

ATM S 340 Winter 2009

PART 1: BASIC THERMODYNAMICS					
Week 1			W&H reading	W&H exercises ^a	Problem set due
Monday	Jan 5	Course information. Introduction to course. Thermodynamic terms and conditions.			
Wednesday	Jan 7	Boyle's and Charles' Laws. The ideal gas equation. Molecular weight.	63-66		
Friday	Jan 9	First Law. Joule's Law. Heat capacity.	72-75	32	
Week 2					
Monday	Jan 12	Equipartition of energy. Pressure-volume diagram for an ideal gas. Isothermal and adiabatic processes.	75-77	33*, 35, 38	
Wednesday	Jan 14	Cyclic and reversible processes. Carnot's ideal heat engine. Engine efficiency. Carnot engine for an ideal gas.	93-95	15, 58, 59, 60	
Friday	Jan 16	Second Law and Carnot's theorems. Entropy.	95-97, 100-101	16, 17, 61, 62	PS #1
Week 3					
Monday	Jan 19	No class – UW holiday			
Wednesday	Jan 21	Clausius-Clapeyron equation. Partial pressure and Dalton's Law.	97-99, 66	1, 40, 64, 65, 66	
PART 2: ATMOSPHERIC THERMODYNAMICS					
Friday	Jan 23	Composition of dry air. Apparent molecular weight. Ideal gas equation for dry air. Hydrostatic equation. Geopotential and geopotential height.	67-69	19	
Week 4					
Monday	Jan 26	Hypsometric equation. Scale height. Thickness.	69-71	2, 3, 4, 26, 27, 29	
Wednesday	Jan 28	Reduction of pressure to sea level. Concept of an air parcel. First law for dry air. Dry static energy. Dry adiabatic lapse rate.	72, 76-77	30*, 31	
Friday	Jan 30	Static stability for dry air parcel displacements. Inversions. Gravity waves.	88-91		PS #2
Week 5					
Monday	Feb 2	Potential temperature.	77-78	14, 36	
Wednesday	Feb 4	Atmospheric thermodynamic diagrams.	78-79	5*, 37	
Friday	Feb 6	Measures of water vapor in the air. Ideal gas equation for pure water vapor and for moist air. Virtual temperature. Hypsometric equation for moist air.	80	6, 7, 20, 41, 42	
Week 6					
Monday	Feb 9	Saturated air. Saturation vapor pressure. Saturation mixing ratio. Relative humidity. Dewpoint. Lifted condensation level. Moist adiabatic processes. Saturated adiabatic vs. pseudoadiabatic processes. Latent heat and the First Law for saturated parcel displacements.	80-83, 84-85	8*, 9, 45, 50*, 51	PS #3
Wednesday	Feb 11	The moist adiabatic lapse rate. Adiabatic liquid water content. Equivalent potential temperature.	85-86	40, 52*	

ATM S 340 Winter 2009

Friday	Feb 13	MIDTERM EXAM – covers weeks 1-5			
Week 7					
Monday	Feb 16	No class – UW holiday			
Wednesday	Feb 18	Wet-bulb temperature. Normand's Rule. Wet-bulb potential temperature.	83-84, 86-87	10, 43, 46, 47, 48	
Friday	Feb 20	Static stability for moist parcel displacements. Conditional instability. Layer lifting and convective instability. Parcel method for assessing possibility of deep convection. Level of free convection. Convective available potential energy (CAPE). Convective inhibition (CIN).	88-93, 344-347	53	
PART 3: CLOUD PHYSICS					
Week 8					
Monday	Feb 23	Cloud formation processes. Cloud nomenclature.			
Wednesday	Feb 25	Homogenous nucleation of cloud droplets. Kelvin's equation.	209-212	1, 9	
Friday	Feb 27	Heterogeneous nucleation of droplets. Köhler curves. CN and CCN.	212-215		PS #4
Week 9					
Monday	Mar 2	Growth of cloud droplets by condensation.	221-224	21	
Wednesday	Mar 4	Onset of precipitation: transition from condensational to collisional growth. Growth of drops by collisions and collection.	224-230	23	
Friday	Mar 6	Ice in clouds. Ice nucleation. Ice enhancement.	223-228		
Week 10					
Monday	Mar 9	Growth of ice particles from the vapor phase. Ice particle habits.	228-241	27	
Wednesday	Mar 11	Growth of ice particles by riming and aggregation. Continuous collection equation for riming and aggregation.	241-245		
Friday	Mar 13	Thunderstorms.	252-259	6	PS #5
FINALS WEEK					
Wednesday	Mar 18	FINAL EXAM 8:30-10:20 in ATG 310C			

^aoptional extra practice exercises – not to be turned in