Chemistry AP Unit 4 Outline: Thermochemistry

Chapter 6: Thermochemistry

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Energy, Radiant Energy, Thermal Energy, Chemical Potential Energy, Potential Energy, Thermochemistry, Open System, Closed System, Isolated System, Law of Conservation of Energy (First Law of Thermodynamics), Heat (q), Work (w), Reaction Pathway, State Function (Property), Systems versus Surroundings, Exothermic versus Endothermic, Internal Energy (E), $\Delta E = q + w$, $w = -P\Delta V$, Enthalpy ($H = E + PV$ and $H = n\Delta H_{rxn}$), Energy Diagram and Change in Enthalpy ($\Delta H < 0$ Exothermic, $\Delta H > 0$ Endothermic)	6.1: The Nature of Energy and Types of Energy (pg. 224) 6.2: Energy Changes in Chemical Reactions (pg. 225 to 256) 6.3: Introduction to Thermodynamics (pg. 227 to 232) 6.4: Enthalpy of Chemical Reactions (pg. 232 to 239)		pg. 255 #2, 3, 7 to 11, 13 to 20 pg 255–256 #21, 24 to 28	
2	Heating Curve, Potential Energy (Phase Changes, $q = n\Delta H_{fus}$, $q = n\Delta H_{vap}$ and $q = n\Delta H_{sub}$ where $\Delta H_{sub} = \Delta H_{fus} + \Delta H_{vap}$), Kinetic Energy (Temperature Change, Specific Heat, $q = mc\Delta T$, Heat Capacity $q = C\Delta T$), Molar Enthalpy of Combustion (ΔH_{comb}), Physical and Chemical Calorimetry (Heat Gained = Heat Lost) using Constant-Volume Calorimter (Bomb Calorimeter) or Constant-Pressure Calorimeter (Styrofoam Calorimeter), Molar Heat of Formation (ΔH_f), Theoretical Molar Enthalpy of Reaction ($\Delta H_{rxn} = \Sigma H_{products} - \Sigma H_{reactants}$), Hess's Law (Adding ΔH), Molar Enthalpy of Solution (ΔH_{sol}), Lattice Energy ($U_{lattice}$), Heat of Hydration (ΔH_{hyd}) Fossil Fuels (Natural Gas, Petroleum, and Coal), Complete and Incomplete Combustions, Fractional Distillation, Cracking and Reforming, Greenhouse Effect (Global Warming), Deforestation, Hydrogen as Fuel, Other Energy Alternatives	11.8 Phase Changes (pg. 480 to 488) 6.5: Calorimetry (pg. 239 to 245) 6.6: Standard Enthalpy of Formation and Reaction (pg. 246 to 251) 6.7: Heat of Solution and Dilution (pg. 252 to 254) 6.8: Present Sources of Energy and New Energy Sources (extra notes)		pg. 496–499 #62, 63, 67, 75. 77, 78, 80, 83, 84, 129, 135, 137, 140 pg. 256 #29 to 38 pg. 257–259 #39 to 42, 45 to 49, 51, 52, 54 to 56, 58, 60 to 64, 73, 74, 76, 77, 80, 81 pg. 258 #66 to 68, 70	
	Chapter 6 Take-Home Quiz (Assign January 11, Tuesday)	***Chapter 6 HW Due: January 19, Wed***		***Ch 6 T-H Quiz Due: Jan 13, Thurs***	

Chapter 18: Spontaneity, Entropy, and Free Energy

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Spontaneous Process, Entropy (S), Positional Probability, Change in Entropy ($\Delta S = S_{final} - S_{initial}$)	18.2: Spontaneous Process (pg. 784 to 785) 18.3: Entropy (pg. 785 to 790)		pg. 810 #1 to 6	
2	Second Law of Thermodynamics ($\Delta S_{univ} = \Delta S_{sys} + \Delta S_{surr}$), Spontaneous ($\Delta S_{univ} > 0$), Non-Spontaneous ($\Delta S_{univ} < 0$), Entropy of the Surrounding $\left(\Delta S_{surr} = \frac{-\Delta H}{T}\right)$, Third Law of Thermodynamics, Free Energy (G), Change in Entropy in Chemical Reactions ($\Delta S_{rxn} = \Sigma S_{products} - \Sigma S_{reactants}$), Qualitative Analysis of ΔS_{rxn} base on State, Moles and Complexities	18.4: Second Law of Thermodynamics (pg. 790 to 795)		pg. 810 #7 to 14	
3	Gibbs Free Energy (G), Change in Free Energy ($\Delta G = \Delta H - T\Delta S$), Cases for Spontaneity, Free Energy of a Chemical Reaction ($\Delta G_{rxn} = \Sigma G_{products} - \Sigma G_{reactants}$), Free Energy at Equilibrium ($\Delta G = 0$), Standard Free Energy of Formation ($\Delta G°_f$)	18.5: Gibbs Free Energy (pg. 796 to 803)		pg. 811–813 #17 to 20, 42, 44, 51, 52, 54, 56 to 61	
4	**Lab #5: Thermochemistry Design of Hand Warmer (Jan 21, Fri)**			***Lab #5 Due: Feb 3, Thurs***	
5	**Unit 4 Test (February 1, Tuesday)**	***Chapter 18 HW Due: February 1, Tuesday***			