

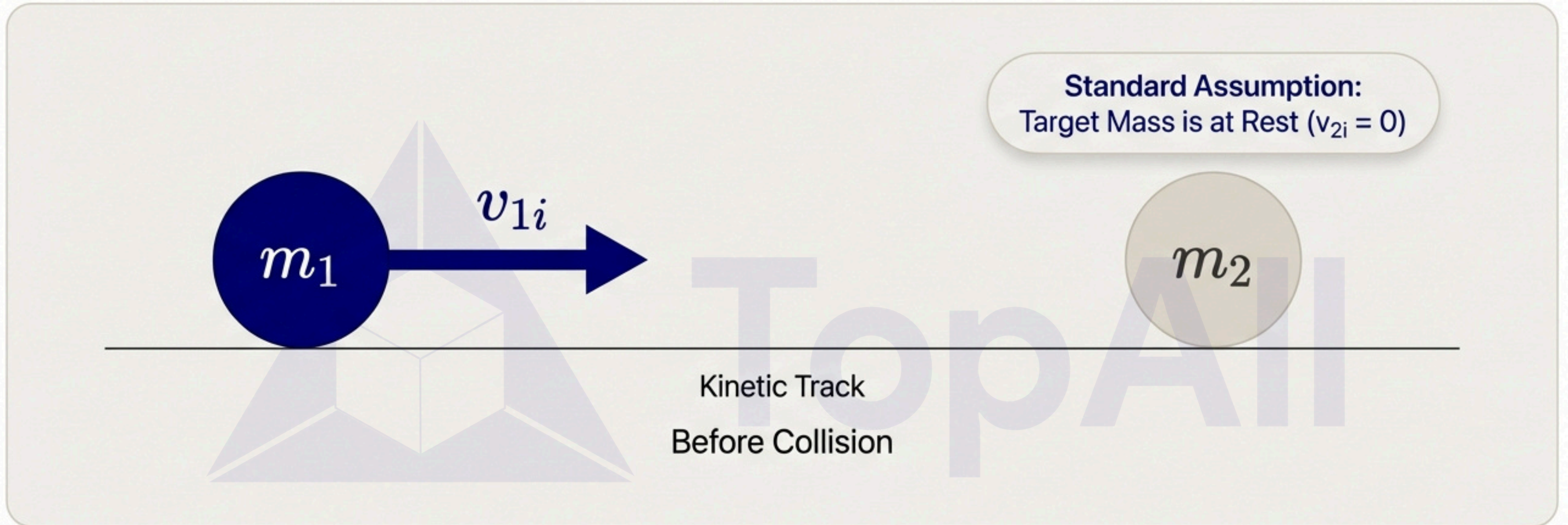
CLASS 11 PHYSICS — WORK, ENERGY & POWER



H1 COLLISIONS IN ONE DIMENSION



System Setup & The Standard Constraint



1. Completely Inelastic

Bodies stick together. Kinetic energy is lost.

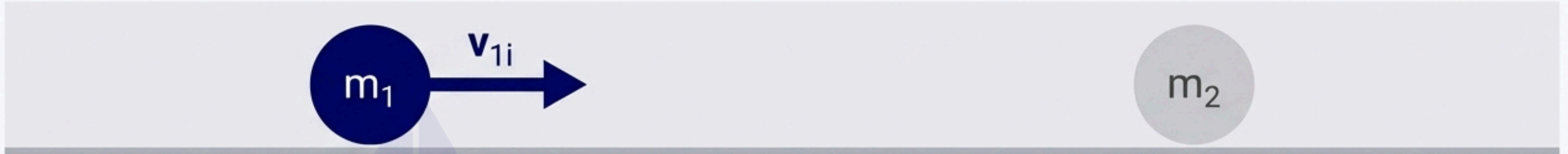
2. Elastic

Bodies bounce. Kinetic energy is perfectly conserved.

Completely Inelastic Collisions

$$\Sigma p = \text{Constant}$$

Before:



After:



$$\text{Momentum: } m_1 v_{1i} = (m_1 + m_2) v_f$$

$$\text{Final Velocity: } v_f = [m_1 / (m_1 + m_2)] * v_{1i}$$

⚠ ΔK is positive in the loss equation: Kinetic Energy is lost to heat/deformation.



**You've Learned the Theory.
Let's Test Them Now.**

$$E=mc^2$$



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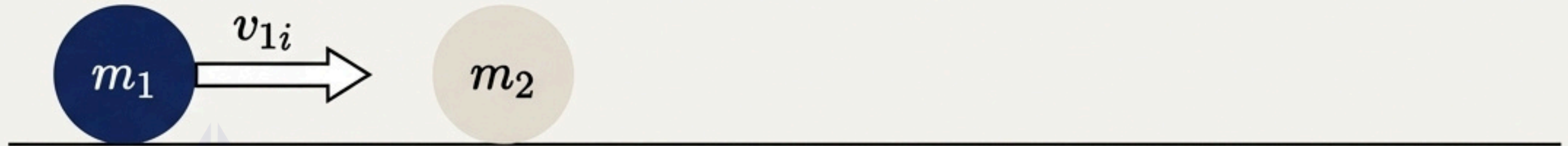
Key Highlights

- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



Elastic Collisions: The Core Framework

“Before”
Kinetic Track



“After”
Kinetic Track



$$\Sigma p = \text{Constant}$$

$$\Sigma K = \text{Constant}$$

Mass 1 Final

$$v_{1-f} = \left[\frac{m_1 - m_2}{m_1 + m_2} \right] * v_{1i}$$

Mass 2 Final

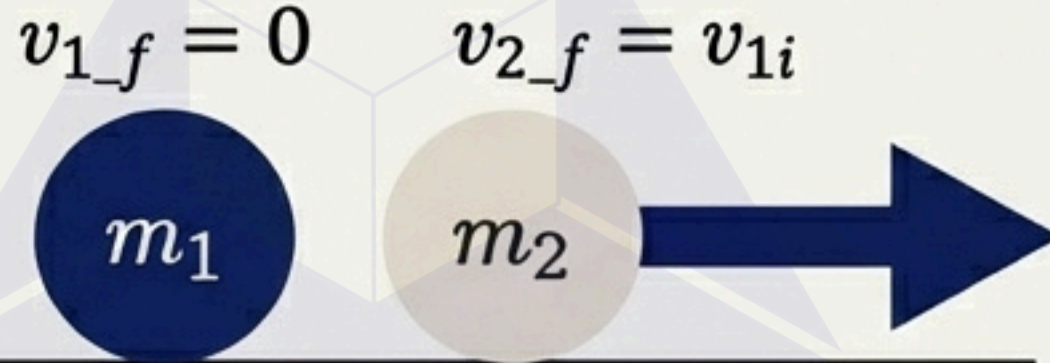
$$v_{2-f} = \left[\frac{2m_1}{m_1 + m_2} \right] * v_{1i}$$

Testable Scenarios: Special Elastic Cases

Equal Masses: $m_1 = m_2$

The Billiard Ball Effect

“After”
Kinetic Track

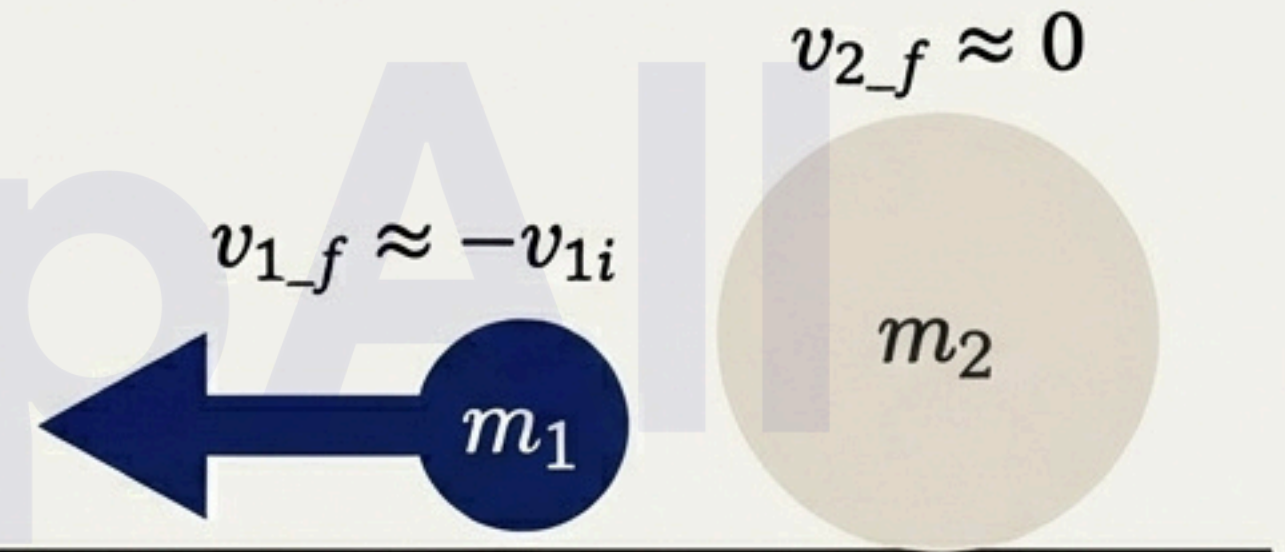


The first mass comes to rest and pushes off the second mass with its exact initial speed.

Massive Target: $m_2 \gg m_1$

The Wall Bounce Effect

“After”
Kinetic



The heavier target is undisturbed while the lighter mass perfectly reverses its velocity.

Key Takeaways

- ✓ **Momentum:** ALWAYS conserved in all isolated collisions ($\Delta p_1 + \Delta p_2 = 0$).
- ✓ **Kinetic Energy:** Conserved ONLY in perfectly elastic collisions. Lost in inelastic collisions.
- ✓ **1D Standard Constraint:** Standard formulas assume the target mass is stationary ($v_{2i} = 0$).
- ✓ **Equal Mass Swap:** In an elastic collision of equal masses, the objects perfectly swap velocities.



You've Learned the Theory.

Now Let's Test It.

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