

AOSC 431 Mid-Term #1 Potential Topics (FALL 2016)

1. Introduction
 - a. Composition of atmosphere, “permanent gases”, %/ppmv/ppbv, molecular weight
 - b. Vertical structure of atmosphere
 - i. Pressure/Density
 - ii. Temperature: Troposphere, Stratosphere, Mesosphere, Thermosphere (know *approximate* temperature values, *approximately where* tropopause, stratopause, and mesopause are located in vertical)
 - iii. Scale height
 - iv. Lapse Rate
 - c. Weather and climate patterns
 - i. Qualitative knowledge of basic patterns of pressure, wind, temperature, precipitation. General Circulation: Hadley cell, etc.
 - d. Temperature
 - i. Relation to kinetic energy, heat versus temperature
2. Thermodynamic Systems and Variables
 - a. Concept of air parcels, system versus environment
 - b. State versus process variables
 - c. Extensive and intensive variables (and how to convert)
 - d. Conservation of quantities: isobaric, isochoric, isothermal, adiabatic
3. Physical properties of air
 - a. Ideal gas law in various forms. When does this apply? 3 state variables (p, V, T)
 - b. Compute mean molecular weight, relation to gas constant relative to universal gas constant (i.e. dry versus wet)
 - c. Moisture: mixing ratio, specific humidity, and virtual temperature
4. Pressure
 - a. Hydrostatic balance, various forms, relation to scale height
 - b. Gravity, geopotential, and geopotential height
 - c. Hypsometric equation
 - d. Correction to sea level
5. First Law of Thermodynamics
 - a. Pressure-Volume Work
 - b. 1st law, internal energy
 - c. Heat capacity
 - d. Special cases for first law
 - e. Heat as related to change in internal energy + work to environment

In general, equations and constants will be provided. However, students should be able to interpret equations, describe the contents, and manipulate/rearrange to solve problems. Students should also know the names of equations (i.e. hydrostatic) and how to apply them when they are provided.