Midterm 1 study guide – page 1

Exam will cover *everything* that was in the lectures, not just what is in this study guide.

The lectures covered:

- Units, etc used in astronomy
- History of astronomy from ancient Greeks until mid-1800's.
  - How we went from geocentric (Earth at center) models to heliocentric (Sun at center) models of Solar System.
- The nature of science.
- How things move
  - Kepler's 3 laws
  - Newton's 3 laws + law of gravity + using them to derive Kepler's laws.
  - Conservation of energy, angular momentum
    - Know what "conservation" of these quantities means.
    - be able to use the concept to reason your way through what will happen in simple situations such as those described in class.
  - Escape velocity & orbits

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The lectures covered (continued):

- What causes accelerations? The four fundamental forces:
  - gravity, electromagnetic, strong nuclear, weak nuclear
- Electromagnetism & Light
  - The electromagnetic wave
  - The speed of light –
    - what did Einstein do to fix things up?
  - Dual wave/particle nature of light
    - What is meant by this?
    - How do we know it is true?
  - The electromagnetic spectrum
    - Different names for light at different wavelengths
    - Measuring the spectrum of an object

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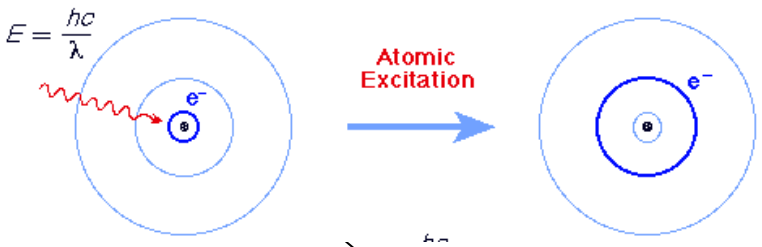
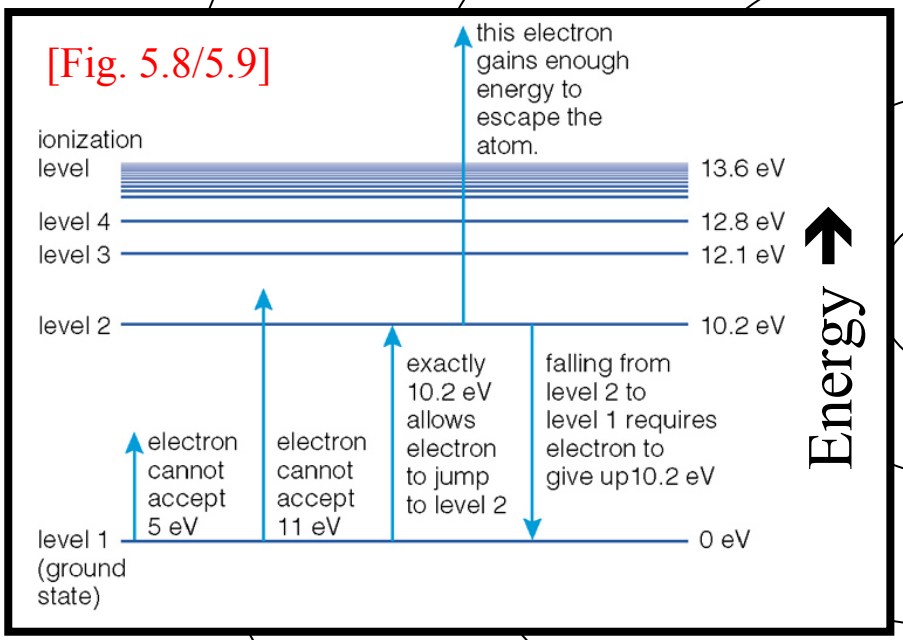
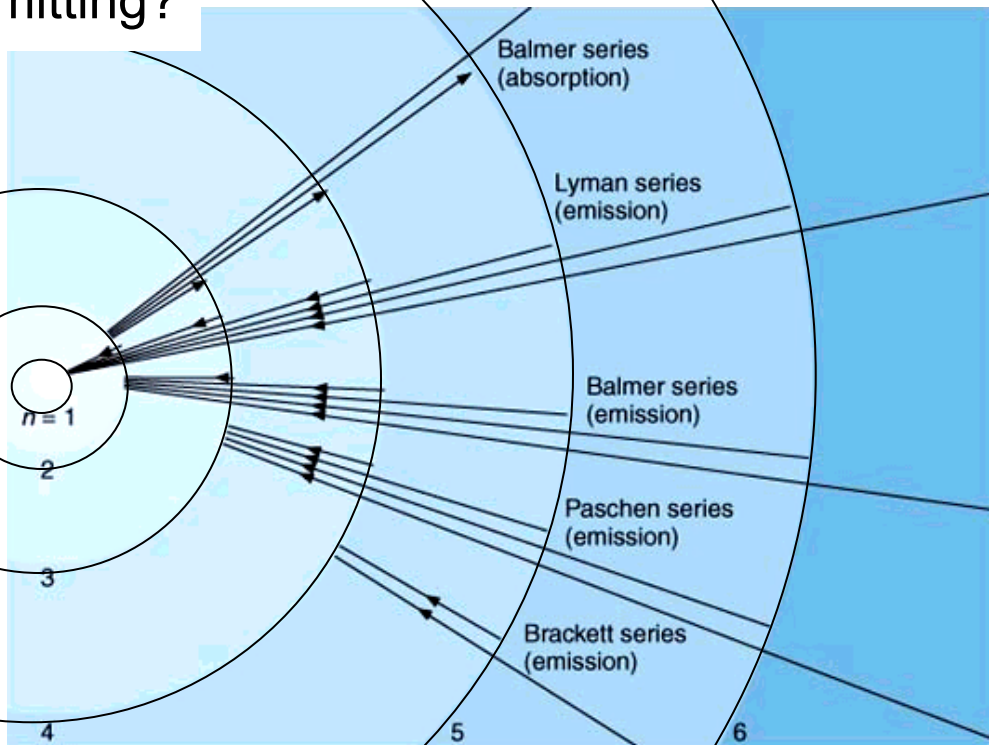
The lectures covered (continued):

