

Answer on Question #44506, Physics, Electromagnetism

Question:

Two particles each of mass are 'm' are moving in a circle of radius 'a' under the effect of their electrostatic force of attraction. If magnitude of charge on each particle is 'q', their speed is

Answer:

Newtons second law for one of particles:

$$F = ma_c$$

where F is electrostatic force, a_c is centripetal acceleration.

From Coulomb's law:

$$F = \frac{kq^2}{(2a)^2}$$

And centripetal acceleration equals:

$$a_c = \frac{v^2}{a}$$

where v is speed, a radius of motion.

Therefore:

$$\frac{kq^2}{4a^2} = m \frac{v^2}{a}$$

$$v^2 = \frac{kq^2}{4ma}$$

$$v = \sqrt{\frac{kq^2}{4ma}}$$

$$\text{Answer: } v = \sqrt{\frac{kq^2}{4ma}}$$