

Lesson #5 Forces

1. What is a force?

A force is a push or a pull. It can be measured in Newtons (N).

2. Physicists think that there are only four fundamental forces in the universe. All of the forces you can think of can be classified into one of the four fundamental forces.
3. The four fundamental forces are: gravity, electromagnetic, strong nuclear force, and weak nuclear force.



gravity



strong force



weak force







electromagnetism

4. Gravity is the force of attraction between two objects that have mass or matter. Gravity dominates at very large distances.
5. Electromagnetic force is the force of attraction or repulsion between two charged particles or two magnetic poles.
6. The weak nuclear force is the force that is responsible for breaking down a neutron into an electron and proton.
7. The strong nuclear force is responsible for holding the nucleus together. Protons attract protons, neutrons attract neutrons, and protons attract neutrons because of the strong nuclear force. The strong nuclear force dominates at distances smaller than 10^{-15}m .
8. All fundamental forces have a mediating particle that transfers the information between the objects. Mediating particles are known as bosons. Gravity has the graviton(not yet observed), weak nuclear has the W^+ boson, W^- boson, Z boson, the electromagnetic has the photon, and the strong nuclear has the gluon.


BOSONS

force carriers
spin = 0, 1, 2, ...

Unified Electroweak spin = 1

Name	Mass GeV/c ²	Electric charge
 photon	0	0
	80.39	-1
 W bosons	80.39	+1
 Z boson	91.188	0

Strong (color) spin = 1

Name	Mass GeV/c ²	Electric charge
 gluon	0	0