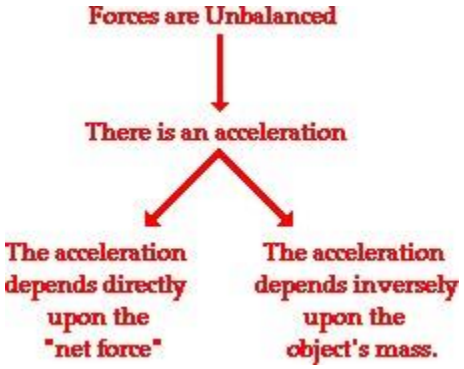
INTEGRATED SCIENCE A

DAY 5

Name_____Class period_____

NEWTON'S SECOND LAW

Newton's second law of motion pertains to the behavior of objects for which all existing forces are not balanced. The second law states that the acceleration of an object is dependent upon two variables - the net force acting upon the object and the mass of the object. The acceleration of an object depends directly upon the net force acting upon the object, and inversely upon the mass of the object. As the force acting upon an object is increased, the acceleration of the object is increased. As the mass of an object is increased, the acceleration of the object is decreased.



The BIG Equation

Newton's second law of motion can be formally stated as follows:

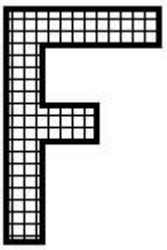
The acceleration of an object as produced by a net force is directly proportional to the magnitude of the net force, in the same direction as the net force, and inversely proportional to the mass of the object.

This verbal statement can be expressed in equation form as follows:

$$a = F_{net} / m$$

The above equation is often rearranged to a more familiar form as shown below. The net force is equated to the product of the mass times the acceleration.

$$F_{net} = m \bullet a$$



In this entire discussion, the emphasis has been on the net force. The acceleration is directly proportional to the net force; the net force equals mass times acceleration; the acceleration in the same direction as the net force; an acceleration is produced by a net force. The NET FORCE. It is important to remember this distinction. Do not use the value of merely "any 'ole force" in the above equation. It is the net force that is related to acceleration. Consistant with the above equation, a unit of force is equal to a unit of mass times a unit of acceleration. By substituting standard metric units for force, mass, and acceleration into the above equation, the following unit equivalency can be written.

1 Newton = 1 kg • m/s^2

The definition of the standard metric unit of force is stated by the above equation. One Newton is defined as the amount of force required to give a 1-kg mass an acceleration of 1 m/s/s.

NEWTON'S SECOND LAW OF MOTION

1. Newton's second law says that when an _____ force is applied to a _____, it causes it to _____.

2. The greater the force that is applied, the _____ the acceleration.

3. The lesser the force that is applied, the _____ the acceleration. If the same force is applied to an object with a large mass, it will have a _____ acceleration.

4. If the same force is applied to an object with a small mass, it will have a _____ acceleration.

5. The equation that is used to solve second law problems is F = ma. a. What do each of the variables mean? F = _____ m = _____ a = _____.

6. How much force is needed to accelerate a 1000-kg car at a rate of 3 m/s2? _____

7. Define a Newton_____

8. _____ is in the same direction as the net force.

9. According to the diagram, the acceleration of an object depends on the _____

10. TRUE OR FALSE If the net force acting on an object is balanced, there will be no Acceleration.