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), 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	5.1 Substances That Exist as Gases (pg. 174 − 175) 5.2 Pressure of a Gas (pg. 175 − 178) 5.3 The Gas Law (pg. 179 – 185) 5.4 The Ideal Gas Equation (pg. 185 – 194) 5.5 Gas Stoichiometry (pg. 194 − 196)		pg. 215-216 #2 to 7, 9, 11, 13 and 14 pg. 216 #15 to 26 pg. 216-217 #28 to 50 (do even; optional odd for extra practices), pg. 220 #94 pg. 217−218 #51 to 60 (do even; optional odd for extra practices), pg. 219-221 #93, 95, 104, 108, 110	
2	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 $\left[\left(P + \frac{n^2a}{V^2}\right)(V - nb) = nRT\right]$	5.6 Dalton's Law of Partial Pressures (pg. 196 – 201) 5.7 The Kinetic Molecular Theory of Gas (pg. 201 − 211) 5.8 Deviation from Ideal Behavior (pg. 211 − 213)		pg. 218 #61 to 72; pg. 220-221 #106, 107 and 111 pg. 219 #73, 74, 78 to 82 (even), 83, 84, pg. 222 #123 pg. 219 #86 to 90	
	Chapter 5 Take-Home Quiz (Assigned on November 2, Wednesday)	**Chapter 5 Homework Due (November 14, Monday)**		**Chapter 5 Take-Home Quiz (Due: November 3, Thursday)**	

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. 462) 11.2: Intermolecular Forces (pg. 463 − 469) 11.3: Properties of Liquids (pg. 469 − 472)		pg. 504–505 #2, 3, 6 to 10, 12 to 20; pg. 508−509 #95, 108, 112, 115, 118 pg. 505 #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. 482 − 485) 11.7: Amorphous Solids (pg. 486 − 489)		pg. 506 #51 to 56; pg. 508 #98, 106 pg. 506 #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 ($\Delta H_{sub} = \Delta H_{fus} + \Delta H_{vap}$), Phase Diagrams, Triple Point, Critical Point, Phase Diagrams of Water and Carbon Dioxide	11.8: Phase Changes (pg. 489 − 498) 11.9: Phase Diagrams (pg. 498 − 499)		pg. 506−507 #59 to 61, 64, 66, 68 to 74, 76, 79, 81, 82, 85 to 88; pg. 508−510 #96, 103, 122, 133 pg. 507−508 #89 to 94; pg. 508−510 #99, 101, 131, 134, 139	
	Chapter 11 Take-Home Quiz (Assigned on November 15, Tuesday)	**Chapter 11 Homework Due (November 30, Wednesday)**		**Chapter 11 Take-Home Quiz (Due: November 17, Thursday)**	

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, Fractional Crystallization, Factors Affecting Solubility (Molecular Structure, Temperature and Pressure – Henry's Law $C = kP$)	12.1: Types of Solutions (pg. 514) 12.2: A Molecular View of the Solution Process (pg. 515 − 517) 12.3: Concentration Units (pg. 517 − 521) 12.4: The Effect of Temperature on Solubility (pg. 521 − 523) 12.5: The Effect of Pressure on Solubility of Gases (pg. 524 − 526) ***** Molality will not be on the AP TEST!!**		pg. 546 #1 and 2 pg. 546 #3 to 6, 9 to 12 pg. 546−547 #13, 15 to 24 pg. 547 #25, 27 to 29 pg. 547 #30 to 38 **Skip Questions related to Molality**	
2	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, Boiling Point Elevation of Nonelectrolytes, Freezing Point Depression of Nonelectrolytes, Semipermeable Membrane, Osmosis, Osmotic Pressure of Nonelectrolytes, van't Hoff Factor $\left(i = \frac{n_{ions}}{n_{solute}}\right)$, Ion Pairs, Colligative Properties of Electrolytes [Boiling Point Elevation of Ionic Solution, Freezing Point Depression of Ionic Solution, Osmotic Pressure for Ionic Solution, Dialysis, Isotonic Solutions, Reverse Osmosis, Desalination	12.6: Colligative Properties of Nonelectrolyte Solutions (pg. 526 − 539) 12.7: Colligative Properties of Electrolyte Solutions (pg. 539 − 541)		pg. 548−549 #39 to 44, 46, 48 to 52, 54 to 56, 58, 60, 62 to 66 **Skip Calculation type Questions related to Colligative Properties** pg. 549 #67 to 78	
3	**Lab #4: Paper Chromatography to Separate Dye Mixture (November 15, Tuesday)**	Lab #4 Handout		**Lab #4 Report Due (December 6, Tuesday)**	
4	**Unit 3 Test (December 1, Thursday)**	**Chapter 12 Homework Due (December 1, Thursday)**			
5	**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 14, Wednesday)**				