Matter

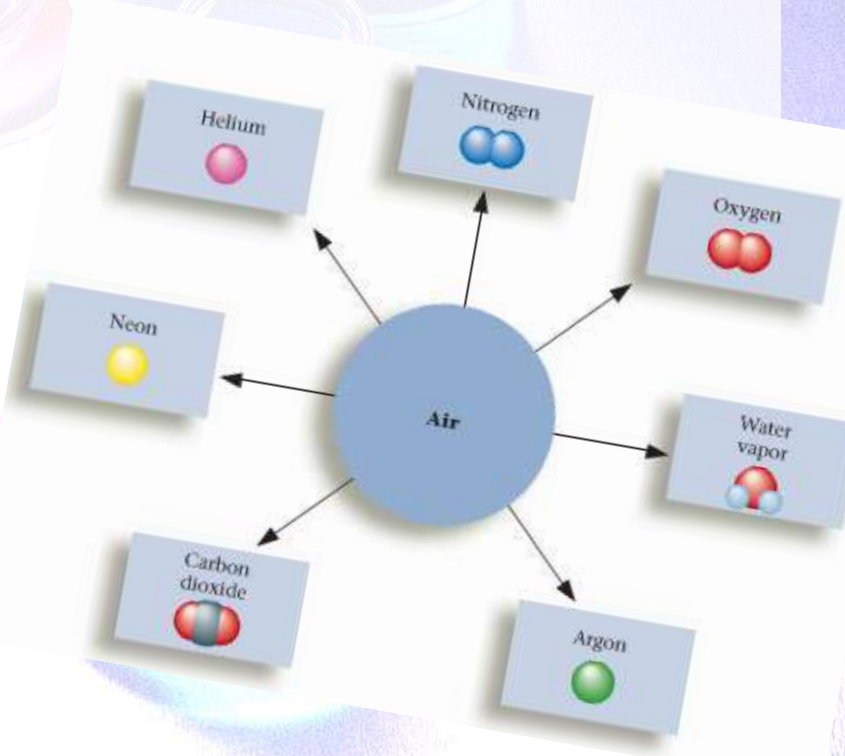
Classifying Matter
Mixtures and Pure Substances

Mixtures and Pure Substances

- Most of the matter around us consists of mixtures of substances.
  - Ex. soil, air, and fountain water.

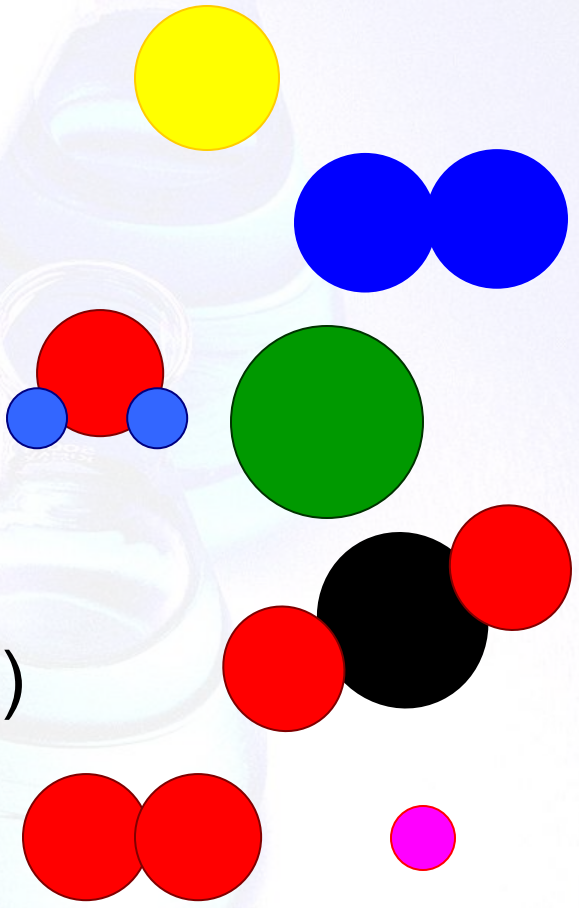
Mixtures

- **Mixture** → a substance with variable composition.



Mixtures and Pure Substances

- Air contains the following:
  - Nitrogen (2 nitrogen atoms)
  - Oxygen (2 oxygen atoms)
  - Water (2 hydrogen and 1 oxygen atom)
  - Argon
  - Carbon dioxide (2 oxygen and 1 carbon atom)
  - Neon
  - Helium



Mixtures and Pure Substances

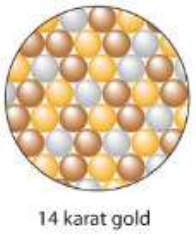
- The composition of compounds in the air (a mixture) depends on where the sample is collected.
  - Air from a desert would have little H_2O.
  - Air from Florida on a humid day would have large amounts of H_2O.
  - In industrial areas, CO_2 and other pollutants would be in large amount in the air.

