Chemistry AP Unit 3 Outline: States of Matter

Chapter 5: Gases

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Pressure, Barometer, Manometer, Units of Pressure (mm Hg, torr, standard atmosphere, kPa), Boyle's Law ($P_1V_1 = P_2V_2$), Charles Law $\left(\frac{V_1}{T_1} = \frac{V_2}{T_2}\right)$, Gay-Lussac Law $\left(\frac{P_1}{T_1} = \frac{P_2}{T_2}\right)$, Avogadro's Law $\left(\frac{V_1}{n_1} = \frac{V_2}{n_2}\right)$, Combined Gas Law $\left(\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}\right)$	5.1: Pressure (pg. 190 to 192) 5.2: The Gas Laws of Boyle, Charles, Guy-Lussac, Avogadro and the Combined Gas Law (pg. 192 to 198)		pg. 232–233 #25 to 27, 29 pg. 233 #31 to 34	
2	Ideal Gas Law ($PV = nRT$), Gas Constant ($R = 0.08206$ L atm mol^{-1} K^{-1}), Molar Volume (L/mol), STP (22.4 L/mol) and SATP (24.8 L/mol), Gas Stoichiometry, Limiting and Excess Reagent, and Combined Stoichiometry, Molar Mass of a Gas	5.3: The Ideal Gas Law (pg. 199 to 202) 5.4: Gas Stoichiometry (pg. 203 to 206)		pg. 233–234 #35 to 45, 47 pg. 234–235 #49 to 62	
3	Partial Pressure, Dalton's Law of Partial Pressure ($P_{total} = P_A + P_B + P_C + \ldots$), Mole Fraction $\left(\chi_A = \frac{n_A}{n_{total}} = \frac{P_A}{P_{total}}\right)$, Kinetic Molecular Theory (KMT) $\left(E_k/\text{mol} = \frac{3}{2}RT\right)$ $\left(E_k/\text{molecule} = \frac{1}{2}mv^2\right)$, Temperature, Boltzman's Constant ($k = 1.38 \times 10^{-23}$ J/K), Root Mean Square Velocity $\left(u_{rms} = \sqrt{\frac{3RT}{M}} = \sqrt{\frac{3kT}{m}}\right)$	5.5: Dalton's Law of Partial Pressures (pg. 206 to 211) 5.6: The Kinetic Molecular Theory (pg. 212 to 219)		pg. 235 #63 to 71 pg. 235–236 #73 to 80	
4	Diffusion, Effusion, Graham's Law of Effusion $\left(\frac{r_1}{r_2} = \sqrt{\frac{M_2}{M_1}}\right)$, Real Gas, van der Waals Equation $\left[\left(P + \frac{n^2a}{V^2}\right)(V - nb) = nRT\right]$	5.7: Effusion and Diffusion (pg. 219 to 222) 5.8: Real Gases (pg. 222 to 224)		pg. 236 #81 to 84 pg. 236 #85 and 86	
5	**Lab #6: Ideal Gas Law** **(November 14, Tuesday)**			**Lab #6 Report** **(Nov 20, Tuesday)**	
6	**Chapter 5 Quiz** **(November 12, Monday)**				

