Newton's First Law – GCSE Physics

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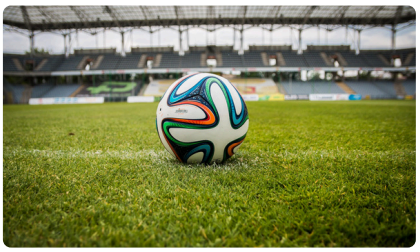
1. Introduction:

- **Motion** is the change in position of an object with respect to time.
- **Newton's First Law of Motion** explains how objects behave when no external forces act on them.
- An object in motion stays in motion with the same **Speed** and same **Direction** unless an **External Force** act on it.

Examples:

Sudden Brake in a Car



A Ball on the Ground

Riding on a Swing

Standing in a Bus

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2. What is Newton's First Law of Motion?

- It States that a **Resultant Force** is required to change the Motion of an object.
- **Newton's First Law of Motion** is also called **Inertia** because it describes the concept of Inertia which is,

The Natural tendency of an objects to Resist changes in their state of Motion.

Examples:

- A satellite in space continues moving unless acted upon by gravity.

- The ketchup stays at the bottom until the force overcomes its inertia.

- A bike stays balanced while moving

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3. What are Balanced and Unbalanced Forces?

Balanced Force:

- Forces acting on an object are equal in **Magnitude** but opposite in **Direction**.
- They cancel each other out, so the Resultant Force is **Zero.**

$$F_R = 0$$

Characteristics:

- No change in Motion.
- Object or Body remains at rest or continues at Constant Velocity.

Examples:

Book on a Table

Car moving with Constant Velocity

Hanging Picture frame

Floating Boat

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Unbalanced Force:

- Forces acting on an object are not equal in **Unbalanced Force.**
- They do not cancel each other out, so the Resultant Force is **non-zero.**

$$F_R \neq 0$$

Characteristics:

- Change in Motion.
- Object or Body accelerates (speed up, speed down or change direction).

Examples:

Falling Ball

Pushing a Car

Braking a Bicycle

Kicking a Football

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4. Real-life Examples

- A rolling soccer ball slows down and stops because **Inertia** keeps it moving, but friction and air resistance act as external forces to stop it.

- When we beat a carpet, dust particles fall out because the carpet moves, but dust tends to stay at rest until gravity pulls it down.

- In a collision, seatbelts prevent passengers from flying forward.

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5. FAQs

1. What is Newton's First Law in simple terms?
It means that an object will keep doing what it's doing - moving or staying still — unless a force changes that.

2. What does "an object in motion stays in motion" mean?
It means that a moving object will keep going at the same speed and in the same direction unless something like friction or another force slows it down.

3. What is the difference between balanced and unbalanced forces?
Balanced forces don't change motion. **Unbalanced forces** cause an object to speed up, slow down, or change direction.

4. How is Newton's First Law used in real life?
It's seen when a car stops suddenly, and passengers jerk forward — their bodies want to keep moving because of **Inertia.**

5. Is gravity part of Newton's First Law?
Gravity is a force, and Newton's First Law explains how forces like gravity can change an object's motion. So, **Gravity** can act as the external force mentioned in the law.