AP PHYSICS

Name: _____

Period: _____ Date: _____

DEVIL PHYSICS

BADDEST CLASS ON CAMPUS

GIANCOLI READING ACTIVITY
Lesson 7-1 to 7-3

1. Big Idea(s):
   a. The interactions of an object with other objects can be described by forces.
   b. Interactions between systems can result in changes in those systems.
   c. Changes that occur as a result of interactions are constrained by conservation laws.
2. Enduring Understanding(s):
   a. All forces share certain common characteristics when considered by observers in inertial reference frames.
   b. A force exerted on an object can change the momentum of the object.
   c. Interactions with other objects or systems can change the total linear momentum of a system.
   d. Certain quantities are conserved, in the sense that the changes of those quantities in a given system are always equal to the transfer of that quantity to or from the system by all possible interactions with other systems.
3. Essential Knowledge(s):
   a. A force exerted on an object is always due to the interaction of that object with another object.
      i. The acceleration of an object, but not necessarily its velocity, is always in the direction of the net force exerted on the object by other objects.
   b. If one object exerts a force on a second object, the second object always exerts a force of equal magnitude on the first object in the opposite direction.
   c. The change in momentum of an object is a vector in the direction of the net force exerted on the object.
   d. The change in momentum of an object occurs over a time interval.
      i. The force that one object exerts on a second object changes the momentum of the second object (in the absence of other forces on the second object).
      ii. The change in momentum of that object depends on the impulse, which is the product of the average force and the time interval during which the interaction occurred.
   e. The change in linear momentum for a constant-mass system is the product of the mass of the system and the change in velocity of the center of mass.
   f. The change in linear momentum of the system is given by the product of the average force on that system and the time interval during which the force is exerted.
      i. The units for momentum are the same as the units of the area under the curve of a force versus time graph.
      ii. The changes in linear momentum and force are both vectors in the same direction.

g. For all systems under all circumstances, energy, charge, linear momentum, and angular momentum are conserved. For an isolated or a closed system, conserved quantities are constant. An open system is one that exchanges any conserved quantity with its surroundings.

h. An interaction can be either a force exerted by objects outside the system or the transfer of some quantity with objects outside the system.

i. The boundary between a system and its environment is a decision made by the person considering the situation in order to simplify or otherwise assist in analysis.

4. Learning Objective(s):

a. The student is able to analyze a scenario and make claims (develop arguments, justify assertions) about the forces exerted on an object by other objects for different types of forces or components of forces.

b. The student is able to describe a force as an interaction between two objects and identify both objects for any force.

c. The student is able to construct explanations of physical situations involving the interaction of bodies using Newton's third law and the representation of action-reaction pairs of forces.

d. The student is able to use Newton's third law to make claims and predictions about the action-reaction pairs of forces when two objects interact.

e. The student is able to justify the selection of data needed to determine the relationship between the direction of the force acting on an object and the change in momentum caused by that force.

f. The student is able to justify the selection of routines for the calculation of the relationships between changes in momentum of an object, average force, impulse, and time of interaction.

g. The student is able to predict the change in momentum of an object from the average force exerted on the object and the interval of time during which the force is exerted.

h. The student is able to analyze data to characterize the change in momentum of an object from the average force exerted on the object and the interval of time during which the force is exerted.

i. The student is able to design a plan for collecting data to investigate the relationship between changes in momentum and the average force exerted on an object over time.

j. The student is able to calculate the change in linear momentum of a two-object system with constant mass in linear motion from a representation of the system (data, graphs, etc.).

k. The student is able to analyze data to find the change in linear momentum for a constant-mass system using the product of the mass and the change in velocity of the center of mass.

l. The student is able to apply mathematical routines to calculate the change in momentum of a system by analyzing the average force exerted over a certain time on the system.

m. The student is able to perform analysis on data presented as a force-time graph and predict the change in momentum of a system.

n. The student is able to define open and closed systems for everyday situations and apply conservation concepts for energy, charge, and linear momentum to those situations.

5. Read sections 7-1 to 7-3 in your textbook.

6. Key Topics:

a. Linear momentum

b. Newton's Second Law (in terms of momentum)

c. Rate of Change of Momentum

d. Identifying variables in equations as being before or after a collision

e. Law of Conservation of Momentum for two bodies colliding (not necessarily human bodies, but any two bodies of mass)

f. Isolated system

g. External forces

h. Impulse

i. Finding Impulse from a Graph

7. Develop a quiz of at least 15 questions covering the most key topics in #6 above. Ten of these will be concept questions and five will be problems. ***Provide answers for the concept questions and solutions for the problems***.

   a. **Concept Questions**: They can be multiple choice, true/false, short answer, fill-in-the blank, essay, or any combination of the previous. Humorous questions are also encouraged, BUT are accepted only in ADDITION TO the 5 serious ones.

   b. **Problems**: Come up with five word problems that are at least somewhat realistic and deal with the concepts/equations in this section

   c. Creative or thought-provoking questions/problems are encouraged.

   d. Don't forget to include answers/solutions!

   e. Secondary skills I would also ***like*** you to work on include:

      i. Use of Microsoft Equations to write equations.

      ii. Use of the outline functions of MS Word to make sequentially numbered questions and sub-questions.

      iii. Diagrams or shapes to accompany your quiz questions for clarification. Use of MS Shapes function or Insert Clipart is highly encouraged.

      iv. Using underlining in conjunction with the tab functions to make fill-in-the blank questions.

      v. Use of textboxes to create an area for name, date and period.

      vi. Creating a boxed heading using the border function.

      vii. Creating a logo of your own design (Devil Physics is already taken) with a picture or clipart and creative font.

      viii. Items i-vii above are not required for your grade, but offer an excellent opportunity to improve your computer skills for use in future assignments/projects/activities.

8. This assignment may be typed or neatly printed. Drawings may be freehand, but try to make use of the 'Shapes' or 'Insert Clipart" functions of MS Word. If you submit this assignment electronically, the ***filename*** (**not just the subject line of the e-mail**) must be in the following format, "LastnameFirstinitialPerXReadActX-X". You ***do not*** need include a copy of these instructions with the assignment you hand in.