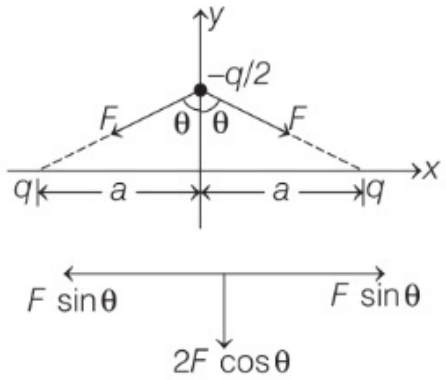
QUES 02:-

Two charges, each equal to q, are kept at $x = -a$ and $x = a$ on the x-axis. A particle of mass m and charge $q_0 = \frac{q}{2}$ is placed at the origin. If charge q_0 is given a small displacement $y(y << a)$ along the y-axis, the net force acting on the particle is proportional to **(2013 Main)**

(a) y (b) $-y$ (c) $\frac{1}{y}$ (d) $-\frac{1}{y}$

SOL:-Ans - a)



$$F_{net} = 2F\cos\theta$$

$$F_{net} = \frac{2kq\left(\frac{q}{2}\right)}{(\sqrt{y^2 + a^2})^2} \cdot \frac{y}{\sqrt{y^2 + a^2}}$$

$$F_{net} = \frac{2kq\left(\frac{q}{2}\right)y}{(y^2 + a^2)^{3/2}} \Rightarrow \frac{kq^2 y}{a^3} \propto y$$