Created by:
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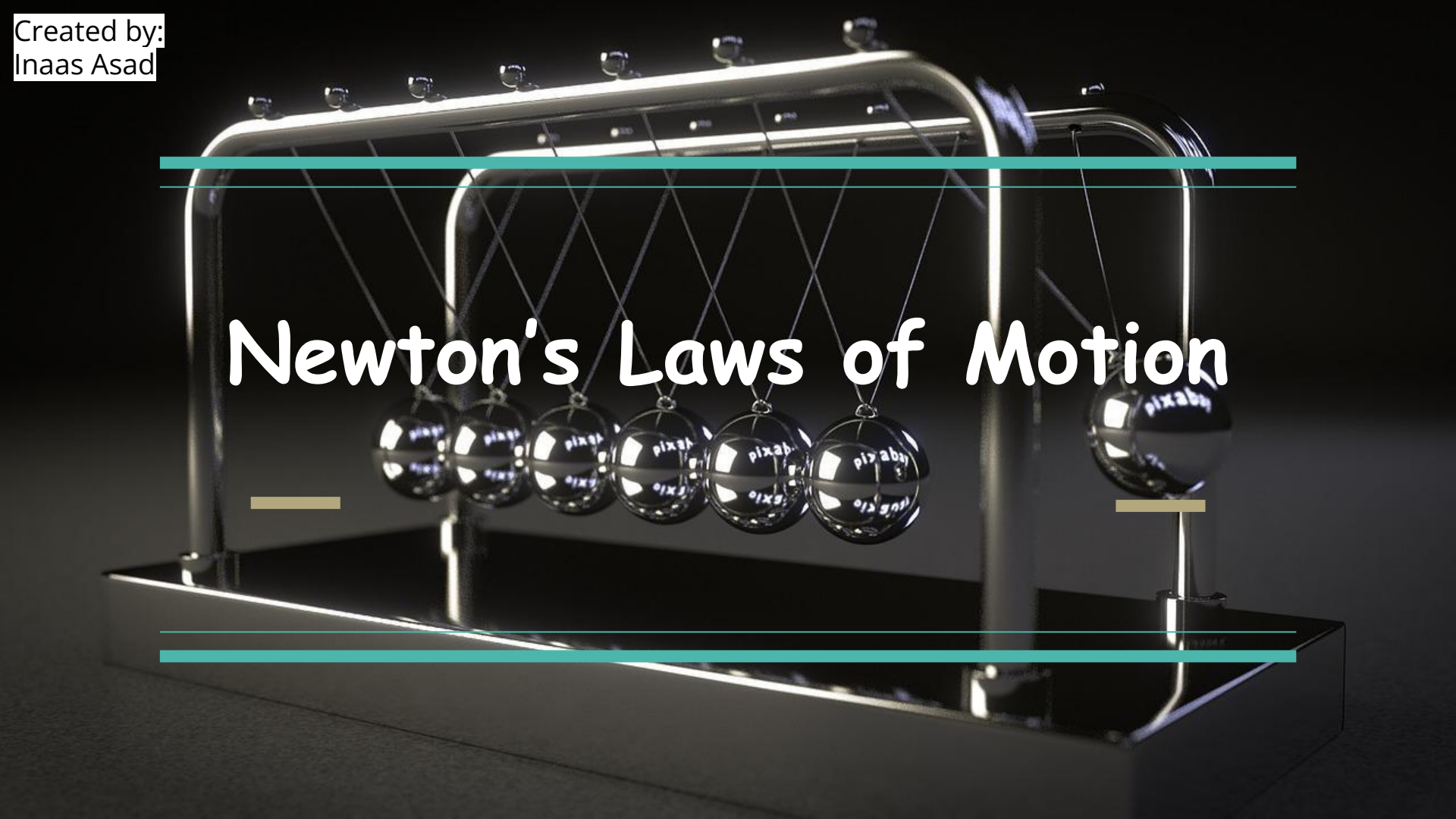


Newton's Laws of Motion

Introduction

Isaac Newton discovered three laws of motion which all matter obeys. They describe the relation between a body and the forces acting upon it and the body's response to the forces.