Chapter 10: Liquids and Solids

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Condensed States, Intermolecular Forces, Dipole-Dipole Forces, Hydrogen Bonding, London Dispersion Forces, Surface Tension, Capillary Actions (Cohesive and Adhesive Forces), Viscosity	10.1: Intermolecular Forces (pg. 449 to 453) 10.2: The Liquid State (pg. 454 to 456)		pg. 500–501 #35 to 40 pg. 501 #41 to 44	
2	Crystalline Solids, Amorphous Solids, Lattice, Unit Cell, X-ray Diffraction, Types of Crystalline Solids (Ionic, Molecular and Atomic Solids) and their properties. Various Atomic Solids (Metals and Alloy, Metalloids-Network Structure, and Solid Group (VIIIA) Elements),	10.3: An Introduction to Structures and Types of Solids (pg. 456 to 461) 10.4: Structure and Bonding in Metals (pg. 461 to 468) 10.5: Network Atomic Solids (pg. 468 to 473) 10.6: Molecular Solids (pg. 478 to 479) 10.7: Ionic Solids (pg. 479 to 483)		pg. 502–503 #67, 68	
3	Vaporization (Evaporation), Heat (Enthalpy) of Vaporization (ΔH_{vap}), Condensation, Equilibrium, Vapour Pressure, Equilibrium Vapour Pressure, ($P_{atm} = P_{vap} + P_{Hg}$), Clausius-Clapeyron Equation $\left[\ln\left(P_{vap}\right) = -\frac{\Delta H_{vap}}{R}\left(\frac{1}{T}\right) + C\right]$ or $\left[\ln\left(\frac{P_{vap,T_1}}{P_{vap,T_2}}\right) = \frac{\Delta H_{vap}}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)\right]$, Sublimation, Heating Curve, Heat (Enthalpy) of Fusion (ΔH_{fus}), Normal Melting and Freezing Points, Supercooled and Superheated States	10.8: Vapour Pressure and Change of State (pg. 483 to 492)		pg. 504 #75 to 81	
4	Phase Diagram, Triple Point, Critical Temperature and Pressure, Critical Point	10.9: Phase Diagram (pg. 492 to 497)		pg. 505 #87 to 89	
5	**Lab #7: Molecular Mass of a Volatile Liquid (November 30, Friday)**			**Lab #7 Report (December 7, Wed)**	
6	**Chapter 10 Quiz (December 3, Monday)**				

Chapter 11: Properties of Solutions

Classes	Topics	Suggested Reading	✓	Assignments	✓
1	Molarity (M) or Molar Concentration (C) (in mol/L), Mass Percent $\left(\text{mass}\,\% = \frac{m_{\text{solute}}}{m_{\text{solvent}}} \times 100\%\right)$, Mole Fraction $\left(\chi_A = \frac{n_A}{n_{total}}\right)$, Molality $(\text{unit} = m) = \frac{n_{\text{solute}}}{m_{\text{solvent}}(kg)}$, Parts per Million (ppm), Parts per Billion (ppb), Normality, Heat of Solution (ΔH_{soln}), Heat of Hydration (ΔH_{hyd})	11.1: Solution Composition (pg. 512 to 515) 11.2: The Energies of Solution Formation (pg. 515 to 519)		pg. 548 #25 to 32 pg. 548 #33 to 35, 37 to 39	
2	Factors Affecting Solubility (Molecular Structure, Pressure – Henry's Law $C = kP$, Temperature), Vapour Pressure of Solution, Raoult's Law ($P_{\text{aoln}} = \chi_{\text{solvent}} P^{\circ}_{\text{solvent}}$), Ideal Solutions ($P_{\text{total}} = \chi_A P^{\circ}_A + \chi_B P^{\circ}_B + \ldots$), Nonideal Solutions (Positive and Negative Deviations)	11.3: Factors Affecting Solubility (pg. 519 to 524) 11.4: The Vapour Pressures of Solutions (pg. 524 to 531)		pg. 549 #41, 43 and 44 pg. 549–550 #45 to 49, 51, 53, 55, and 56	
3	Colligative Properties, 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 Osmotic Pressure, Dialysis, Isotonic Solutions, Reverse Osmosis, Desalination	11.5: Boiling Point Elevation and Freezing Point Depression (pg. 531 to 534) 11.6: Osmotic Pressure (pg. 535 to 540)		pg. 550 #57 to 64 pg. 550 #65 to 67	
4	van't Hoff Factor $\left(i = \frac{n_{ions}}{n_{solute}}\right)$, Ion Pairing, 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 $\left(\Pi = iCRT = i\frac{nRT}{V}\right)$	11.7: Colligative Properties of Electrolyte Solution (pg. 540 to 543)		pg. 550–551 #68 to 75	
5	**Unit 3 Test (December 11, Tuesday)**				