Name: _____ Period: _____ Date: _____

Newton's laws of Motion

Part I: *Fill in the blanks below to state Newton's three laws of motion:*

- **Newton's 1st Law →** All objects will remain at _____, or will continue to move at a constant _____ in the same _____ unless acted upon by an unbalanced _____. This property is called _____.

- **Newton's 2nd Law →** Unbalanced forces cause an object to _____. This can be stated mathematically by the formula:

  F = _____ * _____

- **Newton's 3rd Law →** Every action produces an equal and opposite _____. When one object exerts a force on another object, the second object pushes back with the same amount of _____.

Part II: *Use Newton's 2nd Law of motion to solve each problem. Show your work in your science journal. Then record the correct answer here (with proper units!)*

1) How much force is needed to accelerate a 66 kg skier at 2 m/s^2?

2) What is the force on a 1,000 kg elevator that is falling freely at 9.8 m/s^2?

3) What is the acceleration of a 50 kg object pushed with a force of 500 newtons?

4) The mass of a large car is 1000 kg. How much force would be required to accelerate the car at a rate of 3 m/s^2?

5) A 50 kg skater pushed by a friend accelerates 5 m/s^2. How much force did the friend apply?

6) A force of 250 N is applied to an object that accelerates at a rate of 5 m/s^2. What is the mass of the object?

7) A bowling ball rolled with a force of 15 N accelerates at a rate of 3 m/s^2; a second ball rolled with the same force accelerates 4 m/s^2. What are the masses of the two balls?

8) If a 60 kg person on a 15 kg sled is pushed with a force of 300 N, what will be person's acceleration?

9) A force of 20 N acts upon a 5 kg block. Calculate the acceleration of the object.

10) An object of mass 300 kg is observed to accelerate at the rate of 4 m/s^2. Calculate the force required to produce this acceleration.

11) A 5 kg block is pulled across a table by a horizontal force of 40 N with a frictional force of 8 N opposing the motion. Calculate the acceleration of the object.

12) An object of mass 30 kg is in free fall in a vacuum where there is no air resistance. Determine the acceleration of the object.

13) An object of mass 30 kg is falling in air and experiences a force due to air resistance of 50 newtons.
    A. Determine the net force acting on the object and
    B. Calculate the acceleration of the object.

14) A student pushes on a crate with a force of 100 N directed to the right. What force does the crate exert on the student?

15) A force of 200 N is exerted on an object of mass 40 kg that is located on a sheet of perfectly smooth ice.
    A. Calculate the acceleration of the object.
    B. If a second object identical to the first object is placed on top of the first object, what acceleration would the 200 N force produce?

16) Just before opening her parachute a skydiver of mass 50 kg reaches terminal velocity. Calculate the force of air resistance.

17) For a person who has a mass 60 kg, calculate the weight in newtons. If 1 lb equals 4.45 N, then what is the person's weight in pounds?

18) An object of mass 10 kg is accelerated upward at 2 m/s^2. What force is required?