Chemistry AP Unit 3 Outline: States of Matter

Chapter 5: Gases

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Properties of Gases, Pressure (kPa, atm, mmHg and torr), Barometer, Manometer, Standard Atmospheric Pressure, Variables of a Gas (*V*, *P*, *T*, *n*), Boyle's Law (*P* & *V*), Temperature (K), Charles's Law (*T* & *V*), Gay-Lussac's Law (*P* & *T*), Avogadro's Law (*V* & *n*)	5.1 Substances That Exist as Gases (pg. 170 − 171) 5.2 Pressure of a Gas (pg. 171 − 175) 5.3 The Gas Law (pg. 175 – 181)		pg. 209-210 #2 to 7, 9, 11, 13 and 14 pg. 210-211 #15 to 26	
2	Ideal Gas, Ideal Gas Law (*PV* = *nRT*), Ideal Gas Constant [*R* = 8.31 (L • kPa)/(K • mol) = 0.0821 (L • atm)/(K • mol)], STP and SATP, Combined Gas Law $\left(\frac{P_1V_1}{n_1T_1}=\frac{P_2V_2}{n_2T_2}\right)$, Density and Molar Mass Calculations from Ideal Gas Law, Gas Stoichiometry	5.3 The Ideal Gas Equation (pg. 181 – 189) 5.4 Gas Stoichiometry (pg. 190 − 192)		pg. 211 #28 to 50 (do even; optional odd for extra practices), pg. 214 #94 pg. 211−212 #51 to 60 (do even; optional odd for extra practices), pg. 213-215 #93, 95, 104, 108, 110	
3	Dalton's Law of Partial Pressure, Mole Fraction (χ), Collection of Gas over Water, Vapour Pressure, Kinetic Molecular Theory of Gases, Temperature and Average Kinetic Energy (E_k per mol = 3/2 *RT*) and (E_k per particle = ½ $m\bar{u}^2$), Boltzman's Constant ($k = 1.38 \times 10^{-23}$ J/K), Root Mean Square Velocity $\left(u_{rms}=\sqrt{\frac{3RT}{M}}=\sqrt{\frac{3kT}{m}}\right)$, Graham's Law of Effusion $\left(\frac{r_1}{r_2}=\sqrt{\frac{M_2}{M_1}}\right)$, Diffusion, Departure from Ideal Gas Law, Real Gases, van der Waals Equation $\left[\left(P+\frac{n^2a}{V^2}\right)(V-nb)=nRT\right]$	5.5 Dalton's Law of Partial Pressures (pg. 192 – 196) 5.6 The Kinetic Molecular Theory of Gas (pg. 197 − 206) 5.7 Deviation from Ideal Behavior (pg. 206 − 208)		pg. 212 #61 to 70; pg. 214-215 #106, 107 and 111 pg. 213 #71, 72, 75, 76 to 82 (even), 83, 84, pg. 216 #123 pg. 213 #86 to 90	
4	**Lab #6: Ideal Gas Law** **(November 18, Wednesday)**	Lab #6 Procedure		**Lab #6 Report** **(Due December 1, Tuesday)**	
5	**Chapter 5 Quiz** **(November 20, Friday)**				

Chapter 11: Intermolecular Forces and Liquids and Solids

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Kinetic Molecular Theory of Liquids and Solids, Intermolecular Forces, van der Waals Forces (Dipole-Dipole Forces, London Dispersion Forces), Ion-Dipole Forces, Hydrogen Bonding, Properties of Liquids [Surface Tension, Capillary Actions (Cohesive and Adhesive Forces), Viscosity], Special Structures and Properties of Water	11.1: The Kinetic Molecular Theory of Liquids and Solids (pg. 452) 11.2: Intermolecular Forces (pg. 453 to 459) 11.3: Properties of Liquids (pg. 459 to 462)		pg. 494–495 #2, 3, 6 to 10, 12 to 20; pg. 497−499 #95, 108, 112, 115, 118 pg. 495 #21 to 25, 27 to 32	
2	Crystalline Solids, Types of Crystalline Solids (Ionic, Covalent, Molecular, Metallic and Atomic Solids) and their properties, Amorphous Solids, Lattice, Unit Cell, X-ray Diffraction	11.6: Types of Crystals (pg. 471 to 475) 11.7: Amorphous Solids (pg. 476 to 478)		pg. 496 #51 to 56; pg. 498 #98, 106 pg. 496 #57	
3	Vaporization (Evaporation), Condensation, Dynamic Equilibrium, Equilibrium Vapour Pressure, Liquid-Vapour Equilibrium, Molar Heat (Enthalpy) of Vaporization (ΔH_{vap}) and Boiling Point, Clausius-Clapeyron Equation $\left[\ln\left(P_{vap}\right)=-\frac{\Delta H_{vap}}{R}\left(\frac{1}{T}\right)+C\right]$ or $\left[\ln\left(\frac{P_{vap,T_1}}{P_{vap,T_2}}\right)=\frac{\Delta H_{vap}}{R}\left(\frac{1}{T_2}-\frac{1}{T_1}\right)\right]$, Critical Temperature ($T_C$) and Critical Pressure (P_C), Liquid-Solid Equilibrium, Heating Curve, Normal Melting and Freezing Points, Molar Heat (Enthalpy) of Fusion (ΔH_{fus}), Solid-Vapour Equilibrium, Sublimation, Deposition, Molar Heat of Sublimation ($\Delta H_{sub} = \Delta H_{fus} + \Delta H_{vap}$)	11.8: Phase Changes (pg. 479 to 488)		pg. 496−497 #59 to 61, 64, 66, 68 to 74, 76, 79, 81, 82, 85 to 88; pg. 498−500 #96, 103, 122, 133	
4	Phase Diagrams, Triple Point, Critical Point, Phase Diagrams of Water and Carbon Dioxide	11.9: Phase Diagrams (pg. 488 to 490)		pg. 497 #89 to 94; pg. 498−500 #99, 101, 131, 134, 139	
6	**Chapter 11 Quiz** **(December 4, Friday)**				

