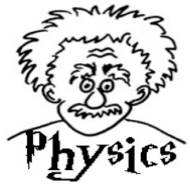

Newton's Laws of Motion Problems

Name_____

Period_____

1. A Porsche 911 accelerates from rest to 27 m/s (60 mph) in 5.8 s. The mass of the car is 1400 kg. What is the magnitude of the average net force that acts on the Porsche?

2. A bicycle has a mass of 13.1 kg and its rider has a mass of 81.7 kg. The rider is pumping hard, so that a net force of 9.78 N accelerates them. What is the acceleration?

3. An empty airplane has a mass of 30400 kg and a takeoff acceleration of 1.20 m/s^2. What is the net force accelerating the plane?

4. Scientists are experimenting with a kind of gun that may eventually be used to fire payloads directly into orbit. In one test, this gun accelerates a 5.0 kg projectile from rest to a speed of 4.0×10^3 m/s. The net force accelerating the projectile is 4.9×10^5 N. How much time is required for the projectile to come up to speed?

5. A 1580 kg car is traveling with a speed of 15.0 m/s. What is the net force that is required to bring the car to a halt in a distance of 50.0 m?

6. During a circus performance, a 72 kg human cannonball is shot out of an 18 m long cannon. If the human cannonball spends 0.95 s in the cannon, determine the average net force exerted on him in the barrel of the cannon.

7. Two skaters, an 82 kg man and a 48 kg woman, are standing on ice. Neglect any friction between the skate blades and the ice. The woman pushes on the man with a force of 45 N. Determine the accelerations of the man and the woman.

8. A water-skier of mass 49 kg is being pulled by a horizontal towrope. The rope exerts a force of 228 N. The water and air exert a combined frictional force of 165 N. What is the skier's acceleration?

9. When a parachute opens, it develops a large drag force with the air. This upward force is initially greater than the weight of the sky diver and, thus, slows her down. Suppose the weight of the sky diver is 915 N and the drag force has a magnitude of 1027 N. What is the magnitude and direction of the acceleration?

10. A catapult on an aircraft carrier is capable of accelerating a plane from 0 to 56.0 m/s in a distance of 80.0 m. Find the average net force that the catapult exerts on a 13300 kg jet.