|  |
| --- |
| Unit 6- Momentum and Impulse |
| * **Momentum** is a measure of how hard it is to stop a moving object; it is the product of the object's mass and its velocity; since velocity is a vector, momentum is a vector quantity; its symbol is *p* and SI unit is *kg m/sec*. The direction of the momentum is the same as that of the velocity. **p= m v**
* **Impulse** describes how a force acts over a time interval to change momentum. Its symbol is *I* and the SI unit is *N sec.* **J = F t**
* Momentum is closely related to Newton’s 2nd law. The more momentum an object has, the harder it is to change its motion.

j0282058, when mass is constant.* Impulse describes how forces change momentum. **J = F t = p = mv**
* The impulse-momentum relation shows that for a change in momentum, if force acts for a longer period of time, the average force applied will be less. This idea has led to many safety devices employed in automobiles (air bags, seat belts, padded bumpers, crumple zones, etc.)
* **Momentum and Impulse:**

When playing baseball or any other sport where you strike a ball with a bat, club, stick, or racquet, you “follow through” with your swing in order to increase the time of impact. This allows the same amount of force to cause a greater increase in the change of momentum. |
| **Conservation of Momentum*** **During isolated interactions (collisions) between two objects, the momentum of the system remains constant**. Isolated interactions means that the only forces present are the action/reaction forces of the collision.
* There are two types of collisions: ***Elastic and Inelastic***. Momentum is conserved in both types of collisions. ***Elastic collisions conserve KE, while Inelastic collisions do not.***
* ***Elastic collisions can generally be classified as “bouncing collisions”.*** Technically, the objects should bounce without making contact. This really can only occur at the sub-atomic level where electric charge provides the necessary interaction.

Momentum is conserved: m1v1i + m2v2i = m1v1f + m2v2f (all v’s are velocity vectors)KE is conserved: ½ m1v1i2 + ½ m2v2i2 = ½ m1v1f2 + ½ m2v2f2 (all v’s are velocity vectors)* ***Inelastic collisions can generally be classified as “sticking collisions”.*** Technically, any collision in which KE is not conserved is inelastic. Almost all real-life collisions are inelastic to some extent. Only momentum is conserved in a sticking collision.

**Inelastic Collision – Sticking CollisionElastic Collision- Bouncing CollisionNote: Both cars have the same mass.** |

Unit 7 Calendar

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Monday | Tuesday | Wednesday | Thursday | Friday |
| Momentum | Conservation of Momentum | Collision Lab | Review | Test |

Unit 7 Objectives:

Phy.1.3 Analyze the motion of objects based on the principles of conservation of momentum, conservation of energy, and impulse.

Phy.1.3.1 Analyze the motion of objects involved in completely elastic and completely inelastic collisions by using the principles of conservation of momentum and conservation of energy.

Phy.1.3.2 Analyze the motion of objects based on the relationship between momentum and impulse.