound, heterogeneous, or homogeneous mixture?

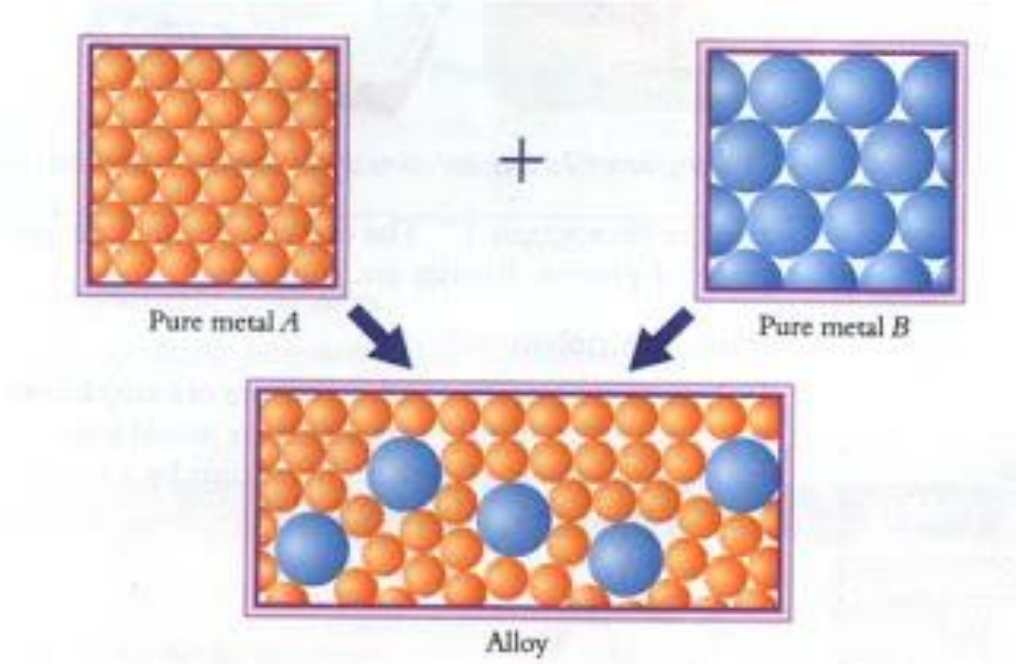


Air is a homogeneous mixture.

