Integrated Science Name _____ Period _____

Newton's Second Law of Motion - Acceleration

Instructions: Complete the following problems using the equation below. SHOW ALL WORK. No work = no credit. Do not forget your units.

Newton's Second Law

$$\text{Acceleration} = \frac{\text{Net force}}{\text{Mass}}, \quad \text{or} \quad a = \frac{F}{m}$$

1. What net force is required to accelerate a car at a rate of 2 m/s^2 if the car has a mass of 3,000 kg?

F= _____

m= _____

a= _____

2. A 10.0 kg bowling ball would require how much force to accelerate down an alleyway at a rate of 3 m/s^2?

F= _____

m= _____

a= _____

3. Sally has a car that accelerates at 5 m/s^2. If the car has a mass of 1000 kg, how much force does the car produce?

F= _____

m= _____

a= _____

4. What is the mass of a falling rock if it produces a force of 147 N? Remember, falling objects have an acceleration of gravity (9.8 m/s^2).

F= _____

m= _____

a= _____

5. What is the mass of a truck if it produces a force of 14,000 N while accelerating at a rate of 5 m/s^2?

F= _____

m= _____

a= _____

6. What is the acceleration of a softball if it has a mass of 0.5 kg and hits the catcher's glove with a force of 25 N?

F= _____

m= _____

a= _____

7. Your own car has a mass of 2000 kg. If your car produces a force of 5000 N, how fast will it accelerate?

F= _____

m= _____

a= _____

8. Sally wants to accelerate faster than in problem #3, so she removes some mass from her car to make it 500 kg. How fast will her 500 kg car accelerate if it produces 5000 N of force?

F= _____

m= _____

a= _____

9. Sally challenges you to a race. On the first turn you run off the course and your car strikes a large bale of hay. Your car still produces 5000 N of force, but now it accelerates at only 2 m/s^2. What is the mass of your car now that the bale of hay is stuck to it?

F= _____

m= _____

a= _____

10. Even though she is way ahead of you, Sally switches her car to run on nitrous oxide fuel. The nitrous oxide allows her car to develop 10,000 N of force. What is Sally's acceleration if her car has a mass of 500 kg?

F= _____

m= _____

a= _____