**Newton’s Laws of Motion**

***Newton’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_Law of Motion***

* An object \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ remains at rest, and an object \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ remains in motion at constant speed and in a straight line unless acted on by an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ force.
* Describes the motion of an object when the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ force acting on the object is \_\_\_\_\_\_\_\_\_N.
* An object at rest will \_\_\_\_\_\_\_\_\_ until an unbalanced force acts on it.
* Objects in motion will continue to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ unless an unbalanced force acts on them.

* Observing effects of Newton’s first law is difficult due to friction.
  + Friction acts on all moving objects, thus applying an

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* Newton’s 1st Law is also referred to as the Law of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the tendency of all objects to resist any \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in motion.
  + An object that has a \_\_\_\_\_\_\_\_\_\_\_\_\_ mass has \_\_\_\_\_\_\_\_\_\_\_\_ inertia then an object that has a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mass.
  + Example: Baseball vs Bowling Ball

***Newton’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Law of Motion***

* The acceleration of an object depends on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the object and the amount of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ applied.
* Acceleration depends on mass: the acceleration of an object \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ as its mass increases.
* Acceleration depends on force: an object’s acceleration \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ as the force on the object increases.
* The relationship in the 2nd law can be expressed mathematically:
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* What force is necessary to accelerate a 1,250kg car at a rate of 40 m/s2?

**Newton’s Laws of Motion**

***Newton’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Law of Motion***

* Whenever one object exerts a force on a second object, the second object exerts an \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ force on the first.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pairs: If a force is exerted, another force occurs that is equal in size and opposite in direction.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_forces: forces in a pair that do not act on the same object.
  + Examples of action and reaction force pairs: \_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is an action and reaction force pair. Gravity pulls the ball toward Earth, and pulls Earth toward the ball.
  + Why don’t we see the Earth moving?

***Momentum***

* A quantity defined as the product of the mass and velocity of an object is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The \_\_\_\_\_\_\_\_\_\_\_\_ momentum an object has, the \_\_\_\_\_\_\_\_\_\_\_\_\_ it is to \_\_\_\_\_\_\_\_\_\_the object or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_can be found by multiplying the velocity of an object and the mass of the object.
    - p is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(kg m/s)
    - m is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(kg)
    - v is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (m/s)
* What is the momentum of a 6kg bowling ball that is moving at 10 m/s down the alley toward the pins?

***The law of conservation of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

* States that any time objects collide, the \_\_\_\_\_\_\_\_\_\_\_\_\_amount of momentum \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Applies to both objects that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ after they collide.
* If objects **stick together**, then momentum depends on the two object’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mass and velocity.
* If objects **bounce off each other**, then momentum is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between the objects.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ forces allow for the transfer of momentum.