Alloy –

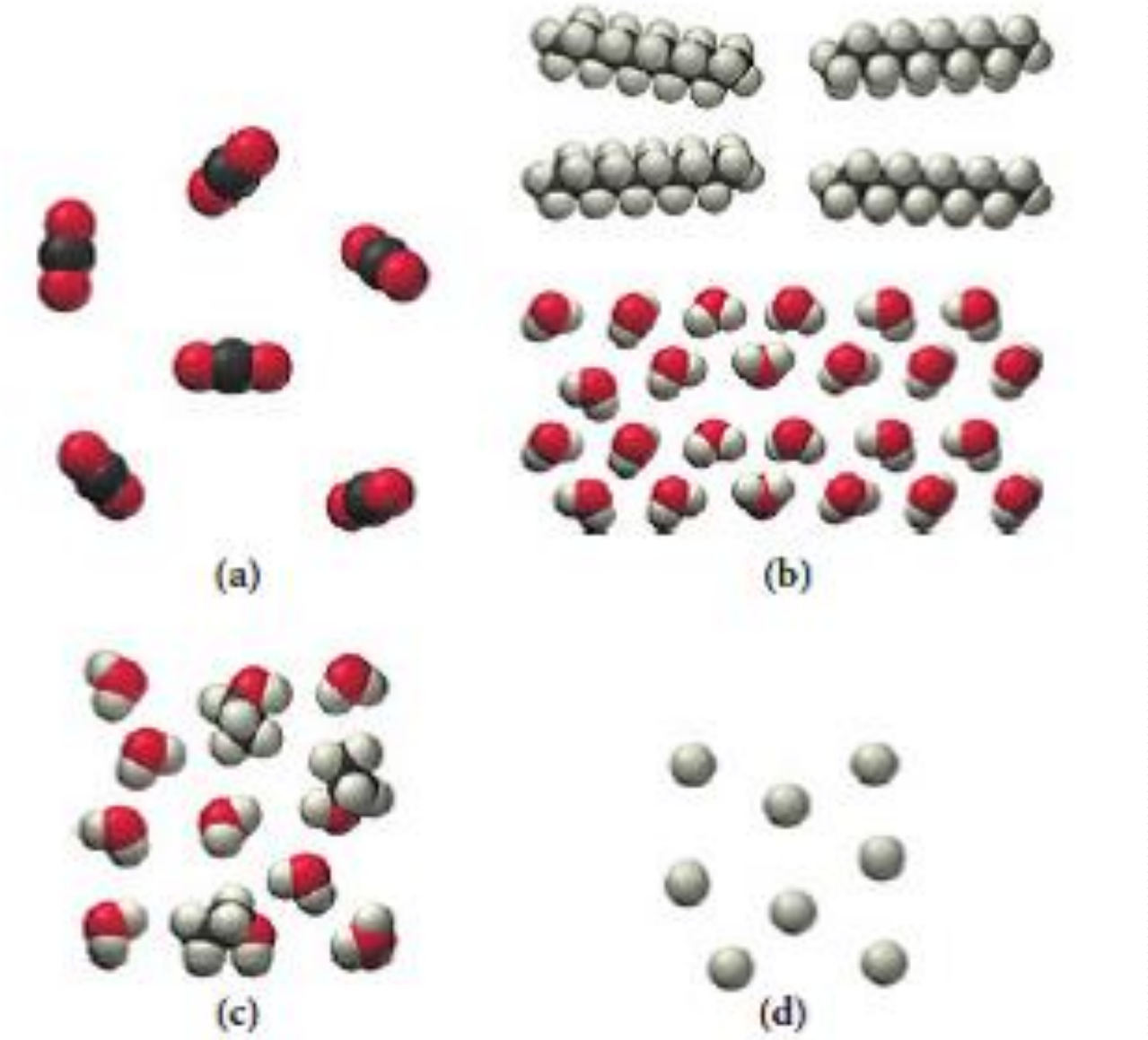
a special type of homogeneous mixture

- two metals melted and blended, then hardened

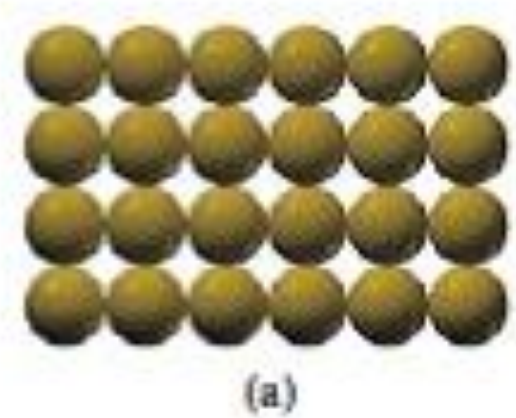


- *Ex. brass, bronze, steel*

Set 3



Set 4



(a)

(b)

(c)

(d)