Let's take a look at them one by one!

Newton's First Law

An object at rest remains at rest, or if in motion, remains in motion unless acted on by a net force.

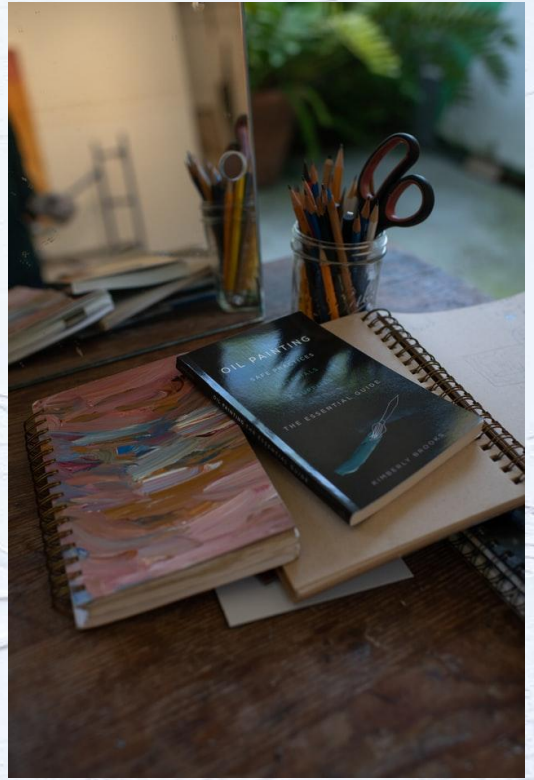
So what does that mean?

- An object at rest will not move unless a force acts on it.
- Similarly, a moving object would only slow down due to external forces such as friction. If friction didn't exist, for example in space, it would keep moving forever.

Newton's First Law Example

Let's say you were to push your book across the table. You would expect it to move a few inches and stop. It doesn't stop moving magically by itself. Here's why.

Here on Earth, we have numerous forces such as friction, air resistance and gravity. When you pushed the book, these forces slowed it down and eventually stopped it from moving.



What if you pushed the same book in space?

Well in space, forces such as gravity, air resistance and friction do not exist.

So if you were to throw a book out of your spacecraft into space, it would just keep moving at the same speed in a straight line forever. Yes. Forever. It would only change its velocity if it collided with another object.

Newton's Second Law

F = ma

Force = mass x acceleration

Force is measured in Newtons (N).

Acceleration is the rate of change in velocity, and it's measured in meters per second squared (m/s^2).

Mass is how much matter a body is made up of, and it's measured in kilograms (kg).

Newton's Second Law

The equation F=ma explains the relation of an object's mass and the force applied upon it to its motion.

The greater the object's mass, the harder it will be to move it.

The greater the force applied to it, the faster it will accelerate.

Let's take a look at an example to understand this.

Newton's Second Law Example

Let's say you have a pencil and a heavy book. The pencil's mass is way less than that of the book.

What would happen if you push both of them with the same amount of force? (Try it out yourself at home!)

The pencil would accelerate and move faster than the book because of its smaller mass.

Newton's Second Law Example 2

Now let's take two identical pencils. Both of them have the same mass.

What would happen if you pushed one pencil with a large force and the other one with a small force?

Due to the greater force, the first pencil will undergo a greater acceleration.

Try out some experiments yourself to further understand this concept!

Newton's Third Law

Every action has an equal and opposite reaction.

This means that when you exert a force on an object, the object will exert an equal force in the opposite direction on you.

For example, when you sit on a chair, you don't go right through it. You exert a force on the chair, and the chair exerts a force on you which keeps you seated on it.

Another example would be pushing a wall. When you push the wall, it keeps still by exerting an equal force on you.

Pushing a wall


Hope you enjoyed
your lesson!