



Flipping Physics Lecture Notes:

Introduction to Elastic and Inelastic Collisions

Let's begin with two different types of collisions:

- Elastic
 - The two objects bounce off of one another.
 - Total momentum is conserved.
 - Remember momentum is conserved in *all* collisions and explosions.
 - Total kinetic energy is conserved.
 - Examples: Billiard balls, air hockey pucks.
- Inelastic
 - Total momentum is conserved.
 - Why?
 - Total kinetic energy is **not** conserved.
 - Kinetic energy is converted to heat and sound.
 - When the objects collide, they deform. That deformation causes friction inside the objects to increase the internal energy of the objects. (Internal friction increases the object's temperature.)
 - *Perfectly* Inelastic: The two objects stick together after the collision.
 - Examples: Clay object sticking to another object, two football players colliding (and holding one another close!), two railroad cars coupling.
 - Inelastic Examples: All real world “bounce” collisions.
 - At the atomic level collisions are often elastic, however, in the macroscopic world we live in, elastic collisions are an “ideal case” which is never quite achieved. There is always some deformation of the objects and therefore some kinetic energy converted to internal energy of the objects. Sadly, even billiard balls do not collide elastically though physicists do approximate the collisions as elastic and so do we, for the sake of this class.

Type of Collision	Is Momentum Conserved?	Is Kinetic Energy Conserved?
Elastic	Yes	Yes
Inelastic	Yes	No

Just so you know, collisions between hard spheres are “nearly” elastic and therefore are generally considered to be elastic in physics classes.

Also, sometimes “Perfectly Inelastic” Collisions are called “Completely Inelastic” or “Totally Inelastic”. These terms all mean the same thing.