

CLASS 11 PHYSICS • CHAPTER 4

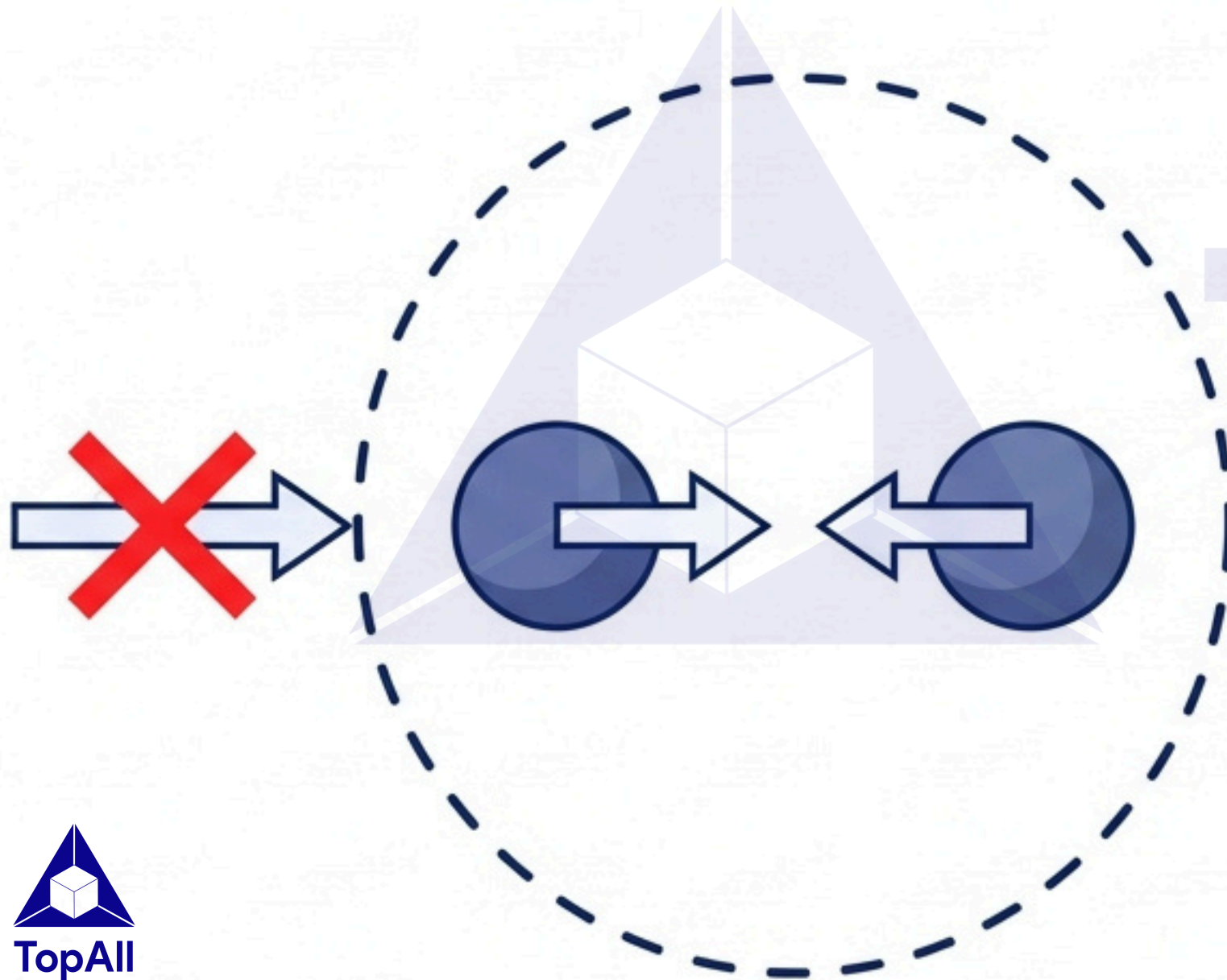
Conservation of Momentum

Mastering the Laws of Motion for NEET & JEE

Understanding isolated systems, recoil, and two-body collisions.

CORE CONCEPT

What is an Isolated System?



- A system where the net external force is zero ($F_{\text{ext}} = 0$).

- Particles inside the system exert mutual forces on each other.

- By Newton's Third Law, these internal forces are **equal and opposite**, perfectly cancelling out.
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ISOLATED-SYSTEM HIGHLIGHT

If no outside force pushes or pulls the system, the total momentum of that system cannot change.