- Emission & absorption lines
  - What are they?
  - How do we interpret them in terms of orbits in the Bohr atom and energy level diagrams?
  - What can they tell us about the gas that does the absorbing or emitting?







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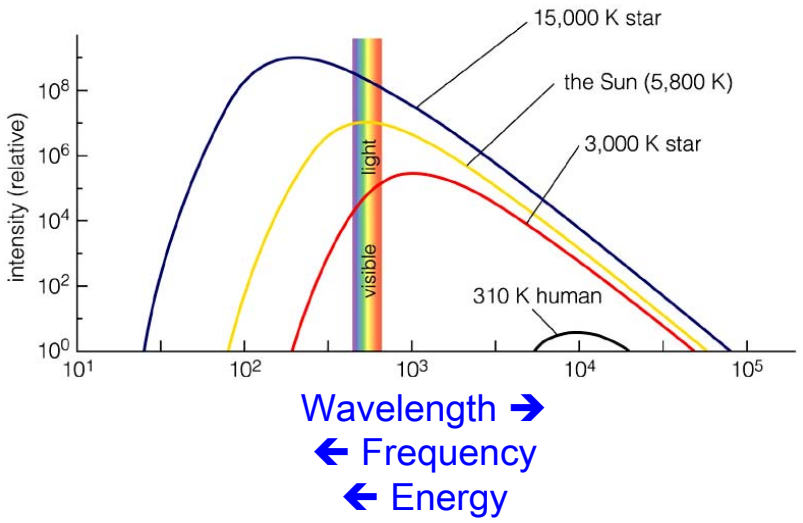
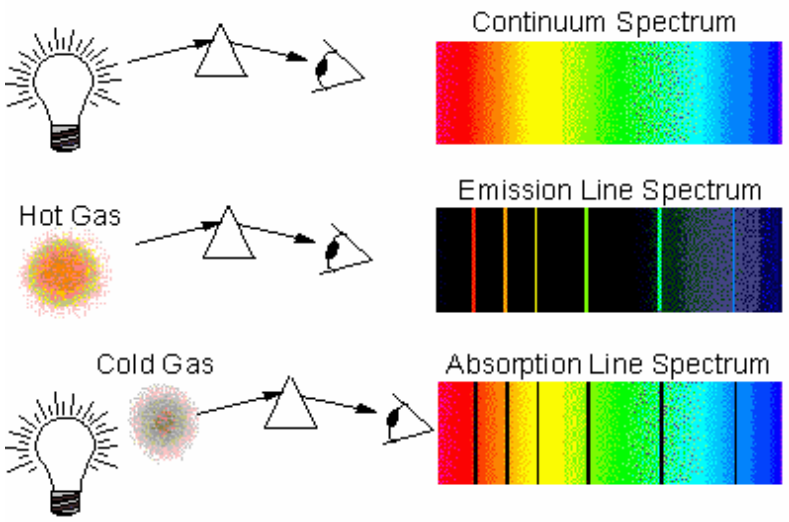
The lectures covered (continued):

