Study Guide for Physics 1180 Exam #1

Note: The exam will consist of both multiple-choice questions (about 35) and short problem solving questions (about 6). There is EXTRA CREDIT embedded within the exam.

Units / Significant Figures / Scientific Notation

Be able to keep track of units and be able to use conversions. For example: Given: Speed = 60 mile per hour, what is this speed in meters per second? (You would be given that 1.6 km = 1 mile, and 1000 m = 1 km).

Be able to round an answer to the appropriate number of significant digits after performing mathematical operations.

Be able to interpret very large or very small number using scientific notation (in particular*, normalized* scientific notation.)

Newton's 1st Law of Motion

Be able to cite Newton's 1st law. What is the behavior of an object when there are no net forces (pushes or pulls) on that object?

What is "inertia"?

What does it mean to be in "equilibrium?" Distinguish between static equilibrium and dynamic equilibrium.

Linear Motion

Remember that "change in (whatever)" = $\text{whatever}_{(\text{after})} - \text{whatever}_{(\text{before})}$. The symbol for "change in" is "Δ". So, $\Delta x = x_{after} - x_{before}$.

Be able to distinguish position, displacement, path, average speed, average velocity and average acceleration. Be able to calculate these.

Distinguish between instantaneous speed and instantaneous velocity.

Be able to interpret position vs. time and velocity vs. time graphs. Be able to deduce a velocity graph from a position graph.

Be able to apply $v = at$ and $d = (1/2)at^2$ in appropriate situations.

(Take the acceleration due to gravity as 10 m/s^2 downward near the Earth's surface.)

Newton's 2nd Law of Motion

Be able to sketch a force vector diagram on an object showing all the forces that act on that object.

Be able to sketch the resultant vector from the addition of 2 or more vectors.

Be able to resolve a given vector into components parallel and perpendicular to some chosen set of coordinate axes.

Be able to distinguish between mass and weight.

Newton's 3rd Law of Motion

Be able to identify action/reaction pairs of forces. Remember action/reaction pairs act on different objects. For example: Earth pulls down on apple = Action. Then the reaction is: Apple pulls up on Earth. (Does it really make a difference which one of the pair is called the "action?")

Distinguish between internal and external forces acting on a given system.

Momentum

Be able to distinguish momentum and impulse. (Impulse is a CHANGE IN momentum).

Be able to deduce the outcome of a collision using conservation of momentum.

Use conservation of momentum $p_{(before)} = p_{(after)}$ for a system with no external forces acting it.

Energy

Be able to compute the work done by a force ($W = F_{(\text{parallel})}$ x displacement) and the rate at which work is done (Power = W/t).

Distinguish different forms of mechanical energy:
Kinetic Energy = $(1/2)mv^2$ Gravitational Potential Energy = mgh

Be able to solve problems such as: How fast does object go at the bottom ramp given some conditions by using conservation of energy.

Gravity / Satellite Motion

Be able to calculate the gravitational force between two objects whose centers are

separated by some distance. Know what it means when something obeys an "inverse-square law".

What are Kepler's Laws of Planetary Motion? What do they mean?

Vibrations & Waves

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 *constructiv*e and *destructive* interference.

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

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*?