Study Guide

AP Physics 1   **Mr. Butler**

Impulse, Momentum, and Collisions

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

1. Define momentum, state its unit, and recognize it as the fundamental quantity that describes motion.

2. Predict how a changing mass or velocity will affect an object's momentum and compare the momenta of objects of different mass.

3. Relate the rate of change of an object's momentum to the net force acting on it.

4. State momentum conservation, use it to describe the transfer of motion, and recognize situations for which the law does not hold true.

5. Describe impulse, recognize it as the mechanism of momentum change and motion transfer, and relate it to an object's momentum change.

6. Know the relationship between impulse, momentum change, acceleration and velocity change and relate these to Newton's 2nd law.

7. Relate the area under an F vs t graph to the impulse imparted to an object during some time interval and describe the shape of the graph curve with respect to the interacting forces acting between objects during a two-body collision.

8. Apply the impulse-momentum principle and momentum conservation to determine the mass and or velocity of objects before and after a two-body collision.

9. Identify action-reaction forces during a collision and apply Newton's 3rd law to describe how these forces cause impulse and momentum changes.

10. Use the concepts of impulse, momentum, and Newton's 3rd law to describe and explain the principle of rocket propulsion.

11. Distinguish between an object's *state of motion* and its *change in state of motion* and relate these to the cause-effect relationship produced by a net force.

12. Distinguish between one-dimensional and two-dimensional linear momentum.

13. Distinguish between *elastic* and *inelastic* collisions and for each, identify which quantities are conserved.

14. Apply momentum conservation to predict the motion of objects before and after a two-body collision.

15. Apply momentum conservation to solve one and two dimensional collision problems.

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