

Momentum Conservation in Explosions

Purpose: To gather evidence that can be used to support a claim that total system momentum is or is not conserved in an explosion.

Background: The objects involved in an explosion are often considered as a system. Provided that the system of two objects is not experiencing a net external impulse, there would be no change in momentum of the system. If one object within the system loses momentum, it is gained by the other object within the system. The combined momentum of both objects would be conserved.

Getting Ready: Navigate to the Collision Carts Interactive in the Physics Interactives section of The Physics Classroom website:

<http://www.physicsclassroom.com/Physics-Interactives/Momentum-and-Collisions/Collision-Carts>

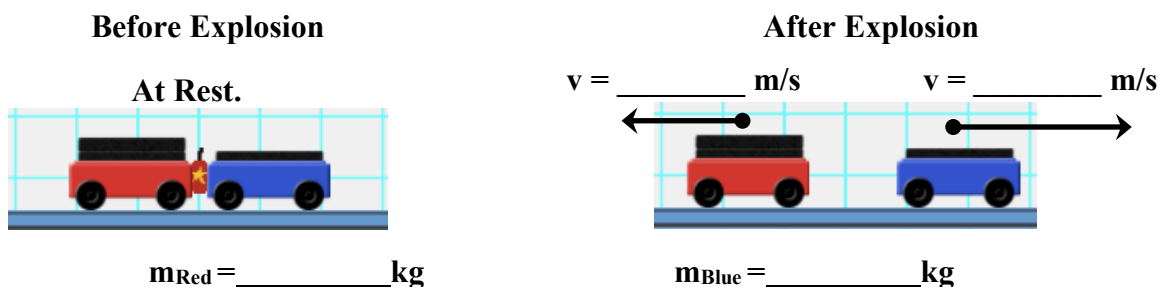
Path:

physicsclassroom.com => Physics Interactives => Momentum and Collisions => Collision Carts

Once the Interactive opens, resize it as desired. Select the **Explosions** option (at the bottom). Experiment with changing the **Mass** of the two carts; leave the **Initial Velocity** at 0 m/s. Observe how the position of the carts along the track can be changed by dragging. Learn to **Start**, **Pause**, and **Reset** the animation.

Explosion 1: Red Cart More Massive than the Blue Cart

<IMPORTANT>Set the initial velocities of both carts to 0 m/s. Set the mass of the red cart to be the greater mass. Run the simulation and record the mass and velocity values.</IMPORTANT>

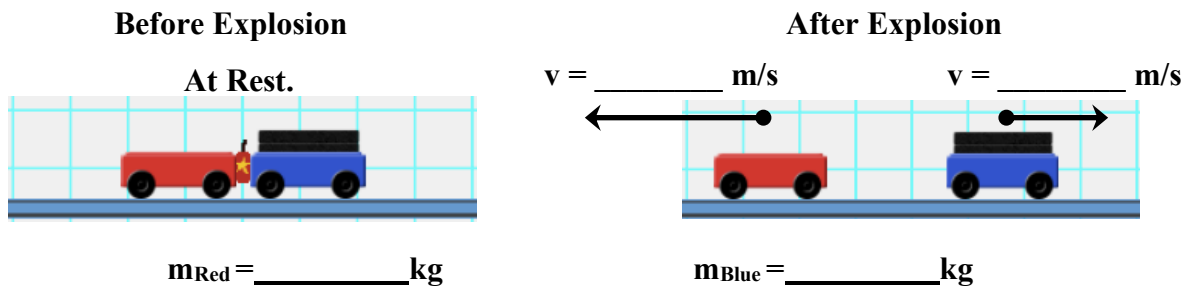


Use mass and velocity values to complete the following momentum table.

	Before Explosion	After Explosion	ΔMomentum
Red Cart	___ kg x ___ m/s = ___ kg•m/s	___ kg x ___ m/s = ___ kg•m/s	
Blue Cart	___ kg x ___ m/s = ___ kg•m/s	___ kg x ___ m/s = ___ kg•m/s	
System Total			

Explosion 2: Red Cart Less Massive than the Blue Cart

<IMPORTANT>Set the initial velocities of both carts to 0 m/s. Set the mass of the red cart to be the smaller mass. Run the simulation and record the mass and velocity values.</IMPORTANT>



Use mass and velocity values to complete the following momentum table.

	Before Explosion	After Explosion	ΔMomentum
Red Cart	$\underline{\hspace{2cm}} \text{ kg} \times \underline{\hspace{2cm}} \text{ m/s}$ $= \underline{\hspace{2cm}} \text{ kg}\cdot\text{m/s}$	$\underline{\hspace{2cm}} \text{ kg} \times \underline{\hspace{2cm}} \text{ m/s}$ $= \underline{\hspace{2cm}} \text{ kg}\cdot\text{m/s}$	
Blue Cart	$\underline{\hspace{2cm}} \text{ kg} \times \underline{\hspace{2cm}} \text{ m/s}$ $= \underline{\hspace{2cm}} \text{ kg}\cdot\text{m/s}$	$\underline{\hspace{2cm}} \text{ kg} \times \underline{\hspace{2cm}} \text{ m/s}$ $= \underline{\hspace{2cm}} \text{ kg}\cdot\text{m/s}$	
System Total			

Conclusion

Make a **Claim** as to whether momentum is conserved or not conserved. Identify the **Evidence** that provides support for your claim; refer to specific sets of values in each data table that serve as credible evidence. Write a paragraph or more of sound **Reasoning** to argue why the evidence logically leads to the claim you are making. Write well. Write logically. Write thoroughly. Use a separate page of paper if necessary.