Momentum and Impulse

Name_____

Momentum exercises: $p = mv$ **Show all equations and work with units**

$weight = \mathbf{F}_g = m\mathbf{g}$

1)   What is momentum? (not the equation)

2)   What is the Momentum of the ball if the mass is 5 kg and the velocity
is 4 m/s?

3)   What is the momentum of the car if the mass is 2000 kg and the velocity
is –30 m/s?

4)   What is the mass of the spaceship if the momentum ($\mathbf{p}$) is 10,000,000 N-s
and the velocity is 45, 000 m/s?

5)   What is the speed of the train if the momentum is 120,000 N-s and the mass
is 140,000 kg?

6)   What is the momentum of a bicycle and rider that are going 15 m/s and
weigh 840 Newtons?

7)   What is the speed of a truck with a momentum of 110,000 kg-m/s and
weighing 14000 newtons?

Impulse problems: $\mathbf{J} = \mathbf{F}\Delta t = \Delta\mathbf{p}$ or $\mathbf{F}\Delta t = m\mathbf{v}_f - m\mathbf{v}_i$

8)   What is the impulse of a bat that exerts a force of 350 N on a ball for .03 seconds?

9)   What is the change in momentum in the problem above? If the ball starts at rest, What is the final speed of a ball having a mass of .54 kg?

10)   What is the force of impact of a car that has an impulse of 130,000 N-s and crashes into a wall during a period of time of 2.5 seconds?

11)   What is the final speed of a soccer ball that starts from rest and is kicked with a force of 450 newtons and with a contact time between the foot and ball of .4 seconds? The mass of the soccer ball is 1.6 kg.

12)   If the kicker increased the time in the problem above to .7 seconds, what would the new final speed be? What do we call the process of increasing the time in a sport?

13)   A person falls a distance of 10 meters (This means his final speed is 7 m/s). If he weighs 750N. What is his mass? What is the change in momentum if he starts from rest? What is his impulse? If a force of 450 N will break his leg bone (femur) figure out how much time he needs the time of impact to be such that he is not injured? (tuck and roll!!!!)