- Continuous radiation
  - What is it due to?
  - How can it tell us the temperature of the emitting object?
- Under what circumstances do we see emission lines, absorption lines, continuous radiation?
- Doppler Effect
  - What is it caused by?
  - What is a redshift? What is a blueshift?

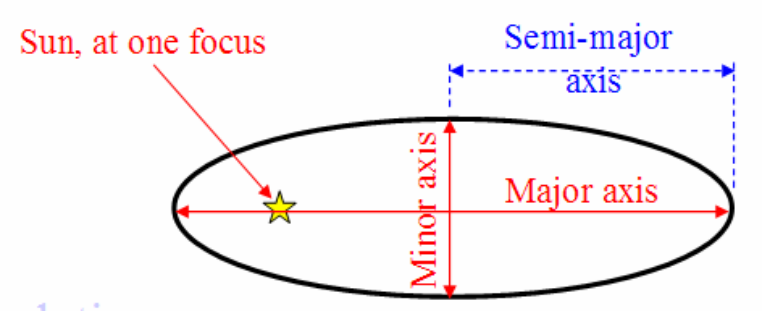


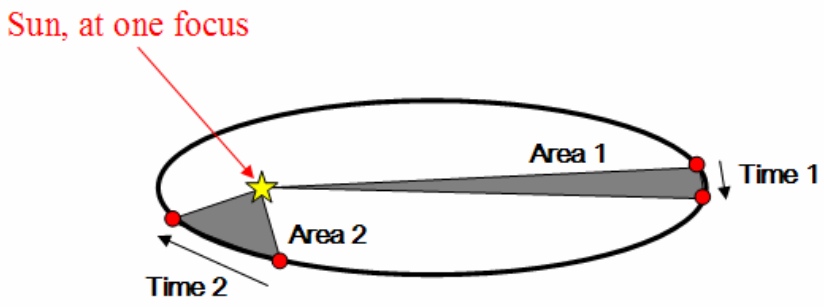


Some “laws” to know

Kepler’s laws:

1. Each planet moves around orbit in ellipse, with sun at one focus.
2. The straight line joining the planet and the sun sweeps out equal areas of space in equal amounts of time.
3. $P^2 = a^3$
   - P = period of orbit, in years
   - a = semi-major axis of orbit, in au.





Newton’s Laws of Motion:

1. In the absence of a net (overall) force acting upon it, an object moves with constant velocity.
2. Force = mass × acceleration
3. For any force, there is an equal and opposite reaction force.

