Introduction to Chemistry

Unit 2
Module 3

Module Concepts

- **Types of change that matter can undergo**

Changes in Matter

- Often, we observe either chemical or physical changes in a substance over time.
- Changes in matter fall into four categories:
  - Physical
  - Chemical
  - Endothermic
  - Exothermic

Physical Changes

- A physical change is a change which affects only certain physical properties of a substance; it does not result in the formation of new substance; it does not alter chemical composition.
- Examples of physical change include:
  - Changes in state
  - Changes in size
  - Changes in shape
  - Changes in texture

Chemical Changes

- A chemical change is a change in a substance which results in the production of one or more new substances; it is a change which alters the chemical composition of a substance.

Chemical Changes – Cont'd

- All chemical reactions are examples of chemical changes.
- Evidence for a chemical change:
  - Color change
  - Formation of a gas
  - Formation of a precipitate (a solid that forms when aqueous solutions are combined)
  - Temperature change

Energy Changes

- All changes, chemical or physical, involve the absorption or release of energy.
- An *endothermic* change occurs when *energy is absorbed* by the system (typically the chemical reaction) from the surroundings
- If the change is chemical, it feels cold to the touch even though you don't put it in an ice bath or refrigerator.

Energy Changes – Cont'd

- A demonstration of an endothermic chemical change. Talk about cool chemistry! ☺
- http://www.youtube.com/watch?v=yTzcoyzPQE0

Energy Changes - Cont'd

- An *exothermic* change occurs when *energy is released* from the system to the surroundings
- If the change is chemical, it will feel hot to the touch even though you didn't heat it over a Bunsen burner flame or hot plate.

Energy Changes – Cont'd

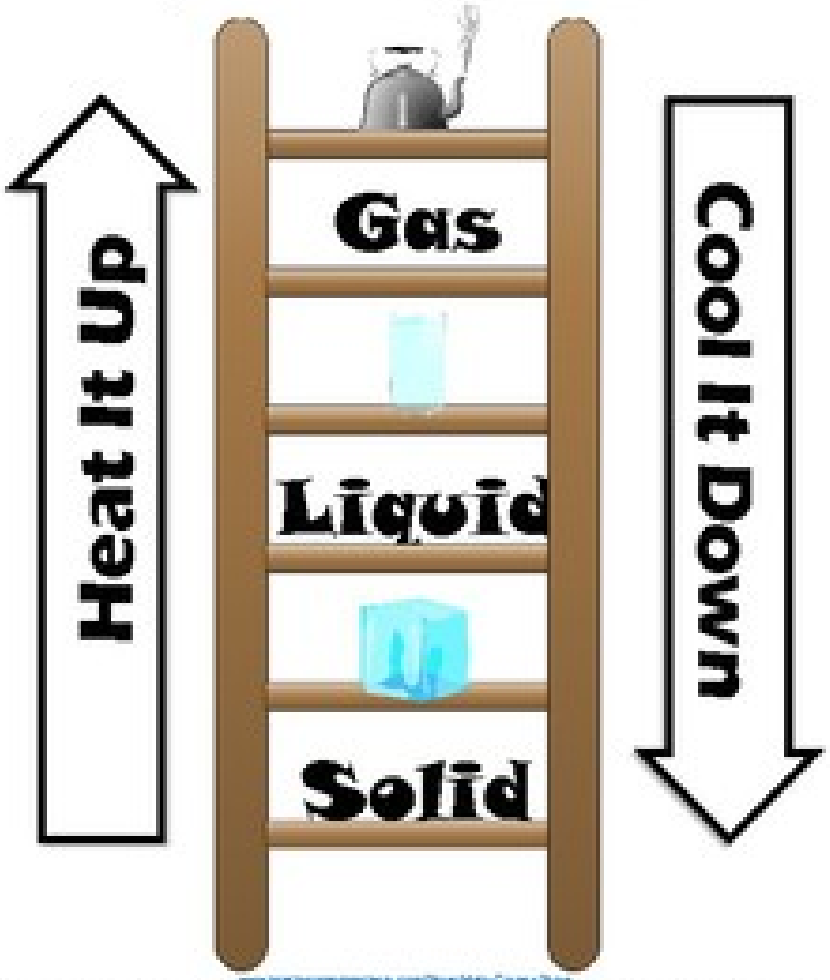
- A demonstration of an exothermic chemical change…let's ignite a spark for learning! ☺
- http://www.youtube.com/watch?v=WrCWLpRc1yM

Energy Changes – Cont'd

- Physical changes can also be described as endothermic or exothermic. Refer to the "State of Matter" ladder shown on the next slide.
- Physical changes in the *upward* direction are *endothermic*.
- Physical changes in the *downward* direction are *exothermic*.

Matter Ladder

The 3 states of matter are solid, liquid and gas. To change matter, such as water, from one state to another, you need to ***heat it up*** or ***cool it down***.



State Changes - FYI

- Endothermic
- S $\rightarrow$ L = Melting
- S $\rightarrow$ G = Sublimation
- L $\rightarrow$ G = Evaporation

- Exothermic
- L $\rightarrow$ S = Freezing
- G $\rightarrow$ S = Deposition
- G $\rightarrow$ L = Condensation