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 g/cm³, what is this density in kilograms per cubic meter?
(You would be given that 1 kg = 1000 g, and 1 m = 100 cm.)

Atomic Nature of Matter

Be able to 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 \textit{adiabatic} process?

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

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

\textbf{Vibrations, Waves \& Sound}

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

Be able to distinguish \textit{transverse} and \textit{longitudinal} waves.

What is interference? Be able to distinguish between \textit{constructive} and \textit{destructive} interference.

What is the \textit{Doppler effect}? What are \textit{beats}? What is \textit{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 \textit{nodes}? Where are the \textit{antinodes}?