

RADIANT

2026

Physics

Laws of Motion

Lecture - 02

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Topics *to be covered*



1

Mass and Inertia

2

Kinds of Inertia

3

Newton's First Law of Motion

4

Linear Momentum ($p = mv$)

5) Newton's Laws of Motion



Recap *of previous lecture*

1

Force

2

Contact Forces

3

Non-Contact Forces



Speed $\uparrow$

(A) Work

(B) $\rightarrow$ force

(C) $\rightarrow$ Power

(i) Contact force

A $\rightarrow$ gravitational

B $\rightarrow$ Magnetic

C $\rightarrow$ friction

D $\rightarrow$ Radiant force

(i) Energy

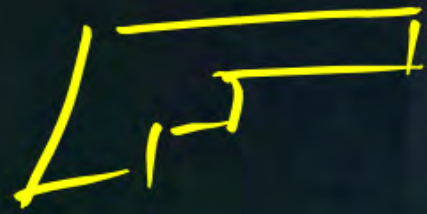
(ii) Mass



Mass and Inertia



- ❖ Inertia is an inherent property of each body by virtue of which it has a tendency to resist the change in its state of rest or state of motion.
- ❖ The property of inertia is because of the mass of the body. The greater the mass, the greater is the inertia of body.
- ❖ Thus, a lighter body has less inertia than a heavier body. In other words, more the mass of a body, more difficult it is to move the body from rest (or to stop the body if it is initially in motion).
- ❖ Thus mass is a measure of inertia.



Rest $\xrightarrow{\text{Inertia}}$ Rest

Motion $\xrightarrow{\text{Inertia}}$ Motion

State $\rightarrow \textcircled{X}$



Kinds of Inertia



Mass and Inertia

Objects with more mass
Have more inertia than an
Object with a smaller mass.

$M \downarrow$



- (i) Inertia of Rest
- (ii) Motion
- (iii) Direction



Kinds of Inertia



Inertia of rest

If a body is at rest, it will remain at rest unless an external force is applied to change its state of rest. This property of body is called the inertia of rest.







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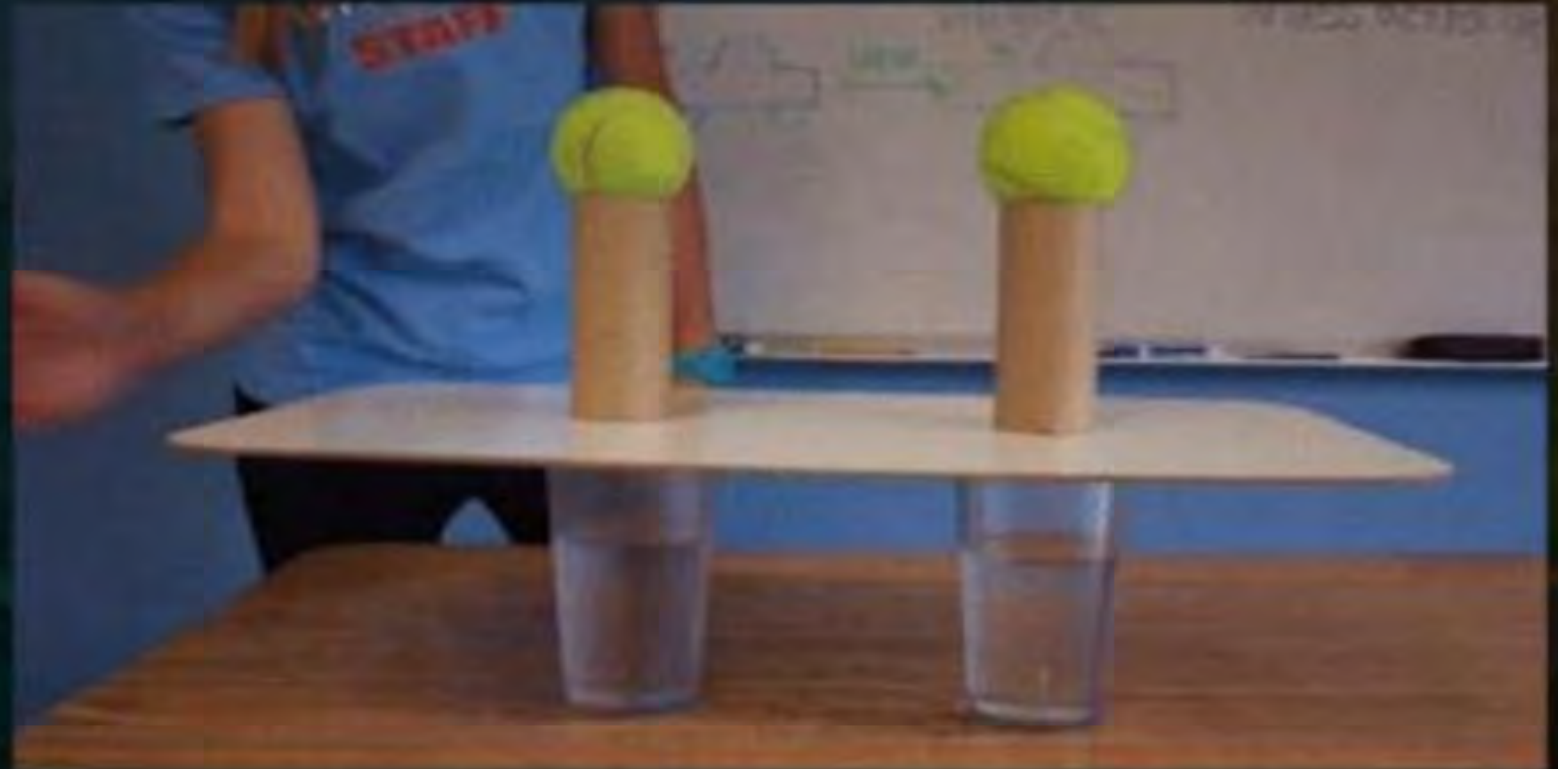


