

Name: _____

Group members: _____

PHYSICS: ELASTIC AND INELASTIC COLLISIONS

Activity: Simulations of Collisions at Walter Fendt

For Simulations 1, 2, & 3

- Go to the website: <http://www.walter-fendt.de/ph14e/collision.htm>
- Choose ELASTIC collision at the top of the green control box.
- Turn on VELOCITY display button at the bottom of green control box.
- Calculate the momentum of each wagon before and after the collision

Collisions 1-3 involve two wagons undergoing elastic collisions that have the **same mass**. Record the velocities after the collision. Calculate the momentum of the red wagon and the blue wagon before and after the collision.

Collision 1: Before the collision, the red wagon (wagon 1) will be moving from left to right and the blue wagon (wagon 2) will be stationary. The wagons will collide.

	BEFORE COLLISION			AFTER COLLISION	
	RED WAGON (wagon 1)	BLUE WAGON (wagon 2)		RED WAGON (wagon 1)	BLUE WAGON (wagon 2)
Mass (kg)	0.50	0.50		0.50	0.50
Velocity (m/s)	0.50	0.00			
Momentum (kgm/s)	+		=	+	

Collision 2: Before the collision, the red wagon (wagon 1) will be moving from left to right faster. The blue wagon (wagon 2) will be moving from left to right slower. The wagons will have rear-end collision.

	BEFORE COLLISION			AFTER COLLISION	
	RED WAGON (wagon 1)	BLUE WAGON (wagon 2)		RED WAGON (wagon 1)	BLUE WAGON (wagon 2)
Mass (kg)	0.50	0.50		0.50	0.50
Velocity (m/s)	0.50	0.20			
Momentum (kgm/s)	+		=	+	

Collision 3: Before the collision, the red wagon will be moving from left to right. The blue wagon will be moving from left to right. Both wagons will have different velocities before the collision.

	BEFORE COLLISION			AFTER COLLISION	
	RED WAGON (wagon 1)	BLUE WAGON (wagon 2)		RED WAGON (wagon 1)	BLUE WAGON (wagon 2)
Mass (kg)	0.50	0.50		0.50	0.50
Velocity (m/s)	0.50	-0.20			
Momentum (kgm/s)		+	=		+

For Simulations 4, 5, 6, 7, & 8.

- Choose ELASTIC collision at the top of the green control box.
- Turn on VELOCITY display button at the bottom of green control box.
- Calculate the momentum of each wagon before and after the collision

Collisions 4-8 involve two wagons undergoing elastic collisions that have different masses. Record the velocities after the collision. Calculate the momentum of the red wagon and the blue wagon before and after the collision.

Collision 4: Before the collision, the more massive red wagon will be moving from left to right. The less massive blue wagon will be stationary. The moving wagon has the greater mass.

	BEFORE COLLISION			AFTER COLLISION	
	RED WAGON (wagon 1)	BLUE WAGON (wagon 2)		RED WAGON (wagon 1)	BLUE WAGON (wagon 2)
Mass (kg)	0.50	0.20		0.50	0.20
Velocity (m/s)	0.50	0.00			
Momentum (kgm/s)		+	=		+

Collision 5: Before the collision, the more massive red wagon will be moving from left to right. The less massive blue wagon will be moving from right to left. The wagons will have a head-on collision.

	BEFORE COLLISION			AFTER COLLISION	
	RED WAGON (wagon 1)	BLUE WAGON (wagon 2)		RED WAGON (wagon 1)	BLUE WAGON (wagon 2)
Mass (kg)	0.50	0.20		0.50	0.20
Velocity (m/s)	0.50	-0.20			
Momentum (kgm/s)		+	=		+

Collision 6: Before the collision, the more massive red wagon will be moving from left to right. The less massive blue wagon will be moving from right to left. They move at the same speed before collision. The wagons have a head-on collision.

	BEFORE COLLISION		=	AFTER COLLISION	
	RED WAGON (wagon 1)	BLUE WAGON (wagon 2)		RED WAGON (wagon 1)	BLUE WAGON (wagon 2)
Mass (kg)	0.50	0.20		0.50	0.20
Velocity (m/s)	0.50	-0.50			
Momentum (kgm/s)				+	

Collision 7: Before the collision, the less massive red wagon will be moving from left to right. The more massive blue wagon will be motionless. The wagons have a head-on collision.

