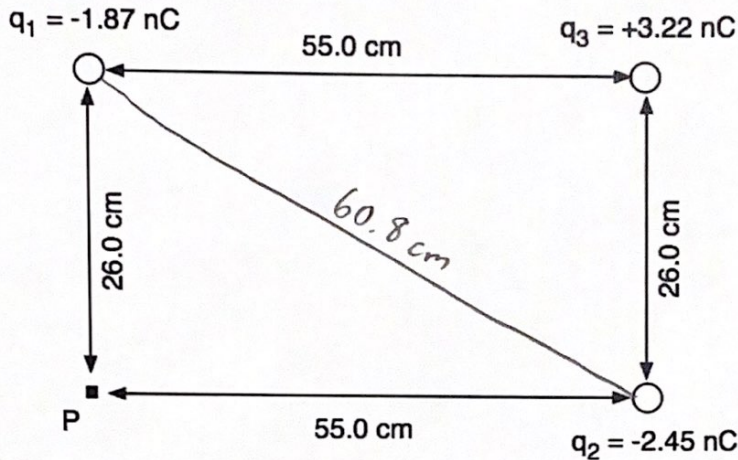<u>Quiz 19.2B</u>

Three charges are arranged in the distribution shown below. Charges q1 and q3 are fixed in place and do not move. A person picks up charge q2 and moves it to point P. Assume that q2 starts and ends its motion at rest.

$q_1 = -1.87$ nC

55.0 cm

$q_3 = +3.22$ nC

26.0 cm

60.8 cm

26.0 cm

$\vec{E}$ generally points

←

so force points ⟶

since q_2 negative.

Since motion is ←,

W_E should be negative

P

55.0 cm

$q_2 = -2.45$ nC

a) What is the voltage at the original location of q2?
b) What is the voltage at the final location of q2?
c) How much work is done by electric force as q2 moves to point P?
d) How much work is done by the person who moves q2 to point P?

a) $V_{TOT} = \dfrac{k_c q_1}{r_1} + \dfrac{k_c q_3}{r_3} = \dfrac{(9\times10^9)(-1.87\times10^{-9})}{.608} + \dfrac{(9\times10^9)(3.22\times10^{-9})}{.26}$

$= -27.68 + 111.46 = \boxed{83.8 \text{ Volts}}$

b) $V_{TOT} = \dfrac{(9\times10^9)(-1.87\times10^{-9})}{.26} + \dfrac{(9\times10^9)(3.22\times10^{-9})}{.608}$

$= -64.73 + 47.66 = \boxed{-17.1 \text{ Volts}}$

c) $W_E = -q_2 \Delta V = -(-2.45\times10^{-9})(-17.1 - 83.8)$

$= \boxed{-2.47\times10^{-7} \text{ J}}$

d) $\Sigma H_F = W_E + W_{App} = 0K \quad -2.47\times10^{-7} + W_{App} = 0$

$\Rightarrow \boxed{W_{App} = +2.47\times10^{-7} \text{ J}}$