Name: _____ Period: _____

Instructor: **Mr. Rodriguez** Course: **Conceptual Physics A**

Term: **Winter 2024-25**

Introduction to Momentum

> Be sure to show your work, include units when appropriate, annd box your answers.

Section 1: Understanding Momentum

1. Define momentum in your own words.

2. Write the mathematical equation for momentum and define each variable.

3. What are the base units of momentum?

4. What factors affect an object's momentum? Explain how each factor influences momentum.

5. Describe a real-world example where momentum plays an important role. Explain why momentum matters in this scenario.

Section 2: Conservation of Momentum

6. State the Law of Conservation of Momentum.

7. If two objects collide in a closed system, what happens to their total momentum? Why?

8. Explain the difference between elastic and inelastic collisions.

9. Give an example of each type of collision from everyday life.

Section 3: Problem Solving with Momentum

Use the equation: $\mathbf{p} = m\mathbf{v}$ (where $\mathbf{p}$ is momentum, m is mass, and $\mathbf{v}$ is velocity)

10. A 2 kg ball is rolling at a velocity of 3 m/s. What is its momentum?

11. A truck has a mass of 2,000 kg and is moving at 10 m/s. What is its momentum?

12. A 0.5 kg soccer ball is moving at 8 m/s. What would its momentum be if its speed were doubled?

13. A 1,200 kg car moving at 20 m/s collides and sticks to a 1,000 kg stationary car. What is their final velocity after the collision? (Hint: Use conservation of momentum.)

Section 4: Conceptual Questions

14. If two objects of different masses have the same momentum, what can you say about their velocities?

15. Can an object have momentum without moving? Why or why not?

16. If a moving object comes to a stop, what happens to its momentum?

Section 5: Challenge Problem

17. A 5 kg skateboarder is moving at 4 m/s and jumps off the skateboard, which has a mass of 2 kg. After jumping, the skateboard moves backward at 3 m/s. What is the velocity of the skateboarder after jumping? (Hint: Use conservation of momentum.)

Reflection Questions

- What did you find challenging about momentum problems?

- How do you see momentum affecting your everyday life?

Bonus: Think of a sport where momentum is crucial. Describe a specific play or movement where momentum makes a difference and explain why.