5. In a vacuum, two particles have charges of q_1 and q_2, where q_1 = +3.5 μC. They are separated by a distance of 0.26 m, and particle 1 experiences an attractive force of 3.4 N. What is q_2 (magnitude and sign)?

Attractive force means opposite charges so the sign of q_2 is negative since q_1 is a positive charge. Force is found from Coulomb's law:

$$F = k\frac{q_1 q_2}{r_{12}^2}$$

Solve for q_2

$$q_2 = \frac{Fr_{12}^2}{kq_1} = \frac{(3.4\ N)(0.26\ m)^2}{\left(8.99\ x\ 10^9\ {Nm^2}/{C^2}\right)(3.5\ x\ 10^{-6} C)} = \frac{0.2298\ Nm^2}{3.1465\ x\ 10^4\ {Nm^2}/{C}}$$

$$q_2 = \frac{0.2298\ Nm^2}{3.1465\ x\ 10^4\ {Nm^2}/{C}} = 7.303\ x\ 10^{-6} C$$

So

$$\boxed{q_2 = -7.3\ x\ 10^{-6} C = -7.3\ \mu C}$$

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