ATOC 3500 Topics Covered, Lecture Notes (red)

- Atmospheric constituents (major and minor gases, aerosols) (1)
- Mixing Ratios, density of air [M], molecular weight (1)
- Absorption of UV by O_2 and O_3 (1,8)
- Hydrostatic Balance (scale height, pressure vs. altitude), vertical profiles (1,2,3)
- Adiabatic Lapse Rates, Stability (2,3)
- General circulation (3)
- Temperature, pressure, density, the Ideal Gas Law, Avogadro's number (1,2)
- Particulate matter, light scattering, visibility, and visibility length (4,5)
- Oxidation of sulfur (SO_2), nitrogen (NO_2), sulfuric acid, nitric acid (5,10a,10b)
- The "Brown Cloud", Beer-Lambert Law, Optical Depth (5,7)
- Bimolecular and termolecular reactions, rates of chemical reactions, lifetimes (6)
- Equilibrium, forward and reverse reactions, steady state (6,10a)
- Solar flux, absorption cross section, photolysis rates (J values) (7)
- Energy of a photon, bond strengths and energy in a mole of photons (7)
- Photolysis of ozone, formation of $O(^1D)$, formation of OH (7,8)
- Stratospheric ozone (history), Dobson and the "Brewer/Dobson Circulation" (8)
- UV, skin cancer, Chapman ozone chemistry (stratosphere), odd oxygen (8)
- Steady state, production and loss, partitioning (6,8)
- Catalytic cycles, reservoirs (e.g., HCl and $ClNO_3$) (8,9)
- Sources of catalysts in the stratosphere (N_2O, H_2O, CH_4, CFCs) (8)
- Rate determining steps, steady state ozone losses (8,9)
- The "Antarctic ozone hole" (9)
- Heterogeneous chemistry, Langmuir equation (sticking coefficients, surface area) (9)
- Urban pollution, health effects, "smog", particulate matter and premature deaths (10b)
- Hydrocarbon oxidation (ozone and aerosol production) (10b)
- Photolysis of NO_2 as a source of tropospheric ozone (10b)
- Ozone production, regulations, Empirical Kinetic Modeling Approach (EKMA) (10b)
- pH, acid rain, equilibrium constants, CO_2 as an acid (10a)
- VOCs, aerosol formation, haze (and to a lesser extent, deliquescence) (5,10b)