

Name: _____

Period: _____ Date: _____

GIANCOLI READING ACTIVITY**Section 7-4 to 7-6**

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. A force exerted on an object can change the momentum of the object.
 - b. Interactions with other objects or systems can change the total linear momentum of a system.
 - c. 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.
 - d. The linear momentum of a system is conserved.
3. Essential Knowledge(s):
 - a. 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.
 - b. 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.
 - c. 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.
 - d. An interaction can be either a force exerted by objects outside the system or the transfer of some quantity with objects outside the system.
 - e. 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.
 - f. In a collision between objects, linear momentum is conserved. In an elastic collision, kinetic energy is the same before and after.
 - i. In a closed system, the linear momentum is constant throughout the collision.
 - ii. In a closed system, the kinetic energy after an elastic collision is the same as the kinetic energy before the collision.

- g. In a collision between objects, linear momentum is conserved. In an inelastic collision, kinetic energy is not the same before and after the collision.
 - i. In a closed system, the linear momentum is constant throughout the collision.
 - ii. In a closed system, the kinetic energy after an inelastic collision is different from the kinetic energy before the collision.

4. Learning Objective(s):

- a. 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.
- b. 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.
- c. 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.
- d. 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.
- e. 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.).
- f. 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.
- g. 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.
- h. The student is able to make qualitative predictions about natural phenomena based on conservation of linear momentum and restoration of kinetic energy in elastic collisions.
- i. The student is able to apply the principles of conservation of momentum and restoration of kinetic energy to reconcile a situation that appears to be isolated and elastic, but in which data indicate that linear momentum and kinetic energy are not the same after the interaction, by refining a scientific question to identify interactions that have not been considered. Students will be expected to solve qualitatively and/or quantitatively for one-dimensional situations and only qualitatively in two-dimensional situations.
- j. The student is able to apply mathematical routines appropriately to problems involving elastic collisions in one dimension and justify the selection of those mathematical routines based on conservation of momentum and restoration of kinetic energy.
- k. The student is able to design an experimental test of an application of the principle of the conservation of linear momentum, predict an outcome of the experiment using the principle, analyze data generated by that experiment whose uncertainties are expressed numerically, and evaluate the match between the prediction and the outcome.
- l. The student is able to classify a given collision situation as elastic or inelastic, justify the selection of conservation of linear momentum and restoration of kinetic energy as the appropriate principles for analyzing an elastic collision, solve for missing variables, and calculate their values.
- m. The student is able to make predictions of the dynamical properties of a system undergoing a collision by application of the principle of linear momentum conservation and the principle of the conservation of energy in situations in which an elastic collision may also be assumed.

- n. The student is able to classify a given collision situation as elastic or inelastic, justify the selection of conservation of linear momentum and restoration of kinetic energy as the appropriate principles for analyzing an elastic collision, solve for missing variables, and calculate their values.
 - o. The student is able to qualitatively predict, in terms of linear momentum and kinetic energy, how the outcome of a collision between two objects changes depending on whether the collision is elastic or inelastic.
 - p. The student is able to plan data collection strategies to test the law of conservation of momentum in a two-object collision that is elastic or inelastic and analyze the resulting data graphically.
 - q. The student is able to apply the conservation of linear momentum to a closed system of objects involved in an inelastic collision to predict the change in kinetic energy.
 - r. The student is able to analyze data that verify conservation of momentum in collisions with and without an external friction force.
 - s. The student is able to classify a given collision situation as elastic or inelastic, justify the selection of conservation of linear momentum as the appropriate solution method for an inelastic collision, recognize that there is a common final velocity for the colliding objects in the totally inelastic case, solve for missing variables, and calculate their values.
 - t. The student is able to apply the conservation of linear momentum to a closed system of objects involved in an inelastic collision to predict the change in kinetic energy.
5. Read section 7-6 in your textbook.
 6. Read *The Charge of the Light Brigade* by Alfred, Lord Tennyson on the next page.
 7. Describe how each of the following is illustrated in this poem. Creativity and poetic license are allowed and encouraged.
 - a. Linear momentum
 - b. Newton's Second Law
 - c. Elastic Collision
 - d. Inelastic Collisions
 - e. Impulse
 - f. Conservation of Momentum
 - g. Conservation of Kinetic Energy In Elastic Collisions
 8. FYI – This is my favorite Reading Activity of all time!
 9. 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 must be in the following format, "LastnameFirstinitialPerXReadActX-X". You do not need to include a copy of these instructions with the assignment you hand in.

The **Charge of the Light Brigade** was a [charge](#) of British [cavalry](#) led by [Lord Cardigan](#) against Russian forces during the [Battle of Balaclava](#) on 25 October 1854 in the [Crimean War](#). The charge was the result of a miscommunication in such a way that the brigade attempted a much more difficult objective than intended by the overall commander [Lord Raglan](#). Blame for the miscommunication has remained controversial, as the original order itself was vague. The charge produced no decisive gains and resulted in very high casualties, and is best remembered as the subject of the poem "[The Charge of the Light Brigade](#)" by [Alfred, Lord Tennyson](#), whose lines emphasize the valour of the cavalry in carrying out their orders, even "tho' the soldier knew / Some one had blunder'd". http://en.wikipedia.org/wiki/Charge_of_the_Light_Brigade

The Charge of the Light Brigade

Half a league, half a league,
Half a league onward,
All in the valley of Death
Rode the six hundred.

'Forward, the Light Brigade!
Charge for the guns' he said:
Into the valley of Death
Rode the six hundred.

'Forward, the Light Brigade!
Was there a man dismay'd?
Not tho' the soldiers knew
Some one had blunder'd:

Theirs not to make reply,
Theirs not to reason why,
Theirs but to do and die:
Into the valley of Death
Rode the six hundred.

Cannon to the right of them,
Cannon to the left of them,
Cannon in front of them
Volley'd and thunder'd;

Storm'd at with shot and shell,
Boldly they rode and well,
Into the jaws of Death,
Into the mouth of Hell
Rode the six hundred.

Flash'd all their sabres bare,
Flash'd as they turned in air
Sabring the gunners there,
Charging an army while
All the world wonder'd:

Plunged in the battery-smoke
Right thro' the line they broke;
Cossack and Russian
Reel'd from the sabre-stroke
Shatter'd and sunder'd.
Then they rode back, but not
Not the six hundred.

Cannon to right of them,
Cannon to left of them,
Cannon behind them
Volley'd and thunder'd;

Storm'd at with shot and shell,
While horse and hero fell,
They that had fought so well
Came thro' the jaws of Death,
Back from the mouth of Hell,
All that was left of them,
Left of six hundred.

When can their glory fade?
O the wild charge they made!
All the world wonder'd.

Honour the charge they made!
Honour the Light Brigade,
Noble six hundred!