ASTR 605 ISM
STUDY GUIDE
MIDTERM EXAM
Monday, April 5, 2010

HOMEWORK 1 MATERIAL

1. "What is the Diffuse Universe", from Astrophysics of the Diffuse Universe (Dopita and Sutherland)
   - 1.0 What is (Eqs 1.1, 1.2, Fig 1.2)
   - 1.1 Phases (also see Handout table "Components of the Interstellar Medium from Wikipedia)
2. "Introduction" from Interpreting Astronomical Spectra (Emerson)
   - Eqs I.1, I.2, I.3, I.4
   - LTE, saturation

HOMEWORK 3 MATERIAL

3. Radiative Transfer 1, class notes (pp 51-72, Chapter 4)
   - 4.1 Radiation field (Eqs 4.1 4.2, 4.3, 4.7, 4.8, 4.10, 4.12; Figs 4.1, 4.2, 4.3)
   - 4.1.3 Astrophysical flux (Eqs 4.16, 4.17)
   - 4.1.4 Observed flux (Eqs 4.21, 4,22; Fig 4.4)
   - 4.2 Microscopic Abs (Fig 4.5)
   - 4.3 Macroscopic Treatment (Eqs 4.23, 4.25, 4.29, 4.35, 4.36, 4.37, 4.38, 4.42, 4.48, 4.49; 4.50, Fig 4.7, 4.8, 4.9)
4. Radiative Transfer 2, class notes (pp 126-132, Chapter 3)
   - 3.4 Trasfer Equation (Eqs 3.67, 3.68, 3.69, 3.70, 3.71;Fig 3.5, 3.6, 3.7, 3.8)
5. Astronomical Spectra, class notes (pp 73-95, Chapter 5)
   - 5.1 Intervening Abs (Eqs 5.4, 5.5, 5.9, ; Figs 5.2, 5.3)
   - 5.2 Column Density (Eqs 5.10, 5.11, 5.12, 5.13, 5.14, 5.15)
   - 5.3 Doppler Broad (Eqs 5.17, 5.24, 5.25, 5.26; Fig 5.4, 5.5, 5.6)
   - 5.4 Total Abs Xsec (all)
   - 5.6 Mags (Eqs 5.32, 5.33, 5.34, 5.38, 5.39, 5.40, 5.47, 4.48, 5.49, 5.50; Fig 5.7)
   - 5.7 Atmos Attenuation (Eqs 5.51, 5.52, 5.54, 5.56)

HOMEWROK 4 MATERIAL

6. Flux Calibration, class notes (pp141-144, Chapter 7)
   - 7.5 Fluc Cal (Eqs, 7.27, 7.29, 7.30, Fig 7.4 , discussion p143) [note typo in Eq. 7.27 which is missing the slit loss term)
7. Spectrographs, class notes (p124-127, Chapter 6)
8. Atomic Cross Sections, class notes (pp 245-254, Chapter 12)
   - 12.1 Classical Oscillator (Eqs 12.6, 12.11, 12.31, 12.35, 12.37, 12.40, 12.41, 12.42, 12.45; Fig 12.1)
9. Absorption Features, class notes (pp 365-376, Chapter 16)
   - 16.1 B-B Xsec (Fig 16.1, Eq. 16.5)
   - 16.2 Voigt Profile (Eqs 16.6, 16.8, 11.6; Figs 16.2, 16.3)
   - 16.3 Equivalent Widths (Eqs 16.13, 16.15, 16.16; Figs 16.4, 16.5, 16.6)

HOMEWORK 5 MATERIAL

10. The Structure of Hydrogen, class notes (pp 177-202, Chapter 9)
    - 9.1 Bohr Model (Eqs 9.1, 9.2, 9.6, 9.7; Tab 9.1; Figs 9.1, 9.2, 9.3)
    - 9.1 Sommerfeld (Eqs, 9.16, 9.17, 9.20, 9.21; Figs 9.4, 9.5, 9.6)
    - 9.2 Wave Nature (Eqs 9.22, 9.28, 9.29, 9.32, 9.39, 9.40, 9.51, 9.54, 9.57; Figs 9.9, 9.10; 9.11, 9.12; Tab 9.3)
11. Finer Structure, class notes (pp 203-222, Chapter 10)
    - 10.1 Spin (Eq. 10.1; Fig 10.1)
    - 10.2 S-L Coupling (Eqs 10.2, 10.3, 10.4, 10.5 10.6; Figs 10.1, 10.2, 10.3)
    - 10.3 Relativistic Model (Eqs 10.7, 10.8, 10.10, 10.11, 10.13, 10.14, 10.15, 10.21, 10.24, 10.25, 10.26, 10.29; Figs 10.4, 10.5, 10.6, 10.7, 10.8, 10.9; Tab 10.1)
12. Atomic Transitions, class notes (pp 223-244, Chapter 11)
    - 11.1 transition Probs. (Eq. 11.5)
    - 11.2 Dipole Approx. (Eqs 11.6, 11.8, 11.10, 11.1 11.12, 11.13 11.14)
    - 11.3 Oscillator Strengths (Eqs 11.19, 11.21, 11.23, 11.26, 11.33, 11.34, 11.37, 11.39)
    - 11.5 Overlap Integrals (Eqs 11.53, 11.54)
    - 11.6 Fine Structure Rates (Eqs 11.46, 11.66 11.67, 11.68, 11.69; Figs 11.1, 11.2)

Know how to apply the equations and the principles behind them. I will provide an equation sheet with the exam, which you can use as needed. Study the homework assignments and review the lecture notes as needed. Exam will be closed note. Calculators will be allowed. As with a Cume, please staple together the work in problem order and use one side of the page.