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PROCESS SCIENCE ASSIGNMENT 2.

1. Q = UAΔTm where ΔTm is the logarithmic mean temperature difference. For the initial conditions: Q1 (m₁ x 4.18)  
    (320 – 280)  
    = U₁A₁[ (360 – 280)  
    - (360 – 320)  
   ]/ [ln (360 – 280)  
   / (360 – 320)  
   ] or: 167.2m₁ = U₁A₁ (80 – 40)  
   / ln 80/40 = 57.7U₁A₁ and: (m₁/U₁A₁)  
    = 0.345 In the second case, m₂ =m₁, U₂ = U₁, and A₂ = 5A₁. ∴ Q₂ = (m₁ x 4.18)  
    (T – 280)  
    = 5U₁A₁[ (360 – 280)  
    -( 360 – T)  
   ]/ ln (360 – 280)  
   / (360 – T)  
    or: 4.18 (m₁/U₁A₁)  
    (T – 280)  
   /5 = 80 - 360 + T  
   /[ln[80/360 – T)  
   ] Substituting for (m₁/U₁A₁)  
   , 0.289 (T – 280)  
    = (T -280)  
   /[ln 80/ 360 – T)  
   ] or: ln[80/ 360 – T)  
   ] = 3.467 and T = 357.5K.
2. **Fourier's law** The **law** of heat conduction, also known as **Fourier's law**, states that the rate of heat transfer through a material is proportional to the negative gradient in the temperature and to the area, at right angles to that gradient, through which the heat flows.
3. **Conduction**
4. Conduction transfers heat via direct molecular collision. An area of greater kinetic energy will transfer thermal energy to an area with lower kinetic energy. Higher-speed particles will collide with slower speed particles. The slower-speed particles will increase in kinetic energy as a result. Conduction is the most common form of heat transfer and occurs via physical contact. Examples would be to place your hand against a window or place metal into an open flame.
5. **Convection**
6. When a fluid, such as air or a liquid, is heated and then travels away from the source, it carries the thermal energy along. This type of heat transfer is called convection. The fluid above a hot surface expands, becomes less dense, and rises
7. **Radiation**
8. Thermal radiation generates from the emission of electromagnetic waves. These waves carry the energy away from the emitting object. Radiation occurs through a vacuum or any transparent medium (either solid or fluid). Thermal radiation is the direct result of random movements of atoms and molecules in matter. Movement of the charged protons and electrons results in the emission of electromagnetic radiation.