Properties of Gravitational Force.

(1) It is always attractive in nature while electric and magnetic force can be attractive or repulsive.

(2) It is independent of the medium between the particles while electric and magnetic force depend on the nature of the medium between the particles.

(3) It holds good over a wide range of distances. It is found true for interplanetary to inter atomic distances.

(4) It is a central force i.e. acts along the line joining the canters of two interacting bodies.

(5) It is a two-body interaction i.e. gravitational force between two particles is independent of the presence or absence of other particles; so the principle of superposition is valid i.e. force on a particle

due to number of particles is the resultant of forces due to individual particles i.e.

$\vec{F} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + ...$

While nuclear force is many body interaction

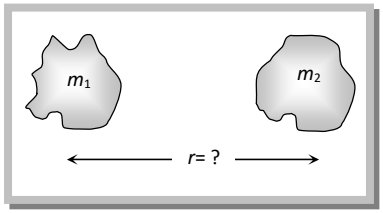
(6) It is the weakest force in nature: As Nuclear> F electromagnetic > F gravitational.

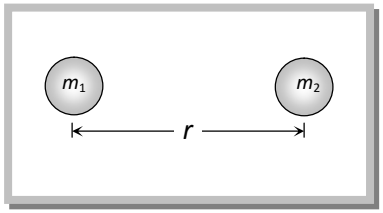
(7) The ratio of gravitational force to electrostatic force between two electrons is of the order of 10^{-43}.

(8) It is a conservative force i.e. work done by it is path independent or work done in moving a particle round a closed path under the action of gravitational force is zero.

(9) It is an action reaction pair i.e. the force with which one body (say earth) attracts the second body (say moon) is equal to the force with which moon attracts the earth. This is in accordance with Newton's third law of motion.

Note: The law of gravitation is stated for two point masses, therefore for any two arbitrary finite size bodies, as shown in the figure, it cannot be applied as there is not unique value for the separation.





But if the two bodies are uniform spheres then the separation r may be taken as the distance between their canters because a sphere of uniform mass behave as a point mass for any point lying outside it.