AP Physics 1
4.1 – Momentum and Impulse Practice Problems

Name: _____   **Period: _____**

1. A 1300 kg race car is traveling at 80 m/s while a 15,000 kg truck is traveling at 20 m/s. Which has the greater momentum?

2. A 300 kg snowmobile is traveling at 30 m/s. How fast would a 200 kg snowmobile need to travel to have the same momentum?

3. A loaded delivery truck has a mass of 5000 kg and is moving at 8 m/s. The truck is unloaded and travels at 12 m/s. If the truck has the same momentum in each case, what is the mass of the empt y truck?

4. A force of 4 N is applied to a ball for 0.75 s. What is the impulse?

5. A car pulls a trailer with a force of 250 N. If the total impulse is 900 000 N*s, for how long is the force applied?

6. A model jet rocket applies an impulse of 20 N*s over 3 s interval of time. What is the force applied?

7. A 3 kg rock is subject to the force of gravity for 8 s. What is the impulse?

8. A group of people are pushing a stalled car with a mass of 1100 kg. If they push with a net force of 350 Newtons for 10 seconds, what is the car's final velocity?

9. A 40 g superball strikes a wall with a velocity of 10 m/s that is normal to the wall. It bounces away at a velocity of 7 m/s, still normal to the wall. What is the ball's change in momentum? If the bounce lasted 0.1 s, what is the force between the ball and the wall?

10. A 0.105 kg hockey puck is traveling at 12 m/s when it is struck by a stick. As a result, the puck travels at 15 m/s in the opposite direction. If the contact between the stick and puck lasted 0.05 s, what was the force?

11. A 400 kg jet dragster's engine produces 5500 N of thrust. If the dragster starts from rest, how fast will it be moving after 1.5 s? After 3 s?

12. A loaded barge has a mass of 1 500 000 kg and is traveling at 3 m/s. If a tugboat applies an *opposing* force of 12 000 N for 10 s, what is its final velocity? How long will it take to stop the barge? How much force would a tugboat need to apply to stop it in one minute?

13. An Airbus A380 airliner lands at 30 m/s. Partially loaded, its mass is 480 000 kg. The engines app ly *reverse* thrust for 12 s to slow the plane to 25 m/s. How much thrust did the engines apply?

14. A stevedore slides a crate along a dock with a 50 kg horizontal force of 175 N. The *opposing* force of friction is 120 N. If started from rest, what is the crate's final velocity after 0.5 s?

15. A rocket sled accelerates to 50 m/s. When the rocket engine stops, the sled skids along its rails. If the coefficient of friction is 0.5, how fast is the sled moving after 2.50 s?

16. A car slams on its brakes while traveling at 8 0 kph. If the coefficient of friction between the tires and the pavement is 0.6, for how much time does the car skid? What if the pavement is wet, reducing the coefficient to 0.3? What if the road is snow-covered, reducing the coefficient to 0.12?