…and Newton’s law of Gravity:

$$F = \frac{Gm_1m_2}{r^2}$$

Some formulae to know

(and to know how to use at the level of the homework):

Motion:

Kepler's 3rd law: $P^2 = a^3$

Newton's 2nd Law: $F = ma$

Newton's law of Gravity: $F = \frac{Gm_1m_2}{r^2}$

Kinetic energy $= \frac{1}{2} mv^2$

Angular momentum $= mvr$

Light:

c = speed of light.

h = Planck's constant

Frequency f, wavelength λ: $f = c/\lambda$

Energy of photon $E = hf = hc/\lambda$

Thermal spectrum $\lambda_{max} = \text{const.} / T$

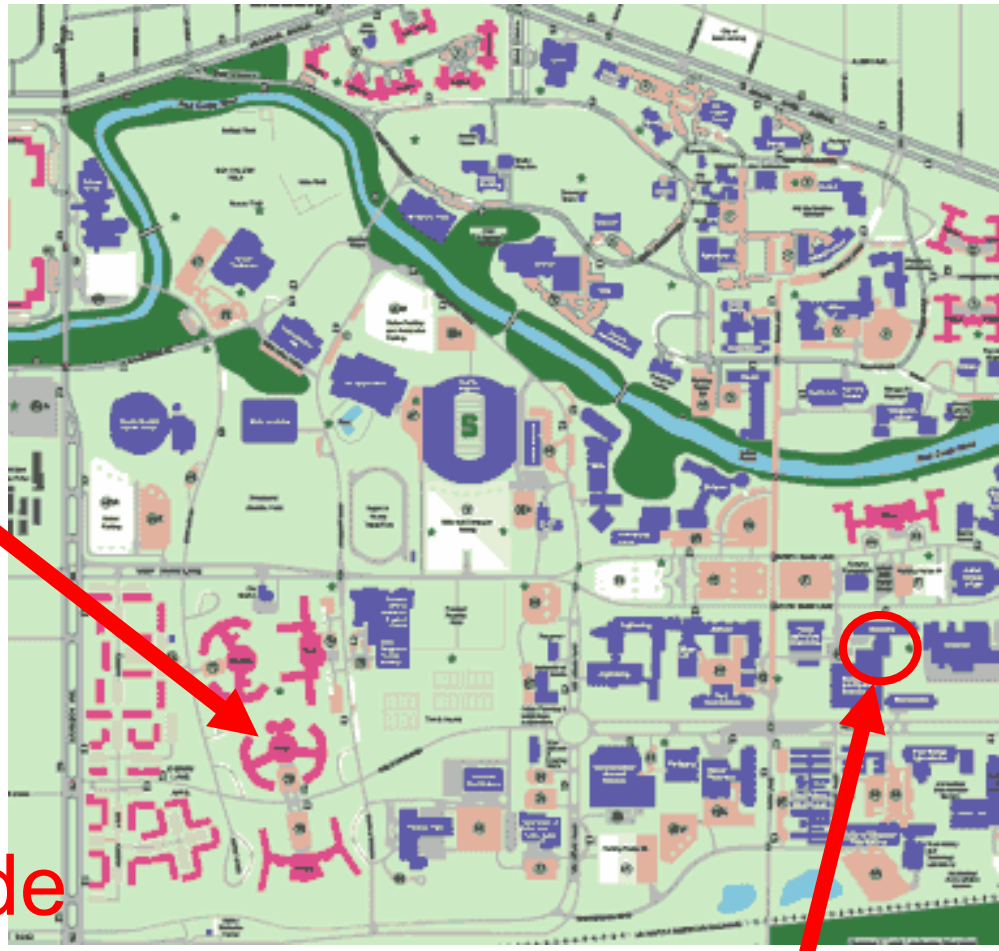
Thermal emission per unit surface area = const.$\times T^4$

Review Sessions

Two choices:

– Monday: 7PM
  - Wilson Hall auditorium
    (Room C-102)

– or Tuesday: 6PM
  - Chemistry 138



Chem 138 is between BPS and Chem buildings

Print & bring Study Guide

- on course web site
- reachable through Angel)

Midterm 1

- 30 multiple choice questions.
  - Sample questions on course web site.
- Closed book, closed notes.
- No calculators or cell phones.
- A few problems like the homework problems.
  - We will give you a table of numbers raised to various powers and roots that you might need.
- Exam must be completed within the class period.
- Sit in assigned rows.