On-level Physics
Momentum

This unit will allow each student to:

a. gain a better understanding of momentum in the interactions of objects around us
b. continue making proper scientific measurements and calculations
c. define and properly use all vocabulary
d. properly apply all terms and concepts in describing/explaining real world examples
e. continue making and interpreting scientific graphs
f. teach someone else the concepts discussed
g. practice proper laboratory safety

This will be accomplished by each student that is able to:

1. recognize and relate SI and USCS units of force and momentum
2. recognize a force and momentum by the units only
3. relate momentum to inertia
4. recognize differences in the momentum of different objects
5. relate momentum and impulse
6. use the concept of impulse as an extension of Newton's laws of motion
7. state the law of conservation of momentum
8. distinguish between elastic and inelastic collisions
9. apply the law of conservation of momentum and Newton's Laws to collisions
10. perform calculations using proper problem solving techniques to determine: momentum and impulse – this includes net force and time due to a collision

Textbook Reference – Physics: Principles and Problems

Chapter 9 - Momentum and its Conservation (Sections 1 & 2)

Key Terms – *write the definitions of the boldface terms on your own paper, definitions are available at thetetersz one.net*

momentum, impulse, elastic collision, inelastic collision, system, law of conservation of momentum

Daily Grade: Daily questions/homework/review sheet
/30

Momentum Review - Answer on a separate sheet of paper due prior to the 20Q on Day 5

A. Which has the greater mass, a heavy truck at rest or a rolling skateboard? Which has more momentum?

B. Compare and contrast momentum and impulse.

C. What is the momentum of a 6 kg bowling ball rolling at 2 m/s?
   - If the bowling ball rolls into a pillow and stops in 1.5 s, calculate the net force it exerts on the pillow.

D. When the force of impact on an object is exerted over a longer time, does the impulse increase or decrease?

E. For a constant force, suppose the duration of impact on an object is doubled.
   - How much is the impulse increased?
   - How much is the resulting change in momentum increased?

F. In a car crash, why is it advantageous for an occupant to extend the time during which the collision takes place?

G. Why is it advantageous for a boxer to ride with a punch? Why should he avoid moving into an oncoming punch?

H. You are standing on a skateboard...
   a) When you throw a ball forward, do you experience an impulse?
   b) Do you experience an impulse when you catch a ball moving the same speed?
   c) Do you experience an impulse when you catch it and then throw it out again?
   d) Which impulse is greatest?

I. Why is more impulse delivered during a collision when bouncing occurs than during one when it doesn't?

J. Distinguish between an elastic and an inelastic collision.

K. State the law of conservation of momentum.

L. In terms of momentum conservation, why does a cannon recoil when fired?

M. Imagine that you are hovering next to the space shuttle in earth orbit. Your buddy of equal mass, who is moving at 4 km/hr with respect to the shuttle, bumps into you. If he holds onto you, how fast do you both move with respect to the ship?

N. You and a clown are sitting at rest on two carts with friction free wheels. The clown has 5 times your mass. You push the clown away from you. Completely describe the motion of you and the clown due to your push.