Name: _____ Date: _____

Momentum & Collisions
Impulse—Changes in Momentum #2

Part 1: Calculate impulse using force and contact time. The units for impulse are the same as units for momentum: kg·m/s. Show your work in the boxes.

$p_0 = m \cdot v_0$ (kg·m/s)

$a = \frac{v_f - v_0}{t}$ (m/s^2)

$p_f = m \cdot v_f$ (kg·m/s)

$J = \Delta p = p_f - p_0$ (kg·m/s)

$F = \frac{J}{t} = \frac{\Delta p}{t} = m \cdot a$ (N)

1. Shandra kicked the soccer ball. The mass of the soccer ball was 0.420 kg. The soccer ball started at rest in the grass. After she kicked the ball, it was moving at 8.0 m/s. Her shoe touched the soccer ball for 0.50 seconds when she kicked it.



Initial momentum of soccer ball	**p_o =**	
Final momentum of soccer ball	**P_f =**	
Impulse of soccer ball	**$J = \Delta p$ =**	
Acceleration of soccer ball	**a =**	
Force of impact	**F =**	

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2. Doug was golfing. The mass of the golf ball was 0.90 kg. The golf ball was sitting motionless on the tee, then was hit by the golf club. The ball moved at 49 m/s after being hit. The contact time between the club and the ball was 0.21 seconds.



Initial momentum of golf ball	$\mathbf{p_o} =$	
Final momentum of golf ball	$\mathbf{P_f} =$	
Impulse of golf ball	$\mathbf{J} = \mathbf{\Delta p} =$	
Acceleration of golf ball	$\mathbf{a} =$	
Force of impact	$\mathbf{F} =$	

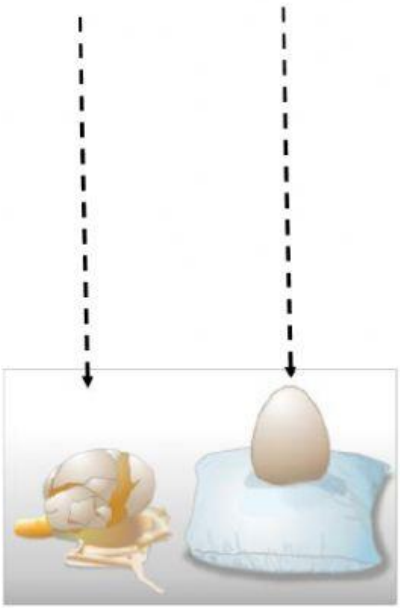
LIVEWORKSHEETS

3. Ralph was playing tennis. The tennis ball has a mass of 0.060 kg. The ball was hit to Ralph moving with a velocity of -16 m/s. When Ralph hit the ball, the ball moved away with a velocity of 22 m/s. The contact time between the racquet and the ball was 0.26 seconds.



Initial momentum of tennis ball	$\mathbf{p_o} =$	
Final momentum of tennis ball	$\mathbf{P_f} =$	
Impulse of tennis ball	$\mathbf{J = \Delta p} =$	
Acceleration of tennis ball	$\mathbf{a} =$	
Force of impact	$\mathbf{F} =$	

LIVEWORKSHEETS



4. Two identical 0.042 kg eggs were dropped from 3 meters above the floor at the same time.

- Egg #1 impacted a tile floor.
- Egg #2 fell into a pillow.

Both eggs were moving at -4.6 m/s immediately before impact. Both eggs came to rest but at different times.

Egg #1 came to rest in 0.10 second (splat).
Egg #2 came to rest in 0.80 second (no splat).

		Egg #1	Egg #2
Initial momentum of egg	$\mathbf{p_o} =$		
Final momentum of egg	$\mathbf{P_f} =$		
Impulse of egg	$\mathbf{J} = \mathbf{\Delta p} =$		
Acceleration of eff	$\mathbf{a} =$		
Force of impact	$\mathbf{F} =$		

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5. Christopher hit the baseball. The pitch was 37 m/s. The ball moved at -49 m/s immediately after it was hit. The mass of the baseball was 0.095 kg. The contact time between the bat and the baseball was 0.36 seconds.



Initial momentum of baseball	$\mathbf{p_o} =$	
Final momentum of baseball	$\mathbf{P_f} =$	
Impulse of baseball	$\mathbf{J} = \mathbf{\Delta p} =$	
Acceleration of tennis ball	$\mathbf{a} =$	
Force of impact	$\mathbf{F} =$	

LIVEWORKSHEETS