Study Guide

AP Physics 1 **Mr. Butler**

Vectors and 2D Kinematics

The student should know or be able to do the following:

1. Distinguish between vector and scalar quantities and provide examples of each.
2. Draw and identify vectors in a two-dimensional coordinate axes within a reference frame for vector, projectile and relative motion and identify the direction of vectors within this frame.
3. Distinguish between the *polygon* and *parallelogram* methods of vector addition and apply each to determine vector values.
4. Apply vector methods to determine the difference between two vectors and the product of a vector and scalar.
5. Distinguish between the *graphical* and *mathematical* methods of vector analysis and correctly use each to determine vector values.
6. Distinguish between vector *composition* and vector *resolution* and utilize vector properties to find vector resultants and components.
7. Apply the component method of vector composition to determine the resultant of a system of vectors.
8. Describe how projectile motion is analyzed in terms of separability and explain the particular horizontal and vertical motion features.
9. Distinguish a projectile's instantaneous velocity from its horizontal and vertical velocity components and apply linear kinematic equations to determine its range and time of flight.
10. Describe the shape of a projectile's path, distinguish a projectile's *inertial trajectory* from its *gravitational trajectory* and identify the complimentary angles which will produce identical ranges.
11. Identify the launch angle that produces a projectile's greatest range for a given initial velocity without air drag.
12. Use the principles of vectors and linear kinematics to describe projectile motion in terms of simultaneous independent horizontal and vertical motions.
13. Compare the vertical motion of an object dropped from rest and the vertical motion of a horizontally launched projectile in term of velocity, *g* and flight time.
14. Correctly identify and describe the horizontal and vertical velocities, accelerations and displacements for a projectile moving in the absence of air resistance.
15. Describe the motion of a projectile with and without the influence of air resistance.
16. Use the concepts of frame of reference and relative motion to describe relative velocity.
17. Apply vector principles and frame of reference to describe and calculate relative velocity.

NOTE: Review diagrams, graphs, worksheets, applets/films, and handout materials.