- The composition of mixtures varies, but the composition of compounds is always the same.

Mixtures and Pure Substances

- **Alloy** → a mixture of elements that has metallic properties.
  - Gold alloys contain varying amounts of gold, silver, and copper atoms.

	Gold	Silver	Copper
14-karat gold	36%	25%	37%
18-karat gold	56%	20%	24%
24-karat gold	100%	0%	0%


14 karat gold


18 karat gold


24 karat gold

Mixtures and Pure Substances

- Compounds always have the same atomic composition!
  - They contain only particles of identical atomic composition.
- A mixture is a collection of compounds and/or elements that are present in varying amounts.
  - The composition depends on how much of each component is used when the mixture is formed.

Mixtures and Pure Substances

Pure Substances

- **Pure substance** → either a pure element or a compound.
- A mixture has variable composition, but a pure substance always has the same composition.
  - Pure water contains just individual H_2O molecules while water found in nature is a mixture of H_2O and other molecules.

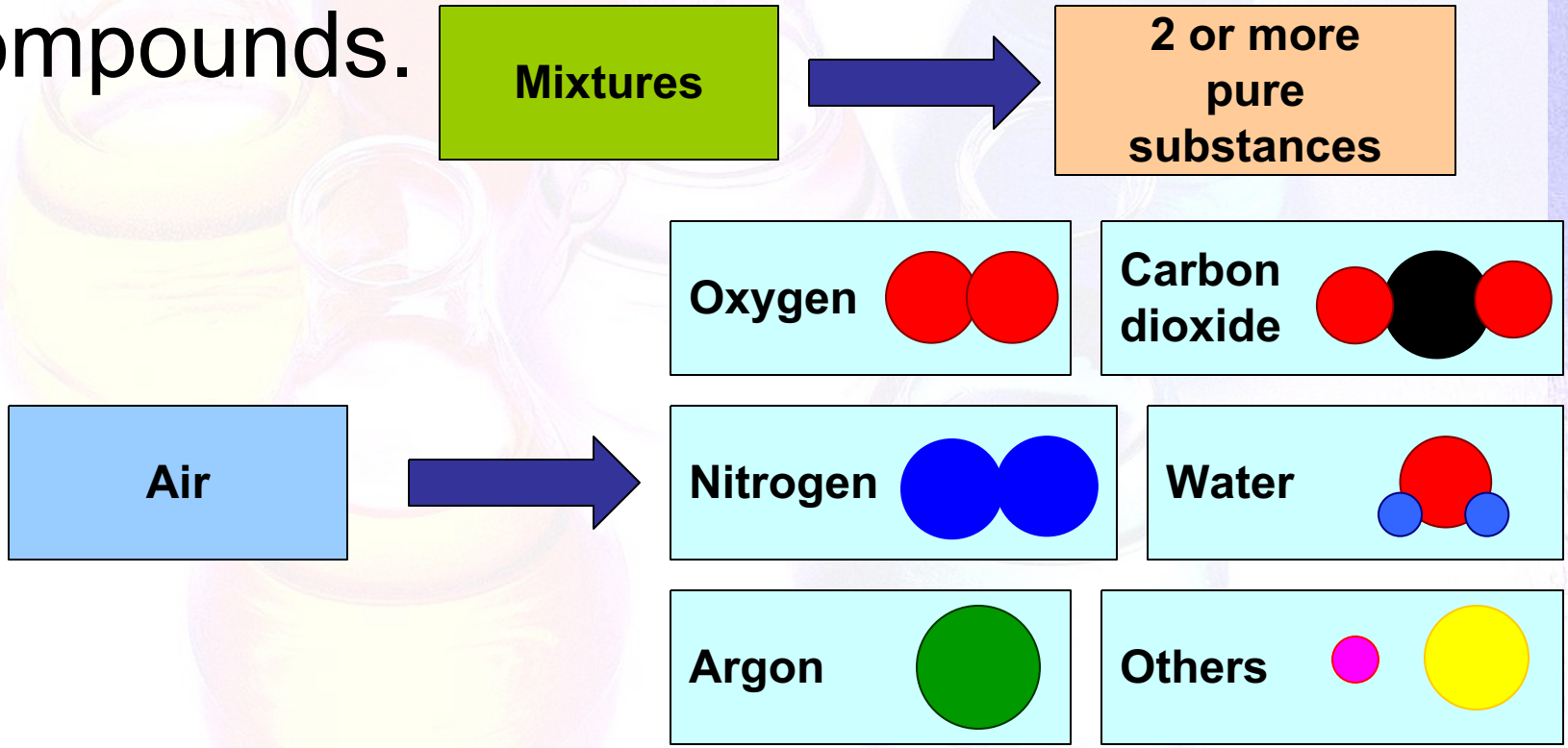
Mixtures and Pure Substances

- Pure water always has the same physical and chemical properties and always consists of molecules containing hydrogen and oxygen in exactly the same proportions (2H:1O), regardless of the original source of the water.

