Newton's Laws of Motion Notes

Background: Sir Isaac Newton (1643-1727) an ________________________ __________________________________ famous for his discovery of the _____ ____________________ also discovered the three ______________________. He published them in his book Philosophiae Naturalis Principia Mathematica (____) in 1687. Today these laws are known as *Newton's Laws of Motion* and describe the motion of all objects on the scale we experience in our everyday lives.

Vocabulary

Inertia: ____
____

Acceleration: ____

____

Velocity: ____
____

Force: ____

Newton's First Law

An object at rest tends to stay at rest and an object in motion tends to stay in motion unless acted upon by an unbalanced force.

Basically, an object will "____" unless acted on by an _________________________________ force.

If the object was sitting still, it will *remain*_______________________. If it was moving at a constant velocity, it will _____________________________.

It takes _________________ to change the motion of an object.

If the forces on an object are ___________ and ______________________, they are said to be ______________________, and the object experiences no __________________ in motion. If they are ___________ equal and opposite, then the forces are ______________________ and the motion of the object _____________.

Newton's First Law is also called the ____________________________

Inertia: the tendency of an object to __________ changes in its state of motion

The First Law states that __________________ *have inertia*. The ________ mass an object has, the __________ inertia it has (and the ______________ it is to change its motion).

So why do moving objects eventually stop moving?

Things don't keep moving forever because there's almost always an _______________________ force acting upon them.

________________ and ____________________ are constantly at work on moving objects. _______________ energy is used to overcome friction, so eventually an object will run out of energy and come to a stop. Falling objects eventually meet the earth, which exerts an opposite force, causing them to stop.

In outer space, away from gravity and any sources of friction, a rocket ship launched with a certain speed and direction would ___________________ ____.

Newton's Second Law

Force equals mass times acceleration.

Formula: __________________________

Force is *directly proportional* to _________ and ______________________. Imagine a ball of a certain mass moving at a certain acceleration. This ball has a certain force.

Now imagine we make the ball twice as big (________________________) but keep the acceleration constant. F = ma says that this new ball has ______________________ of the old ball.

Now imagine the original ball moving at twice the original __________________. F = ma says that the ball will again have ________ __________________of the ball at the original acceleration.

basically means that the ____________________________________ comes from its mass and its acceleration.

Something very massive (_______________) that's changing speed very slowly (___________________), like a glacier, can still have ____________ force.
Something very small (______________) that's changing speed very quickly (____________________), like a bullet, can still have a ____________force.
Something very ___________ changing speed very__________ will have a very _____________ force.

Newton's Third Law

For every action there is an equal and opposite reaction.

For every force acting on an object, there is an _________________ acting in the_______________________ direction. Right now, gravity is pulling you ___________in your seat, but Newton's Third Law says your seat is pushing _______ against you with _________ *force*. This is why you are not moving. There is a __________________ *force* acting on you– gravity pulling down, your seat pushing up.

What happens if you are standing on a skateboard or a slippery floor and push against a wall? You _______________________________________ direction (________________ the wall), because you pushed on the wall but the wall pushed back on you with equal and opposite force.

Why does it hurt so much when you stub your toe? When your toe _______________________________ a rock, the rock exerts ____________ ________________ back on your toe. The _______________you hit your toe against it, the ____________ force the rock exerts back on your toe (and the more your toe hurts).