Warm-up

- The United States Bullion Depository at Fort Knox, Kentucky, contains almost half a million standard mint gold bars, each with a mass of 12.4414 kg. Assuming an initial bar temperature of 5.0 Degrees Celsius , each bar will melt if it absorbs 2.50 MJ of energy transferred by heat. If the specific heat capacity of gold is 129 J/kg •Degree Celsius and the melting point of gold is 1063 Degrees Celsius , calculate the heat of fusion of gold.

Physics D—Chapter 13

Transfer of Heat

Energy Transfer as Heat

- Conduction
  - Particle collisions
  - Objects must be in contact
- Convection
  - Displacement of cold matter by hot matter
  - Matter is actually transferred
  - Forced vs natural
- Radiation
  - Energy is transferred by electromagnetic waves
  - Matter is not required

Calculation of Heat Transfer by Conduction

- Heat conduction depends of 5 factors
  - Proportional to time, area of conducting surface and temperature difference
  - Inversely proportional to length
  - Dependant on material—Thermal Conductivity-p. 386

$$Q = \frac{(kAT)t}{L}$$

Calculation of Heat Transfer by Radiation

- Radiation of heat energy is dependant on
  - Time
  - Temperature
  - Surface Area
  - Emissivity of the surface

$$Q = e\sigma T^4 At$$

- Stefan-Boltzmann constant = 5.67×10⁻⁸ J/(s•m²•K⁴)