

## Energy

- What is energy?
  - The ability to cause change
- What is work?
  - The transfer of energy
  - work = force x distance  $w = f \times d$
- Force x Distance describes 'motion'
  - Motion = Kinetic energy

---

---

---

---

---

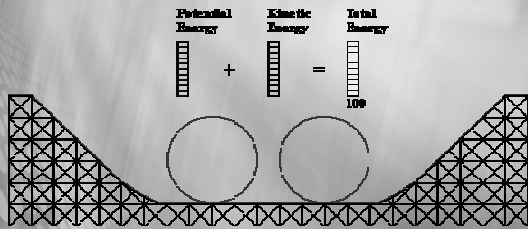
---

---

---

## Conservation of Energy

- Potential Energy and Conservation of Energy



---

---

---

---

---

---

---

---

## Kinetic Theory

- Kinetic Theory states that the atoms/molecules in all forms of matter are in constant motion

---

---

---

---

---

---

---

---

## Temperature

- **Temperature**
  - Is something hot or cold?
  - Relative measure

---

---

---

---

---

---

---

---

## Temperature

- **Temperature**
  - Greater the temperature
  - Greater the motion of its molecules
  - Measure of the average kinetic energy of the molecules of a substance

---

---

---

---

---

---

---

---

## Temperature

- **Thermometer**
  - **Measuring instrument**
    - Utilizes the physical properties of materials to accurately determine temperature
  - **Thermal expansion**
    - Expand with increasing temperature
    - Contract with decreasing temperature

---

---

---

---

---

---

---

---

## Temperature

- **Temperature scales**
  - Reference points
  - Ice points
    - Freezing point of water
  - Steam point
    - Boiling point of water

---

---

---

---

---

---

---

---

## Temperature

- **Temperature scales**
  - Kelvin
    - Absolute temperature scale
    - Zero temperature is the absolute lower limit
    - Absolute zero

$$T_K = T_C + 273 \quad (\text{Celsius } T_C \text{ to Kelvin } T_K) \quad 5.1$$

---

---

---

---

---

---

---

---

## Temperature

- **Temperatures that relate to kinetic energy are given in the Kelvin scale and is written as K**
- **The Kelvin temperature is directly related to the average kinetic energy of the molecules. As the temperature changes, so does the average Kinetic energy.**
- **Note that Kelvin is an S.I. unit for temperature and does not use the degree symbol °**

---

---

---

---

---

---

---

---

## Heat

- Heat

- Flows from higher to lower temperature
- Energy in transit because of a temperature difference
- When heat is added to a body, internal energy increases

---

---

---

---

---

---

---

---

## Heat

- Heat

- SI unit Joule (J)
- Common unit calorie (cal)
  - Heat necessary to raise one gram of pure water by one Celsius degree

$$1 \text{ cal} = 4.186 \text{ J } (\approx 4.2 \text{ J})$$

---

---

---

---

---

---

---

---

## Heat

- Kilocalorie

- Food calorie (Cal) is equal to one kilocalorie

$$1 \text{ food Calorie} = 1000 \text{ calories (1 kcal)}$$

$$1 \text{ food Calorie} = 4186 \text{ joules } (\approx 4.2 \text{ kJ})$$

---

---

---

---

---

---

---

---

### Assumptions of Kinetic Theory and Gases

- Molecules are far apart
- They are in constant motion
- Collisions are perfectly elastic

---

---

---

---

---

---

---

---

### Gas Pressure

- What is atmospheric pressure?
  - The collision of air molecules in the atmosphere
- A barometer is used to measure atmospheric pressure
  - SI unit is called a Pascal (Pa) and is usually displayed in kiloPascals (kPa)
  - At sea level the atmospheric pressure is 101.3 kPa

---

---

---

---

---

---

---

---

### Expressions of Pressure

- kPa – kiloPascal
  - S.I. Unit
  - 1 Newton (unit of force) per square meter
- mm Hg – millimeters of Mercury
  - Height of mercury column in a barometer
- atm – atmosphere
  - Pressure required to support 760 mm Hg

---

---

---

---

---

---

---

---

## Pressure Conversions

- $1 \text{ atm} = 760 \text{ mm Hg} = 101.3 \text{ kPa}$
- Convert 2.0 atm to kPa
- Convert 2.0 kPa to mmHg
- Convert 2.0 mm Hg to kPa

---

---

---

---

---

---

---

---