Why Does a Gun Recoil?

Initially, both gun and bullet are at rest (Total Initial Momentum = 0).

When fired, the force on the bullet equals the opposite force on the gun.

To keep total momentum at zero, the gun must recoil backwards.



$$p_g = -p_b \rightarrow p_g + p_b = 0$$



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

$$E=mc^2$$



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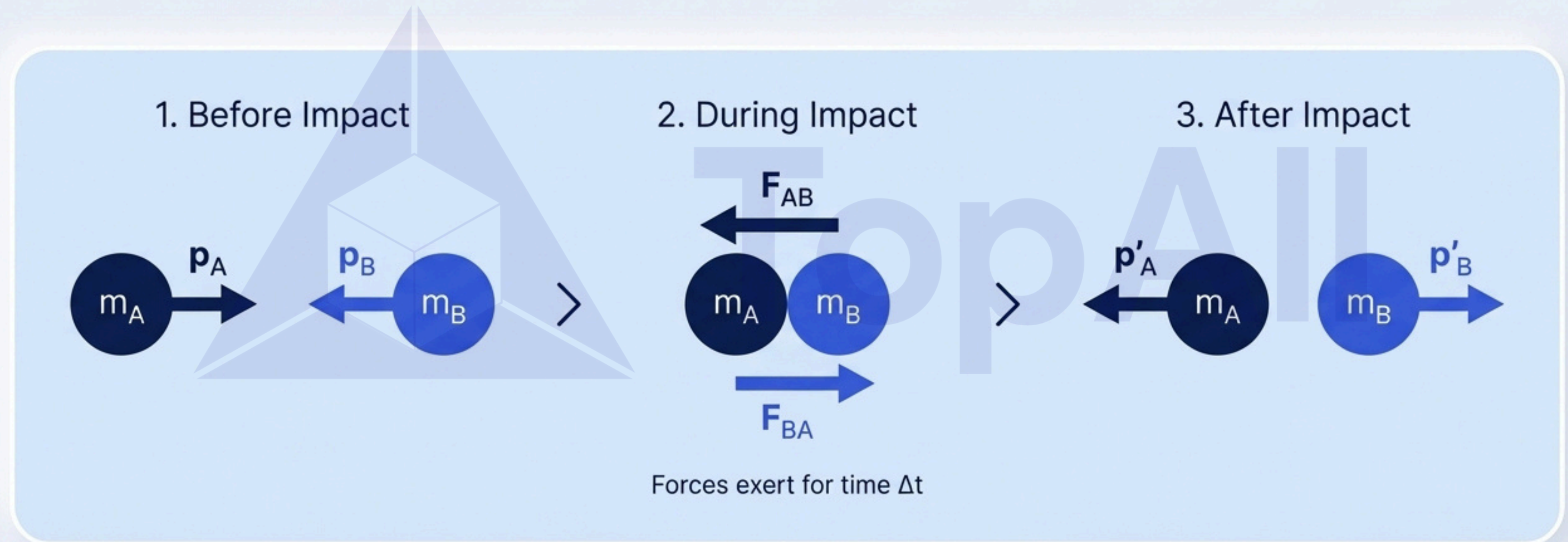
Key Highlights

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Modeling a Collision

Consider two bodies, A and B, in an isolated system.



Total Momentum Remains Constant

Momentum changes cancel out in pairs.

Total momentum is perfectly conserved.

$$p_A + p_B = p'_A + p'_B$$

(Total Initial Momentum = Total Final Momentum)

! EXAM TIP: Always define your positive and negative directions before plugging numbers into this equation!

Does the type of collision matter?

Elastic Collisions



Bodies bounce off perfectly.

Inelastic Collisions



Bodies may deform or stick together.

MOMENTUM IS ALWAYS CONSERVED IN BOTH!

(Note: The difference lies in Kinetic Energy conservation, which we cover in Chapter 5).

Key Takeaways

- ✓ An isolated system has zero net external force.
- ✓ In an isolated system, total momentum is perfectly conserved.
- ✓ Action-reaction pairs (like a gun and bullet) cause equal and opposite momentum changes.
- ✓ $p_{\text{initial}} = p_{\text{final}}$ applies to all collisions (elastic and inelastic).

→ Start Practice: Try Chapter 4 MCQs Next!



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