Chapter 12: Physical Properties of Solutions

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Different Types of Solutions, Crystallization and Precipitation, Solution Process, Heat of Solution (ΔH_{soln}), Heat of Hydration (ΔH_{hyd}), Different Concentration Levels (Miscible, Partially Miscible, Non-miscible), Percent by Mass $\left(\text{mass }\% = \frac{m_{solute}}{m_{solvent}} \times 100\%\right)$, Mole Fraction $\left(\chi_A = \frac{n_A}{n_{total}}\right)$, Molality (unit = m) = $\frac{n_{solute}}{m_{solvent}(kg)}$, Molarity (M) or Molar Concentration (C) (in mol/L), Parts per Million (ppm), Parts per Billion (ppb), Normality	12.1: Types of Solutions (pg. 504 to 505) 12.2: A Molecular View of the Solution Process (pg. 505 to 507) 12.3: Concentration Units (pg. 507 to 511)		pg. 534 #1 and 2 pg. 534−535 #3 to 6, 9 to 12 pg. 535 #13, 15 to 24	
2	Fractional Crystallization, Factors Affecting Solubility (Molecular Structure, Temperature and Pressure – Henry's Law $C = kP$)	12.4: The Effect of Temperature on Solubility (pg. 511 to 513) 12.5: The Effect of Pressure on Solubility of Gases (pg. 513 to 515)		pg. 535 #25, 27 to 29 pg. 535−536 #30 to 38	
3	Colligative Properties, Vapour Pressure Lowering of Solution, Non-volatile Solute, Raoult's Law ($P_{aoln} = \chi_{solvent} P^o_{solvent}$), Ideal Solutions ($P_{total} = \chi_A P^o_A + \chi_B P^o_B + \ldots$), Nonideal Solutions (Positive and Negative Deviations), Franctional Distillation, Molal Boiling Point Constant (K_b), Boiling Point Elevation of Nonelectrolytes ($\Delta T_b = K_b \times$ Molality), Molal Boiling Point Constant (K_f), Freezing Point Depression of Nonelectrolytes ($\Delta T_f = K_f \times$ Molality), Semipermeable Membrane, Osmosis, Osmotic Pressure of Nonelectrolytes $\left(\Pi = CRT = \frac{nRT}{V}\right)$, Molar Mass Determination from Colligative Properties,	12.6: Colligative Properties of Nonelectrolyte Solutions (pg. 515 to 528)		pg. 536−537 #39 to 47, 50 to 54, 56 to 58, 60, 62, 64 to 68	
4	van't Hoff Factor $\left(i = \frac{n_{ions}}{n_{solute}}\right)$, Ion Pairs, Colligative Properties of Electrolytes [Boiling Point Elevation of Ionic Solution ($\Delta T_b = iK_b \times$ Molality), Freezing Point Depression of Ionic Solution ($\Delta T_f = iK_f \times$ Molality), Osmotic Pressure for Ionic Solution $\left(\Pi = iCRT = i\frac{nRT}{V}\right)$, Dialysis, Isotonic Solutions, Reverse Osmosis, Desalination	12.7: Colligative Properties of Electrolyte Solutions (pg. 528 to 529)		pg. 537−538 #69 to 82	
5	**Lab #7: Determining Molecular Mass by Freezing Point Depression (December 9, Wednesday)**			**Lab #7 Report (January 5, Tuesday)**	
6	**Unit 3 Test (December 10, Thursday)**				
7	**Final Exam (Semester 1) - covers Units 1 to 3 (Chapters 1 to 5, 7 to 9, 10.1 to 10.5, 11, 12, 24, 25.1 and 25.2) (December 15, Tuesday)**				