AP Physics 1

CONSERVATION OF MOMENTUM AND COLLISIONS

I. Conservation of momentum

- In the absence of a net external force, momentum is conserved during a collision.
- The momentum of the system before the collision must be equal to the momentum of the system after the collision.
  - $\Sigma p_o = \Sigma p_f$
- The momentum of each object within the system may increase or decrease, but the total remains the same.

- Pay attention to the directions of motion before and after the collision.
- Maintain a consistent coordinate system to distribute negatives correctly.

- Momentum of each axis must be conserved.
- For example, if an object is moving with a velocity that is directed 45 degrees above the horizon, then it has momentum that is partially vertical and partially horizontal.
- The two are conserved independent of one another.

II. Type of Collisions

- Inelastic collisions
  - Momentum is conserved during collisions; however, some kinetic energy is transferred to other forms of energy. (ex: sound, heat, light, etc)
  - Describes most everyday collisions
  - Perfectly inelastic collisions occur when the colliding objects stick together and move as one after the collision.

II. Type of Collisions

- Elastic collisions
  - Momentum and kinetic energy are conserved
  - Usually confined to collisions on the atomic level.
  - You must check the total kinetic energy before and after to confirm that the collision is elastic.

III. Tips for Solving Collisions

- Conservation of momentum is used at the collision.
- Conservation of energy, including non-conservative forces, are used prior to and after a collision.
- If using conservation of energy after a collision, the initial energy is not necessarily where the object started … it is at the point right after the collision