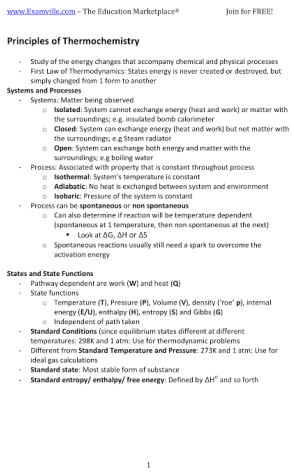

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Principles of Thermochemistry

- Study of the energy changes that accompany chemical and physical processes
- First Law of Thermodynamics: States energy is never created or destroyed, but simply changed from 1 form to another

Systems and Processes

- Systems: Matter being observed
  - **Isolated**: System cannot exchange energy (heat and work) or matter with the surroundings; e.g. insulated bomb calorimeter
  - **Closed**: System can exchange energy (heat and work) but not matter with the surroundings; e.g Steam radiator
  - **Open**: System can exchange both energy and matter with the surroundings; e.g boiling water
- Process: Associated with property that is constant throughout process
  - **Isothermal**: System's temperature is constant
  - **Adiabatic**: No heat is exchanged between system and environment
  - **Isobaric**: Pressure of the system is constant
- Process can be **spontaneous** or **non spontaneous**
  - Can also determine if reaction will be temperature dependent (spontaneous at 1 temperature, then non spontaneous at the next)
    - Look at ΔG, ΔH or ΔS
  - Spontaneous reactions usually still need a spark to overcome the activation energy

States and State Functions

- Pathway dependent are work (**W**) and heat (**Q**)
- State functions
  - Temperature (**T**), Pressure (**P**), Volume (**V**), density ('roe' **ρ**), internal energy (**E/U**), enthalpy (**H**), entropy (**S**) and Gibbs (**G**)
  - Independent of path taken
- **Standard Conditions** (since equilibrium states different at different temperatures: 298K and 1 atm: Use for thermodynamic problems
- Different from **Standard Temperature and Pressure**: 273K and 1 atm: Use for ideal gas calculations
- **Standard state**: Most stable form of substance
- **Standard entropy/ enthalpy/ free energy**: Defined by ΔH° and so forth

1

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