

Newton's Laws Notes

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Isaac Newton

- Figured out that certain things happen to all objects in the universe relating to their motion.
- He developed 3 laws to explain how motion works.

Newton's First Law of Motion

- aka Law of Inertia
- An object at rest stays at rest unless acted on by an outside force.
- An object in motion stays in motion unless acted on by an outside force.

Inertia

- An object's resistance to change.
- The more mass an object has the more inertia it has.
 - This means the more mass an object has the harder it will be to:
 - Slow Down/Speed Up
 - Start moving if stopped.
 - Change directions
- Inertia and gravity are not the same thing. Even when there is no gravity, an object will still have inertia.

Explain the scientific purpose of seatbelts.

- According to Newton's 1st Law, inertia is the resistance to change in motion.
- If you are traveling in a car that is going 60 mph, that means that your body is also traveling at 60mph.
- If the driver suddenly slams on the brakes, your body will continue to move at the same speed until an outside force acts on it.
- The seatbelt is the outside force that acts on my body to stop it from continuing to move forward.

Newton's Second Law

- Acceleration is produced when a force acts on a mass.
- The greater the mass of the object, the greater the amount of force needed to accelerate the object.

Balanced and Unbalanced Forces

- Balanced forces = NO movement
 - Opposite forces cancel each other out.
- Unbalanced Forces = Movement
 - One force is stronger than another
 - The object will move in the direction of the stronger force.

Net Force

- The resulting force.
- If the forces are being applied in OPPOSITE directions, you will subtract.
- If the forces are being applied in the SAME direction, you will add.

Net Force Example



10 N

3N →

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7N

Force According to the 2nd Law

- If an object is in motion and more force is applied to it the object will begin to move faster.
- If two objects have the same mass and a greater force is applied to one of the objects, the object that received the greater force will change speed quicker.
- If an object must be slowed down, the force being applied to it, must be greater than the force being exerted by the object.

Newton's 3rd Law of Motion

- aka the Law of Action and Reaction
- For every action, there is an equal and opposite reaction.
- Examples:
 - A person pushes against the wall (Action Force), and the wall exerts an equal and opposite force against the person. (Reaction Force).

Gravity

- On Earth, gravity pulls objects down toward the center of the Earth.
- As an object falls, its speed will continually increase.
- When an object is thrown, gravity will make the object slow down and fall toward the Earth.

Gravity

- Gravitational force depends on the mass of the two objects and the distance they are apart.
 - The further apart, the less the attraction.
 - The larger they are the more the attraction.

Friction

- The slowing force of friction always acts in the direction opposite to the force causing the motion.
- Friction can make it difficult to make an object start moving.
 - Enough force has to be applied to overcome the friction.
- The smoother the two surfaces are, the less friction there is. The object will then not slow down as quickly.
- As an object gets heavier, the friction between the two surfaces becomes greater.

Friction

- Friction can be reduced by:
 - Smooth Surfaces
 - Use of wheels
 - Lubricating/oiling the surfaces.
- 2 things that can change the amount of friction:
 - The types of surfaces
 - The force pressing the surfaces together.