Study Guide

AP Physics C **Mr. Butler**

Rectilinear Kinematics

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

1. **Discuss the importance of identifying reference frames in order to describe motion and explain why all motion is relative.**

2. **Draw and identify coordinates axes within a reference frame for one-dimensional motion and identify the one-dimensional direction of motion within a reference frame.**

3. **Identify and define the quantities of motion and distinguish which are *vectors* and which are *scalars.***

4. **Distinguish between *distance* and *displacement* and use them to define and calculate speed and velocity.**

5. **Distinguish between *average velocity* and *average speed* and distinguish between *average velocity* and *instantaneous velocity*.**

6. **Correctly apply the general motion equations in solving one-dimensional motion problems.**

7. **Discuss the important features and results of Galileo's thought experiments involving the behavior of falling bodies and compare-contrast these results with contemporary views.**

8. **Describe the significant and important aspects and results of Galileo's inclined plane and free-fall experiments with particular focus given to the law of odd numbers and the law of squares.**

9. **Describe the details of the postulates of freely falling bodies set forth by the medieval scholars Oresme, Saxony and da Vinci and how these postulates differed from those of Galileo.**

10. **Describe the affect of air on the motion of a freely falling body and compare it to an object falling in a vacuum with particular focus on describing the body's net acceleration and *terminal velocity* for each case.**

11. **Distinguish *velocity* from *acceleration*, distinguish *average acceleration* from *instantaneous acceleration* and apply the general motion equations to solve motion problems involving these quantities.**

12. **Distinguish between *uniform velocity* and *uniform acceleration* and correctly apply the kinematic equations in solving problems involving constant acceleration, including freely falling objects.**

13. **Graphically interpret *average* from *instantaneous* quantities of velocity and acceleration and calculate numerical values for each of these quantities using graphical information and by applying the techniques involving *secant* and *tangent* lines.**

14. **Interpret and describe rectilinear motion from analyzing motion diagrams and *x, v* and *a* graphs and apply the skills of graphical analysis to draw motion diagrams and *x, v* and *a* graphs for any rectilinear motion.**

15. **Apply appropriate techniques to evaluate and interpret graphs of rectilinear motion in terms of slope and area under the curve.**

16. **Apply appropriate techniques to evaluate and interpret motion diagrams and be able identify the motion diagram to its corresponding functional motion graph.**

17. **Apply calculus methods of differentiation and integration to determine functional expressions for position, velocity and acceleration for non-constant accelerated motion and apply the technique of velocity and position by integration using initial conditions to determine quantities of motion.**

18. **Apply the correct use of the quadratic solution in kinematic equations for cases involving motion problems for which this application is required.**

19. **Correctly apply the physics problem solving method to all kinematic motion problems which involve algebraic derivations or numerical calculations involving calculus.**

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