

Chemistry

Chapter 14

Central Science

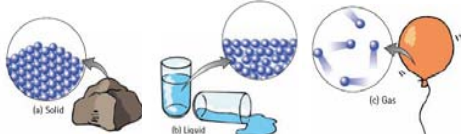
- Study of matter
- Transformations it can make
- Basic research—how things work
- Applied research—making useful things

Submicroscopic world

- Made of atoms
- Link to make molecules

Phases of Matter

- Three normal states at Earth's surface
 - Solid
 - Liquid
 - Gas
- How the molecules hold together



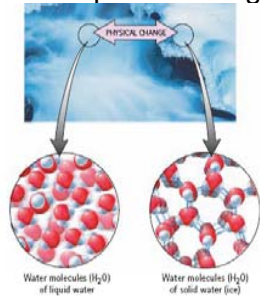
Properties

- What is it like?
- What phase?
- Color
- Reflectance
- Odor
- Density
- Texture ...

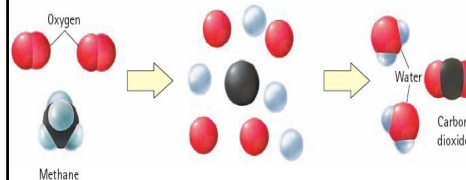
Properties

- Physical changes
 - Usually dependent on conditions
 - New substance NOT created
- Chemical changes
 - A reaction occurs
 - Transforms in to something different that has new properties

Water—phase change



Methane—chemical change



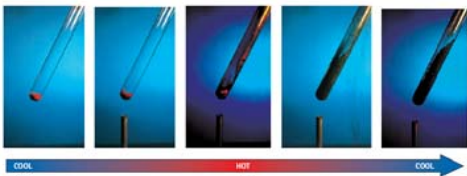
Guidelines to determine which has occurred

- Return to original conditions
 - Do you get the original substance back?
 - Warm it up
 - Cool it down
 - Goes from ice to water
 - Goes from water to ice
- Physical change



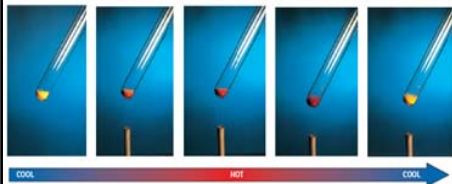
Guidelines to determine which

- Return to original conditions
 - Do you get the original substance back?
 - Warm it up
 - Cool it down
- Ammonium dichromate becomes ammonia, water vapor and chromium oxide



Guidelines to determine which

- Return to original conditions
 - Do you get the original substance back?
 - Warm it up
 - Cool it down
- Potassium Chromate returns to yellow powder



Imagine that you can watch a small collection of molecules that are moving around slowly while vibrating and bumping against each other.

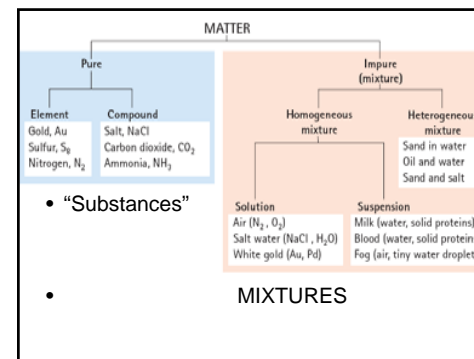
The slower moving molecules then start to line up, but as they do so, their vibrations increase. Soon all the molecules are aligned and vibrating about fixed positions. What is happening?

Elements

- Substances not bonded to other types of atoms
- May be single atoms in elemental formula
 - Au Gold
 - Li Lithium
- May have more than one atom to make molecules of that substance
 - O₂ oxygen
 - N₂ nitrogen
- Or be macromolecules: diamond crystals of C

Compounds

- More than one type of atom in the molecule
- Has a **Chemical Formula**
- Sodium Chloride NaCl
- Ammonia NH₃
- Subscript tells how many of each
- (Subscript 1 is omitted)



Properties of Compounds

- Very different from elements of their composition
- Sodium
 - Shiny soft metal,
 - melts at 97° C
 - Reacts violently with water
- Chlorine
 - Boils at -34° C
 - Toxic gas

Properties of Sodium

- Opaque, soft shiny metal
- Very malleable: can be cut with knife
- Tarnishes rapidly in air
- Melts at about 100°C
- Reacts violently with water, producing lye and hydrogen



<http://en.wikipedia.org/wiki/Sodium>

Properties of Chlorine

- Yellowish gas at room temperature
- Toxic to organisms at low concentrations
- Reacts readily with most other elements
- Characteristic odor



http://www.amazingrust.com/Experiments/show_1a/G2.html

Properties of Sodium Chloride

- Clear, brittle solid at room temperature
- Melts at 800° C
- Not toxic—table salt
- Not reactive with water



<http://sharanixim.tradeindia.com/Exporters/Exporter19695.325973/Sodium-Chloride.html>

Naming compounds first word

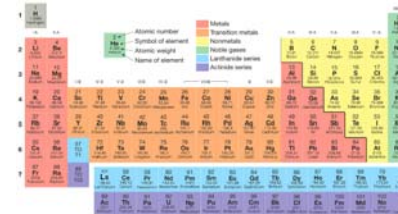
- Start with compound more to the left side of periodic table



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Naming compounds second word

- Add the compound more to the right on the periodic table, change suffix to *-ide*



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Naming compounds NaCl

- Sodium Chloride



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Naming compounds Li₂O

- Lithium Oxide



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Naming compounds CaF₂

- Calcium Fluoride



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Naming different compounds of same elements

- When more than one compound is formed from differing ratios of the same atoms, a prefix is added to distinguish them
 - Carbon Dioxide
 - Carbon Monoxide

Naming Common Compounds

Some have traditional names

- Water
- Ammonia
- Methane
- Propane
- etc.

Naming compounds



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