

## Answer on Question #46942, Physics, Electric Circuits

### Question:

Two equally charged particles are held  $3.2 \cdot 10^3$  m apart and then released from rest. The initial acceleration of the first particle is observed to be  $7.0 \text{ m/s}^2$  and that of the second to be  $9.0 \text{ m/s}^2$ . If the mass of the first particle is  $6.3 \cdot 10^7$  kg, what are

- (a) the mass of the second particle
- (b) the magnitude of the charge of each particle?

### Answer:

Newton's third law of motion:

$$F_{21} = F_{12} = F$$

- a) Newton's second law of motion:

$$F = m_1 a_1 = m_2 a_2$$

Therefore:

$$m_2 = m_1 \frac{a_1}{a_2} = 6.3 \cdot 10^7 \text{ kg} \frac{7}{9} = 4.9 \cdot 10^7 \text{ kg}$$

- b) Coulomb's law:

$$F = \frac{kq^2}{r^2}$$

From Newton's second law of motion

$$F = m_1 a_1$$

Therefore:

$$q = \sqrt{\frac{m_1 a_1 r^2}{k}} = \sqrt{\frac{6.3 \cdot 10^7 \cdot 7 \cdot (3.2 \cdot 10^3)^2}{9 \cdot 10^9}} = 708 \text{ C}$$