Newtonian Mechanics

A. Kinematics *(Ch 2 & 3)*

Motion in One Dimension:

Students should understand the general relationships among position, velocity, and acceleration for the motion of a particle along a straight line so that:

- Given a graph of one of the kinematic quantities, position, velocity, or acceleration, as a function of time, they can recognize in what time intervals the other two are positive, negative, or zero, and can identify or sketch a graph of each as a function of time. *(2.1 - 2.4)*

Students should understand the special case of motion with constant acceleration so they can:

- Write down expressions for velocity and position as functions of time, and identify or sketch graphs of these quantities. *(2.6 - 2.7)*
- Use the equations $v = v_0 + a \cdot t$, $x = x_0 + v_0 \cdot t + \frac{1}{2} a \cdot t^2$, and $v^2 = v_0^2 + 2 \cdot a \cdot (x - x_0)$ to solve problems involving one-dimensional motion with constant acceleration. *(2.6 - 2.7)*

Motion in Two Dimensions:

Students should be able to add, subtract, and resolve displacement and velocity vectors so they can:

- Determine components of a vector along two specified, mutually perpendicular axes. *(3.1 - 3.3)*
- Determine the net displacement of a particle or the location of a particle relative to another. *(3.1 - 3.3)*
- Determine the change in velocity of a particle or the velocity of one particle relative to another. *(3.1 - 3.3)*

Students should understand the motion of projectiles in a uniform gravitational field so they can:

- Write expressions for the horizontal and vertical components of velocity and position as functions of time, and sketch or identify graphs of these components. *(3.4 - 3.5)*
- Use these expressions in analyzing the motion of a projectile that is projected above level ground with a specified initial velocity. *(3.4 - 3.5)*

Equations - Kinematics *(Ch 2 & 3)*:

$v = v_0 + a \cdot t$ $\quad$ $x = x_0 + v_0 \cdot t + \frac{1}{2} a \cdot t^2$ $\quad$ $v^2 = v_0^2 + 2 \cdot a \cdot (x - x_0)$

*** AP Course Outline information is taken from the Teacher's Guide to Advance Placement Courses in Physics, published by the College Entrance Examination Board and Educational Testing Service. ***