

AOSC 431 Final Exam (12/15/16) Potential Topics (FALL 2016)

1. Most important topics from first two mid-terms
 - a. Composition/Structure of atmosphere, conservative processes (adiabatic versus isothermal, etc.), ideal gas law
 - b. Hydrostatic balance, hypsometric equation
 - c. 1st law of thermodynamics and special cases thereof, heat capacity
 - d. Poisson's equation and potential temperature
 - e. Latent heating, saturation
 - f. Clausius-Clapeyron
 - g. Skew-Ts
2. Atmospheric stability
 - a. Stable/Unstable/Neutral/Metastable
 - b. Dry Static Stability
 - i. Function of potential temperature, compare to lapse rate
 - ii. Brunt Vaissala Frequency
 - c. Lapse rates, dry v. moist adiabatic
 - d. Conditional and Potential Instability
3. Deep Convection
 - a. CAPE, CIN (Skew T and Quantitative Computation)
 - b. Convective Temperature, CCL
4. Stability Indices
 - a. LI, SI, TT, KI, SWEAT (general idea of what these are, compute from data to diagnose instability)
5. Nucleation of water vapor condensation
 - a. Surface energy, Kelvin curve
 - b. Supersaturation, what is it and how can it exist?
 - c. CCN, role of soluble, Kohler curve
6. Warm Clouds
 - a. Growth by condensation, why too slow, growth rate equation (apply)
 - b. Difference in marine and continental clouds
 - c. Entrainment and implications for parcel theory
 - d. Collision/Coalescence, Application (as in HW)
7. Cold Clouds
 - a. What is supercooled water and how can it exist? Supersaturation w.r.t. ice
 - b. Ice nucleation, characteristics of good ice nucleus
 - c. Growth: directly from vapor phase, riming, aggregation,
 - d. Different types of ice particles, what controls the type?
 - e. Evaporation rate relative to water, Visual identification of ice/liquid cloud
8. Precipitation processes
 - a. Importance of ice processes, why?
 - b. Bright band signature / Melting layer
 - c. Precipitation type
9. Lightning

Constants as needed will be provided. It is expected that students can work through some of the important, simpler derivations. 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.