Kinds of Inertia



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Examples:

- (1) When a train suddenly starts moving forward, the passenger standing in the compartment tends to fall backwards.
- (2) When a hanging carpet is beaten with a stick, the dust particles start falling out of it: The reason is that the part of the carpet.
- (3) On shaking (or giving jerks to) the branches of a tree, the fruits fall down.



Kinds of Inertia

Law of inertia:

A body does not change its state of rest or of uniform motion unless an external force compels it to change that state.





Kinds of Inertia



Inertia of motion

A body in a state of motion, continues to be in the state of motion with the same speed in the same direction in a straight line unless an external force is applied on it to change its state. This property of body is called the inertia of motion.

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(i) Rest $\xrightarrow{\text{I}}$ Rest

(ii) Motion $\xrightarrow{\text{I}}$ Motion

(iii) Direction $\xrightarrow{\text{I}}$ Same

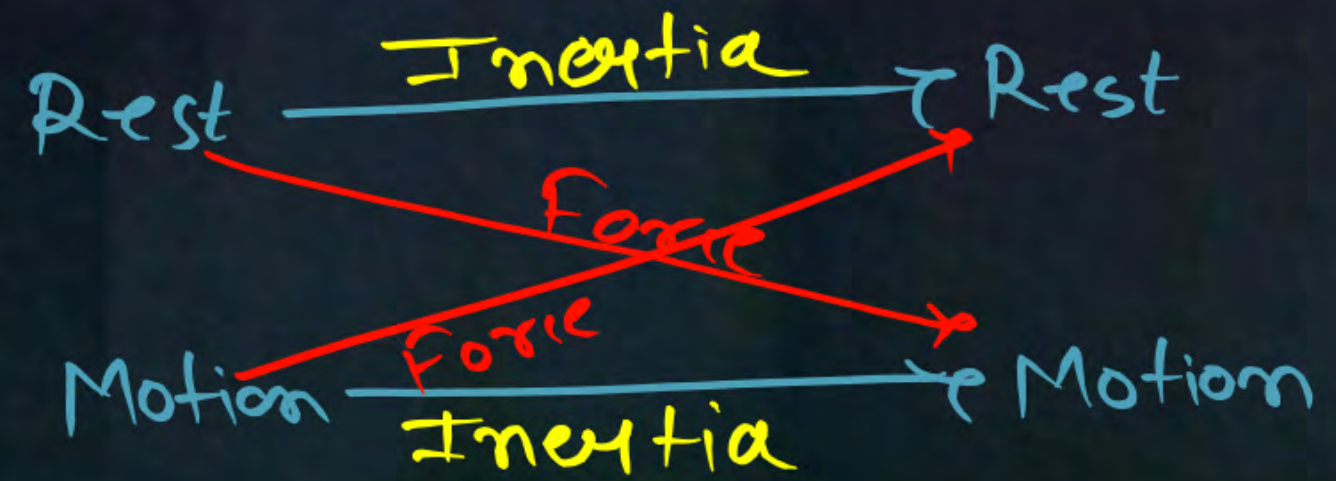




Newton's First Law of Motion



③ law





Newton's First Law of Motion

- (i) If a body is at rest, it remains at rest unless a force is applied on it.
- (ii) If a body is moving, it will continue to move with the same speed in the same direction unless a force is applied on it.

Newton put the above observations in the form of a law which is called the Newton's first law of motion.

Statement: According to Newton's first law of motion, if a body is in a state of rest, it will remain in the state of rest and if it is in the state of motion, it will remain moving in the same direction with the same speed unless an external force is applied on it.



Newton's First Law of Motion



Qualitative discussion

Newton's first law can be understood in the following two parts:

- (i) definition of inertia, and
- (ii) definition of force.



Newton's First Law of Motion



Force is that external cause which tends to change the state of rest or the state of motion of an object.

Note:

- (i) Force is a vector quantity.
- (ii) The sum of two equal and opposite forces is zero.
- (iii) A body acted upon by several forces can also have the resultant net force on it, equal to zero.

Question



The property of inertia is more in:

mass

- A** a car
- B** a truck ✓
- C** a horse cart
- D** a toy car

Question



The property of inertia is more in:

- A** a car
- B** a truck
- C** a horse cart
- D** a toy car

Ans. (B) a truck

Question



A force is needed to:

- A** change the state of motion or state of rest of the body
- B** keep the body in motion
- C** keep the body stationary
- D** keep the velocity of body constant

Question



A force is needed to:

- A** change the state of motion or state of rest of the body
- B** keep the body in motion
- C** keep the body stationary
- D** keep the velocity of body constant

Ans. (A) change the state of motion or state of rest of the body

 **Thank** *You* 