Physical vs. Chemical

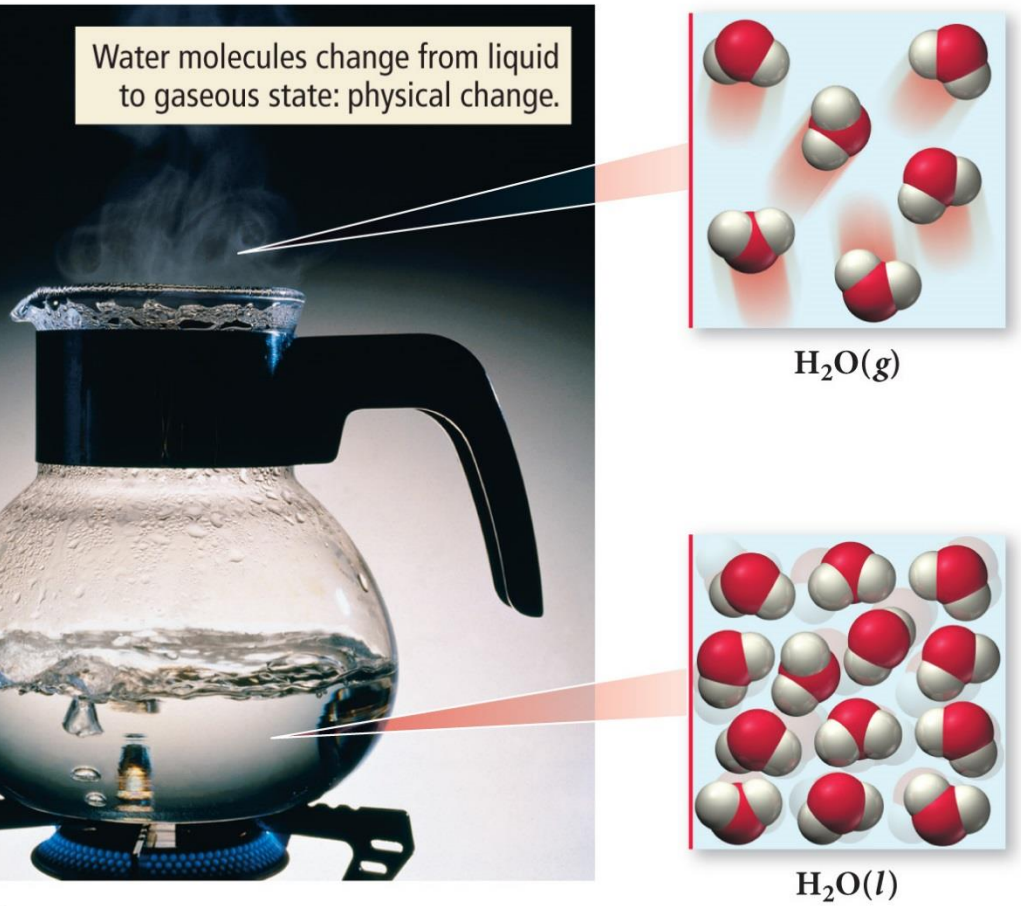
Properties and Changes

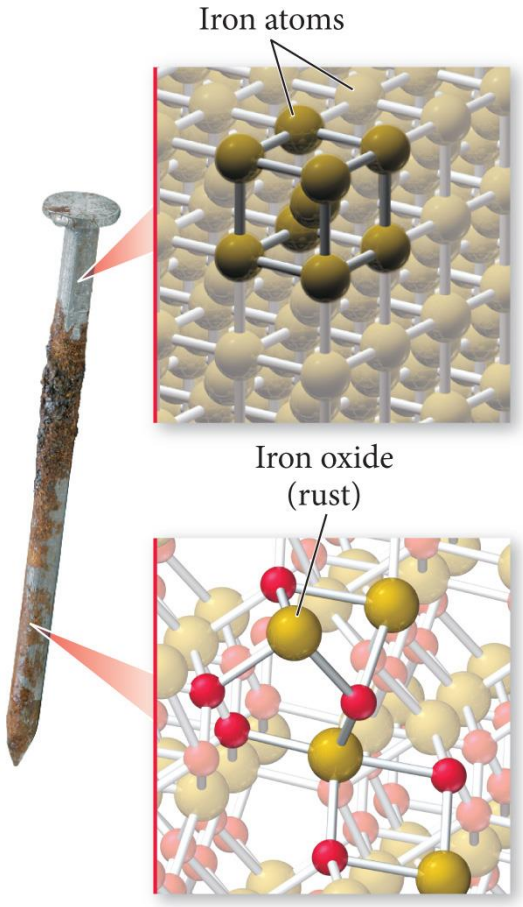
Physical

- can be observed without changing the identity of the substance
- change in form/appearance, but chemical make-up stays the same

Chemical

- cannot be observed unless identity is changed
- chemical make-up is changed, cannot be changed back to original *(generally)*





Physical Properties & Changes

- **melting**
- **boiling**
- **magnetism**
- **conductivity**- ability to conduct electric current
- **malleability**- flattened into thin sheets without cracking
- **ductility**- ability to be pulled into wires w/o breaking
- **phase changes**
- **dissolving**
- **recycling**

Physical Properties

- **Density** = $\frac{\text{mass}}{\text{volume}}$

- Example: metals of the same volume do not have the same mass
  - Aluminum = 2.70 g/mL
  - Iron = 7.87 g/mL

Chemical Properties

- **reactivity** – quickly undergoes changes
- **flammability –** ability to combust
- **inert** – unreactive
- **rust**
- **corrosion**
- **oxidation**
- **combustion**
- **cooking**
- **rotting**

Other Examples:

Cake baked with flour, water, and sugar cannot be separated back into ingredients

Law of Conservation of Mass

- **Law of Conservation of Mass** – matter cannot be created or destroyed
- mass at beginning = mass at end

