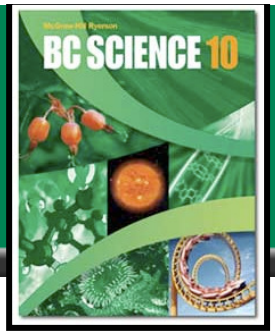
These notes are posted on my site for the following reasons:

- for students to copy in their own hand-writing
  - in order to complete their class notes
  - if student did not have enough time in class
  - if student was away and missed this section
- for assistants and tutors to follow progress of the concepts taught

Photocopied/printed notes can not be used during the Unit Notebook Check in class.

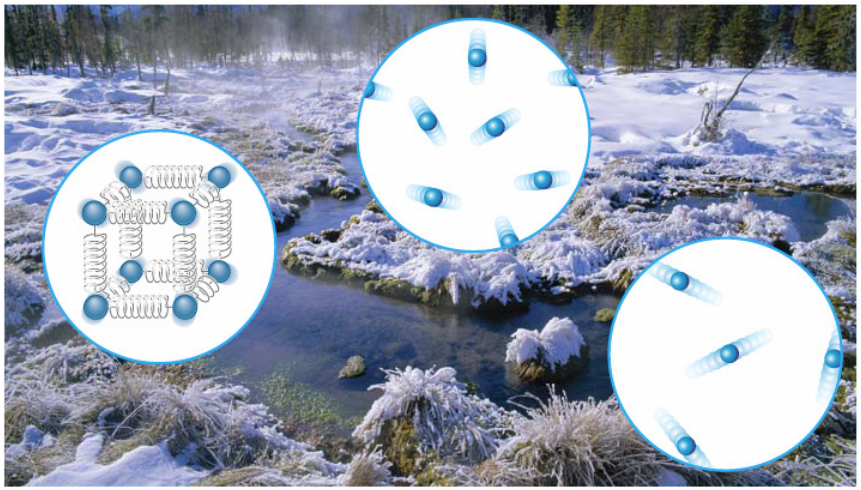
ndupuis@sd61.bc.ca dupuis.shawbiz.ca

10.1 Temperature Thermal Energy, and Heat



- **The kinetic molecular theory explains that all matter is made up of tiny particles.**
  - **These atoms and molecules are constantly in motion.**
  - **Kinetic energy is energy due to motion.**
- **The particles of a substance move differently for different states.**
  - **In solids, particles vibrate slightly, do not change position.**
  - **In liquids, particles vibrate more and move around within a set volume.**
  - **In gases, particles vibrate greatly and move around to take all volume available.**

Solids, liquids and gases behave differently according to the kinetic molecular theory.



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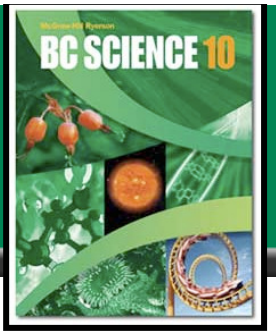
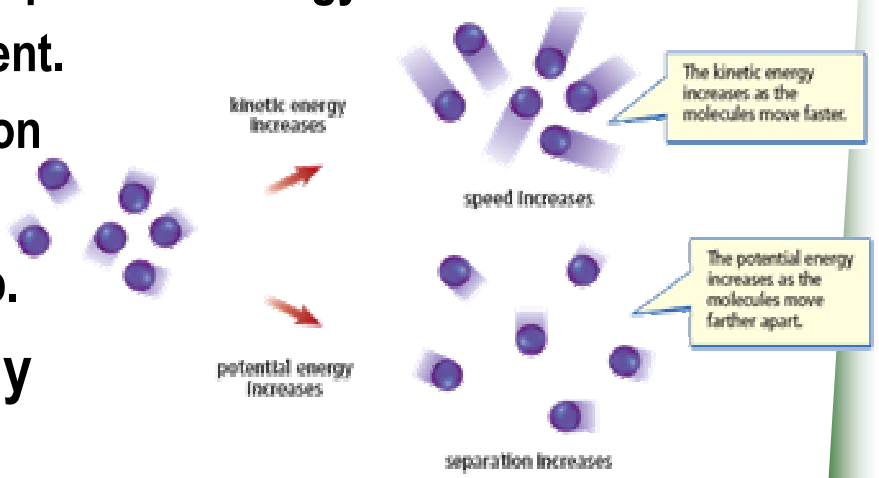
Temperature, Thermal Energy and Heat



- **Temperature** is the average of the kinetic energy of the particles of a substance.
  - The movement of particles is what we measure as temperature.
  - Temperature is measured in degrees Fahrenheit, Celsius and/or Kelvin.
- **Thermal energy** is the total energy of all the particles in a substance.
  - Thermal energy = all kinetic energy + all potential energy
  - Kinetic energy is the energy of movement.
  - Potential energy is the energy of position = how much the particles vibrate, and therefore how much space they take up.
- **Heat** is the transfer of thermal energy
  - Heat flows from higher thermal energy to lower thermal energy



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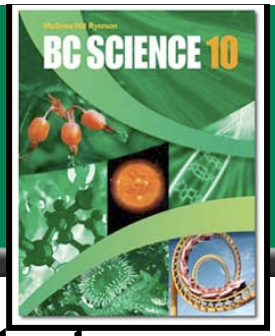
Thermal Energy Transfer



- **Conduction** is the transfer of thermal energy by direct contact.
  - Heat is transferred from high temperature, high kinetic energy particles to lower temperature, lower kinetic particles.
  - For example, a cold spoon warms when placed in a cup of hot coffee.
  - Thermal conductors transfer heat easily, while insulators do not.
- **Convection** is the transfer of heat energy in fluids (liquids and gases)
  - Convection is the movement of heat energy from hot to cold within a fluid, or the movement of hot liquid to an area of cool liquid.
  - Because there is a density difference, warm fluid (low density) moves to cold.
    - This is how convection currents form.
- **Radiation** is the transfer of radiant energy by waves.
  - What we feel as heat is generally called infrared radiation.
  - Earth's interior thermal energy comes from the core, plus some radioactive element decay.

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Take the Section 10.1 Quiz