

## Study Guide for Physics 1100 Exam II

(See Exam #1 Study Guide for earlier material)

### Measurement & Conversions

Be able to keep track of units and be able to use conversions. For example:  
Given: Density =  $6.0 \text{ g/cm}^3$ , what is this density in kilograms per cubic meter?  
(You would be given that  $1 \text{ kg} = 1000 \text{ g}$ , and  $1 \text{ m} = 100 \text{ cm}$ .)

### Atomic Nature of Matter

Be able distinguish *elements, compounds, mixtures, atoms, molecules*.  
Know structure of atoms: Where are the *protons, neutrons, electrons* in an atom?  
What are protons and neutrons made of?

Be able to use a periodic table (it will be provided), to use information regarding *atomic number & atomic mass*. (See Questions 18-23 on p. 223).

What is *antimatter*? What is *dark matter*?

### Solids

Be able to distinguish *mass, volume, weight, density*.  
Be able to calculate *density* if given the mass and volume of a substance.

Be familiar with *elasticity*: that the amount of stretch force (or compression force) is proportional to the change in length (*Hooke's law*). (See p. 231)

If given diagrams (like those on page 232), be able to tell where the *tension* occurs and where the *compression* occurs.

Be able to describe *scaling* effects (for example, "surface area to volume ratio").

### Liquids

Be able to calculate *pressure* in a liquid at a given depth.

Be able to calculate *buoyant force* on a submerged or floating object knowing that the magnitude of the buoyant force is equal to the weight of the fluid displaced. (*Archimedes Principle*)

Be able to relate the density of a floating object to the fluid it is in by noting the fraction of the submerged portion.

Be able to use *Pascal's Principle* to explain a "hydraulic lever" (see page 255).

What is *surface tension*? What is *capillarity*? Be able to distinguish between *cohesive forces* and *adhesive forces* between atoms and molecules.

### Gasses & Plasmas

Be able to use *Boyle's Law* to relate pressure and volume. For example:  
If the volume of a container of gas is cut in half, what happens to the pressure?

Note that air is fluid and that an object in air also experiences a buoyant force equal to the weight of the air displaced by the object (see p. 271-2).

*Bernoulli's Principle*: where the speed of a fluid increases, the pressure decreases and vice versa.

What is *plasma*? What are some examples?

### Temperature, Heat & Expansion

Be able to distinguish *temperature*, *heat*, and *internal energy*.  
Be able to convert between *Celsius scale* and the *Kelvin scale*.

Understand the fundamental meaning of *specific heat capacity* and be able to use  $Q = mc\Delta T$ . See Problems 37-39 at the end of Chapter 15 (p. 298)

Expansion of materials:  $\Delta L/L = \alpha\Delta T$

### Heat Transfer

Be able to distinguish between *conduction*, *convection* and *radiation*.

Which is hotter: a red-hot object or a blue-hot object? Why?

What is *Newton's law of cooling*? (What does  $\Delta T$  represent in the equation?)

### Change of Phase

Know whether *evaporation* or *condensation* is a cooling or warming process and why.

Be able to use  $Q = mL$  to calculate *latent heat of transformation*. For example:  
How much heat is required to change 10 g of ice at 0 °C to water at 0 °C?  
(See Problems 37-40 at the end of Chapter 17 (p. 333).

### Thermodynamics

Be able to cite the first 2 laws of thermodynamics. What is an *adiabatic* process?

Be able to calculate the *efficiency* of a heat engine operating between 2 temperatures or the *coefficient of performance* of a refrigerator. (Be sure to use Kelvin temperature!)

What is *entropy*? Be able to calculate the probability for a simple event (for example, like we did in class with the rolling of dice).

### Vibrations, Waves & Sound

Be able to identify the *amplitude, wavelength, frequency, period* and *wave speed* for a wave if given a picture and/or numbers.

Be able to distinguish *transverse* and *longitudinal* waves.

What is interference? Be able to distinguish between *constructive* and *destructive* interference.

What is the *Doppler effect*? What is *resonance*?

Be able to describe how the angle of a bow wave or Mach cone varies for speeds greater than the speed of the wave through that medium.

Be able to identify resonance modes of a vibrating air column or string from numbers or a picture. Where are the *nodes*? Where are the *antinodes*?