- This makes it possible to identify a pure substance conclusively.

Mixtures and Pure Substances

- Mixtures can be separated into pure substances: elements and/or compounds.



Mixtures and Pure Substances

Homogeneous and Heterogeneous Mixtures

- Mixtures fall into 2 groups: homogeneous or heterogeneous.
  1. **Homogeneous mixture** → mixture that is the same throughout.
     - All regions of the resulting mixture have the same properties.
     - Also called a solution.

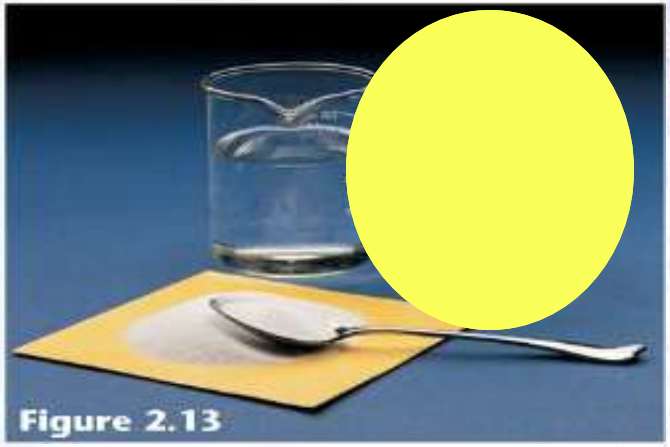


Figure 2.13

Mixtures and Pure Substances

- **Solution** → a homogeneous mixture.
- Different amounts of the components can be mixed to form various solutions, but a homogeneous mixture (a solution) does not vary in composition from one region of the solution to another.
  - Example: brass is a homogeneous mixture of copper and zinc.

Mixtures and Pure Substances

2. **Heterogeneous mixture** → a mixture containing regions with differing properties.
   - Different regions of the resulting mixture have different properties.
   - Do not mix to form a uniform mixture.

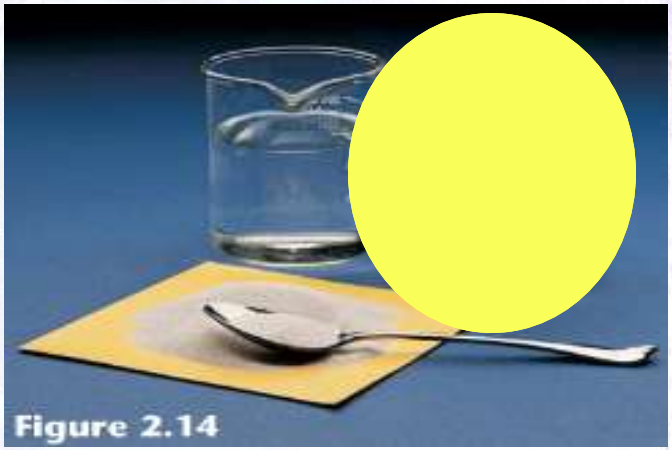


Figure 2.14

Mixtures and Pure Substances

Distinguishing Between Mixtures and Pure Substances

Identify each of the following as a pure substance, a homogeneous mixture, or a heterogeneous mixture

a. Maple syrup.

Homogeneous mixture of sugar and other substances dispersed uniformly in water.

Mixtures and Pure Substances

Distinguishing Between Mixtures and Pure Substances

Identify each of the following as a pure substance, a homogeneous mixture, or a heterogeneous mixture

b. The oxygen and helium in a scuba tank.

Homogeneous mixture

Mixtures and Pure Substances

Distinguishing Between Mixtures and Pure Substances

Identify each of the following as a pure substance, a homogeneous mixture, or a heterogeneous mixture

c. Oil and vinegar salad dressing.

Heterogeneous mixture

Mixtures and Pure Substances

Distinguishing Between Mixtures and Pure Substances

Identify each of the following as a pure substance, a homogeneous mixture, or a heterogeneous mixture

d. Common table salt (sodium chloride)

Pure Substance (compound), so it always has the same composition (Commercial iodized salt has iodine added to it, so it would be a homogeneous mixture)

The End