Practice ID Phys & Chemical

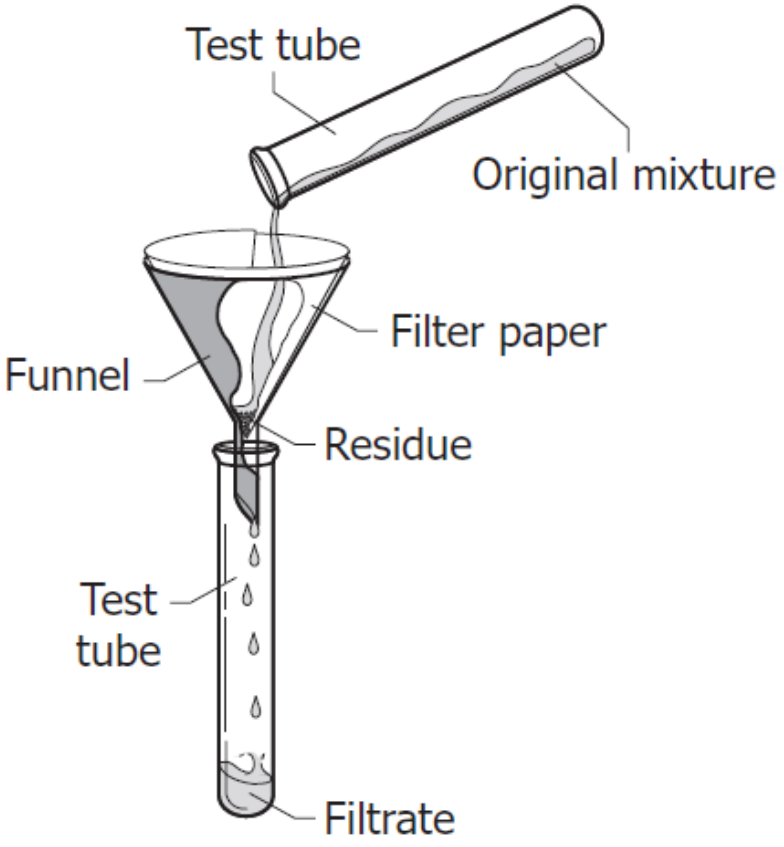
1) Acid rain corroding the statue of liberty
2) Dissolving salt in water
3) Boiling salt water until just salt remains
4) Melting steel
5) A car rusting
6) Cracking ice
7) Food digesting

