Answer on Question #50849-Physics-Electromagnetism

Two electric charges $q_1 = 2\ \mu C$ and $q_2 = -1\ \mu C$ are placed at a distance of $d = 20\ cm$ from each other in vacuum. Locate the point on the line joining these two charges outside the region between them at which the electric potential is zero with reference to the positive charge.

Solution

The electric potential of point charge at distance r is

$$V(r) = \frac{kq}{r}.$$

The electric potential of positive charge is

$$V_1 = \frac{kq_1}{x}.$$

The electric potential of negative charge is

$$V_2 = \frac{kq_2}{x-d}.$$

The total electric potential is zero:

$$V = V_1 + V_2 = \frac{kq_1}{x} + \frac{kq_2}{x-d} = 0.$$

$$q_1(x-d) = -q_2 x \to 1 - \frac{d}{x} = -\frac{q_2}{q_1} \to x = \frac{d}{1+\frac{q_2}{q_1}} = \frac{20\ cm}{1-\frac{1}{2}} = 40\ cm.$$

Answer: $40\ cm$.

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