	BEFORE COLLISION		=	AFTER COLLISION	
	RED WAGON (wagon 1)	BLUE WAGON (wagon 2)		RED WAGON (wagon 1)	BLUE WAGON (wagon 2)
Mass (kg)	0.20	0.50		0.20	0.50
Velocity (m/s)	0.50	0.00			
Momentum (kgm/s)	+			+	

Collision 8: Before the collision, the less massive red wagon will be moving from left to right faster. The more massive blue wagon will be moving from left to right slower. The wagons have a rear end collision.

	BEFORE COLLISION		=	AFTER COLLISION	
	RED WAGON (wagon 1)	BLUE WAGON (wagon 2)		RED WAGON (wagon 1)	BLUE WAGON (wagon 2)
Mass (kg)	0.20	0.50		0.20	0.50
Velocity (m/s)	0.50	0.10			
Momentum (kgm/s)	+			+	

For simulations 9, 10, 11, & 12

- Choose INELASTIC collision at the top of the green control box.
- Turn on VELOCITY display button at the bottom of green control box.
- Calculate the momentum of each wagon before and after the collision

Collisions 9, 10, 11, & 12 involve two wagons undergoing inelastic collisions. They will fuse together (connect) during the collision. Record the velocities after the collision. Calculate the momentum of the red wagon and the blue wagon before and after the collision.

Collision 9: Before the collision, the red wagon will be moving from left to right and the blue wagon will be stationary before the collision. Wagon 1 and Wagon 2 will have equal masses.

	BEFORE COLLISION		=	AFTER COLLISION
	RED WAGON (wagon 1)	BLUE WAGON (wagon 2)		MERGED WAGONS (wagon 1,2)
Mass (kg)	0.50	0.50		1.00
Velocity (m/s)	0.50	0.00		
Momentum (kgm/s)	+			

Collision 10: Before the collision, the red wagon will be moving from left to right faster and the blue wagon will be moving from left to right slower. Wagon 1 and Wagon 2 will have equal masses.

	BEFORE COLLISION		=	AFTER COLLISION
	RED WAGON (wagon 1)	BLUE WAGON (wagon 2)		MERGED WAGONS (wagon 1,2)
Mass (kg)	0.50	0.50		1.00
Velocity (m/s)	0.50	0.10		
Momentum (kgm/s)	+			

Collision 11: Before the collision, the red wagon will be moving from left to right faster and the blue wagon will be moving from right to left slower. Wagon 1 and Wagon 2 will have equal masses.

	BEFORE COLLISION		=	AFTER COLLISION
	RED WAGON (wagon 1)	BLUE WAGON (wagon 2)		MERGED WAGONS (wagon 1,2)
Mass (kg)	0.50	0.50		1.00
Velocity (m/s)	0.50	-0.20		
Momentum (kgm/s)	+			

Collision 12: Before the collision, the red wagon will be moving from left to right and the blue wagon will be moving from right to left. Wagon 1 and Wagon 2 will have equal masses and move with the same speed.

	BEFORE COLLISION		=	AFTER COLLISION
	RED WAGON (wagon 1)	BLUE WAGON (wagon 2)		MERGED WAGONS (wagon 1,2)
Mass (kg)	0.50	0.50		1.00
Velocity (m/s)	0.50	-0.50		
Momentum (kgm/s)	+			

Analyze the collisions. Look at the before and after velocities and the before and after momentums. Answer the questions.

ELASTIC COLLISIONS

	BEFORE COLLISION		AFTER COLLISION	
	Which wagon had the greater momentum?	Which wagon had lesser momentum?	How did velocity change for RED wagon, and why?	How did velocity change for BLUE wagon, and why?
1				
2				
3				
4				
5				
6				
7				
8				

INELASTIC COLLISIONS

	BEFORE COLLISION		AFTER COLLISION
	Which wagon had the greater momentum?	Which wagon had lesser momentum?	How did the velocity of the fused wagons compare to the motions of the RED and BLUE wagons before the collision.
9			
10			
11			
12			