## Answer on Question #57971-Physics-Electromagnetism

Two metal balls A and B of negligible radius are floating at rest on Space Station Freedom between two metal bulkheads, connected by a taut nonconducting thread of length 2.00m. Ball A carries charge q, and ball B carries charge 2q. Each ball is 1.00m away from a bulkhead.

(a) If the tension in the string is 2.50 N, what is the magnitude of q?

(b) What happens to the system as time passes? Explain.

## Solution

(a) The tension within the string is the same as the force felt between the two objects. The force felt between two point objects due to there electrostatic repulsion is given by:

$$F = \frac{kq_1q_2}{r^2}$$

In this case, substitute in the values given:

$$2.50 = \frac{(9 \cdot 10^{9})(q)(2q)}{2.00^{2}}$$
$$q = 2.00 \sqrt{\frac{2.50}{18 \cdot 10^{9}}} = 2.36 \cdot 10^{-5} \text{C}.$$

(b) The charged balls will induce the electric field on metal bulkheads (neutral) in manner to create attraction between the first ball and the first bulkhead, and the second ball and the second bulkhead. To compensate these forces the tension would increase.

https://www.AssignmentExpert.com