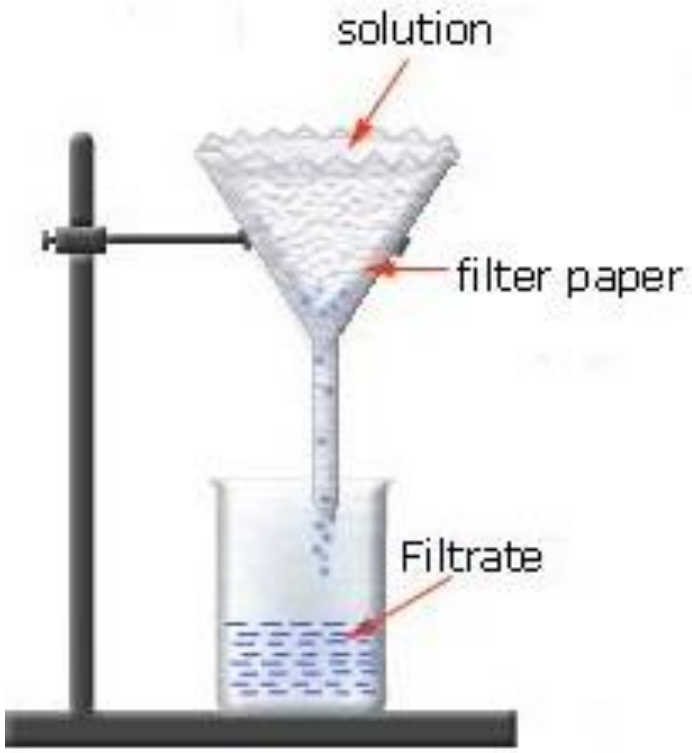
Separation Techniques

Methods to separate the components of a mixture

Separation Techniques

- **<u>filtration</u>** – mixture poured through porous paper



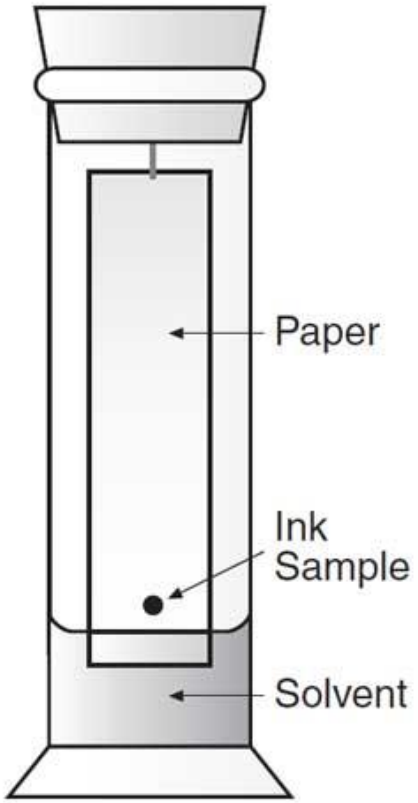


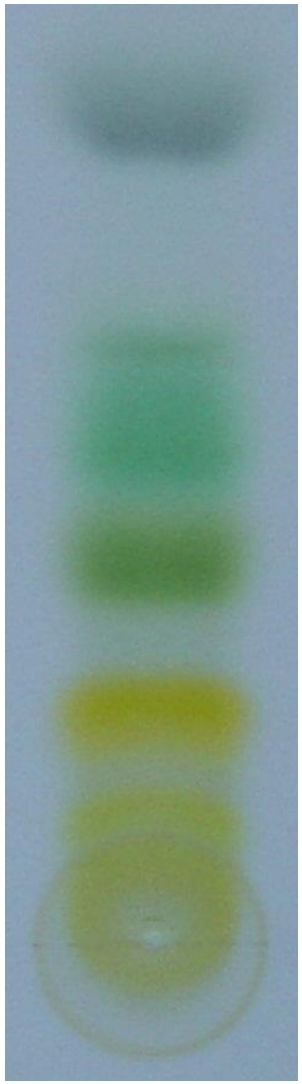
Separation Techniques

- **<u>decanting</u>** – pouring a solution without disturbing solid on bottom

Separation Techniques

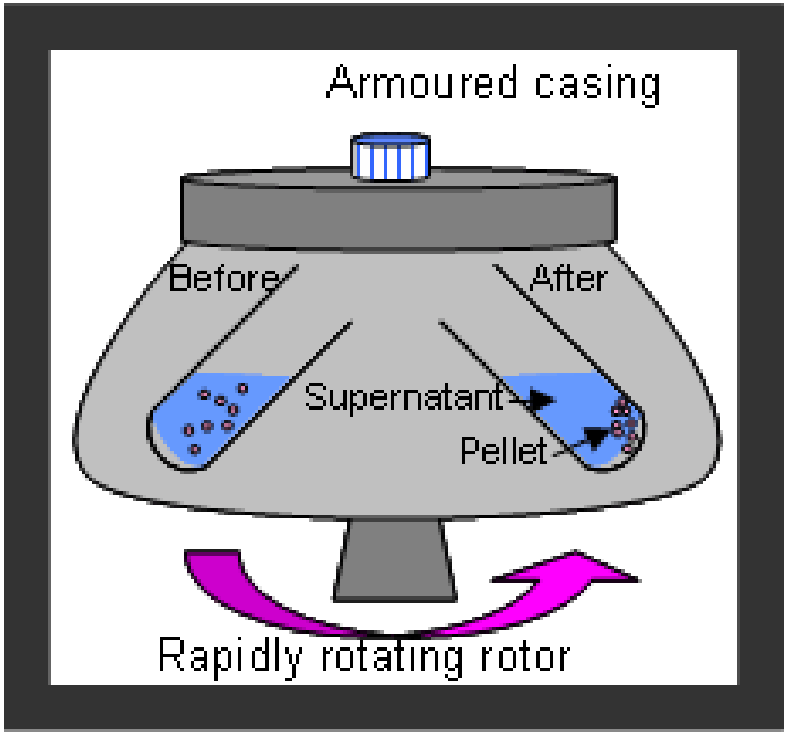
- **<u>chromatography</u>** – components travel across the surface of a paper at different rates

