Notes: Forces Part 2: Newton's First and Third Laws of Motion

First we need to define the word **FORCE**:

- The cause of motion (_____)
- Two types of forces
  - _____
  - _____

Forces may be _____ or _____

- **Balanced forces** – all forces acting on an object are _____
  - There is _____ or object is moving at a_____
- **Unbalanced forces** – one or more forces acting on an object are _____ than others
  - There is _____ and a net force _____

Objects at Rest

- Objects at rest tend to stay at rest unless acted upon by an _____. [push or pull]
- Newton described this tendency as _____.
- **Inertia** can be described as the tendency of an object to keep doing whatever it's doing.
  - * Inertia is NOT_____!

Mass is the _____ in an object.

The more _____ an object has, the more _____ the object has.

Bigger objects are _____ to start & stop

What about objects that are already in motion?

Newton stated that objects in motion tend to _____ until acted upon by an _____.

Newton's 1st Law (also known as the _____)

- A moving object moves in a _____ with _____ unless an _____ acts on it.
- The tendency of an object at rest to _____ and an object in motion to _____ unless acted upon by an _____.
- **Objects do not change their motion unless an unbalanced force acts on them!**

Newton's 3rd Law (_____)

- Newton's third law describes something else that happens when one object exerts a force on another object.
- According to **Newton's third law of motion**, forces always _____ with equal _____ and opposite _____.
- Another way of saying this is _____.
- This means that when you push on a wall, the _____ with a force equal in strength to the force you exerted.

Action and Reaction Forces _____

- The forces exerted by two objects on each other are often called an _____.
- Either force can be considered the action force or the reaction force.
- Action and reaction force pairs don't cancel because they act on different objects; _____ _____.
- You constantly use action-reaction force pairs as you move about.

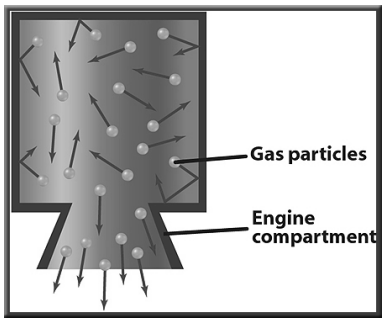
Examples of Newton 3rd Law Pairs:

- When you jump, you push down on the ground.
  - The ground then pushes up on you. It is this upward force that pushes you into the air.
- When a bird flies, its wings push in a downward and a backward direction.
  - This pushes air downward and backward.
  - By Newton's third law, the air pushes back on the bird in the opposite directions—upward and forward.
  - This force keeps a bird in the air and propels it forward.

Large and Small Objects

- When you walk forward, you push backward on the ground.
- Your _____ pushes Earth _____, and _____ pushes your shoe _____.
- Earth has so much _____ compared to you that it does not move noticeably when you push it.
- If you step on something that has less mass than you do, like a skateboard, you can see it being pushed back.

A Rocket Launch



- When the rocket fuel is ignited, a hot gas is produced.
- As the gas molecules collide with the inside engine walls, the walls exert a force that pushes them out of the bottom of the engine.
- This downward push is the _____.
- The reaction force is the _____ on the rocket engine by the gas molecules.
- This is the thrust that propels the rocket upward.