Coulomb's Law

Principle of Coulomb's Law

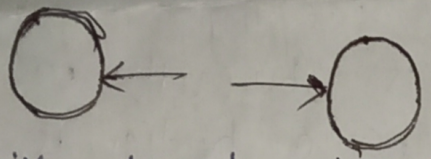
Suppose if we have two charged bodies one is positively charged and one is negatively charged. then they will attract each other if they are kept at a certain distance from each other. Now if we increase the charge of one body keeping other unchanged, the attraction force is obviously increased. Hence, the force between the charge bodies is proportional to the charge of either bodies or both.

$$F \propto Q_1 \ \& \ F \propto Q_2 \Rightarrow \boxed{F \propto Q_1 Q_2}$$

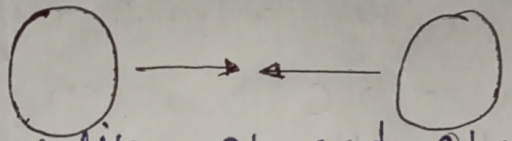
Now, by keeping their charge fixed at Q_1 and Q_2 if you bring them nearer to each other the force between them increases and if you take them away from each other the force acting between them decreases. If the distance b/w the two charge bodies is d, it can be proved that the force acting on them is inversely proportional to d^2

$$F \propto \frac{1}{d^2}$$

Coulomb's First Law



Like charged objects repel each other



Unlike charged objects attract each other

Second Law

The force of attraction or repulsion between two electrically charged objects is directly proportional to the magnitude of their charge and inversely proportional to the square of the distance b/w them. Hence, according to the Coulomb's second Law,

$$F \propto Q_1 Q_2 \quad \& \quad F \propto \frac{1}{d^2}$$

$$\Rightarrow F \propto \frac{Q_1 Q_2}{d^2} \Rightarrow F = k \frac{Q_1 Q_2}{d^2}$$