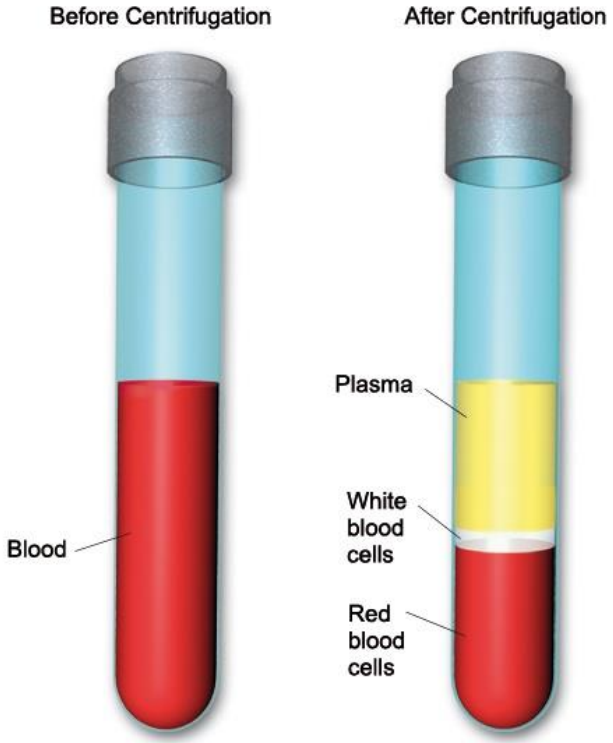




Separation Techniques

- **<u>centrifugation</u>** – machine spins mixture to separate a solid to the bottom of a tube



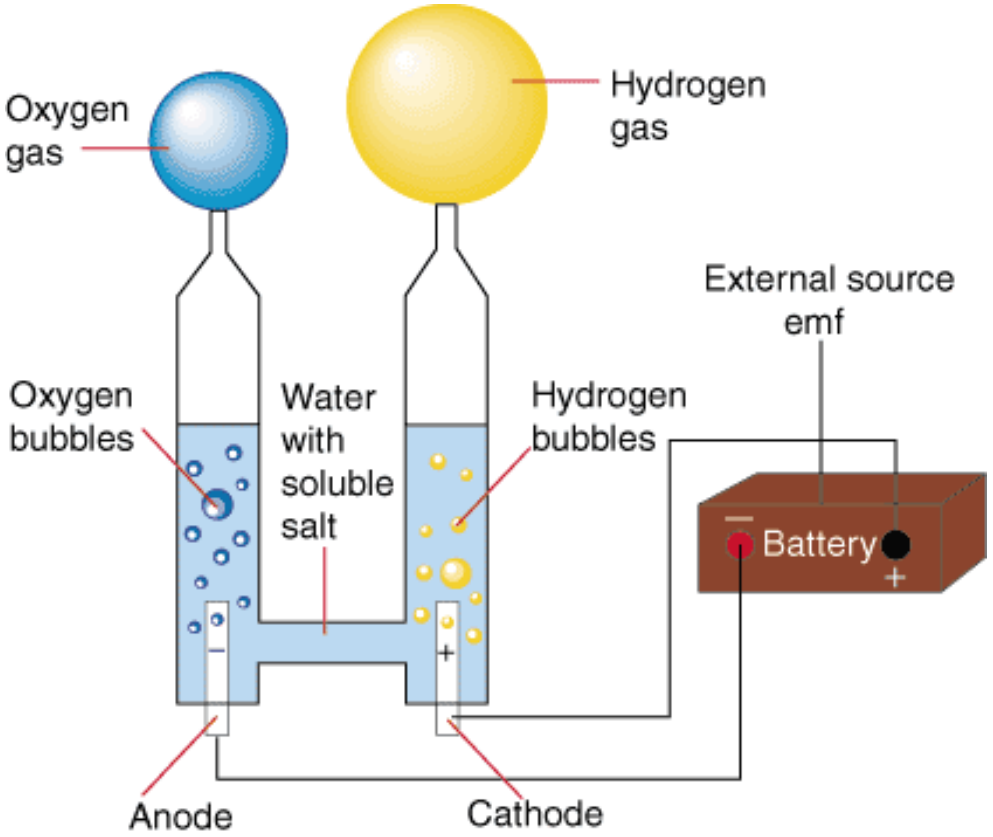


Separation Techniques

- **crystallization** – solid crystals form out of a solution

Separation Techniques

- **<u>electrolysis</u>** – using an electric current to break apart a compound



Separation Techniques

- **<u>distillation</u>** – separating liquids based on differing boiling points and condensing the vapors