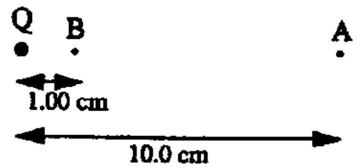
C3. A point charge, $Q = +2.50 \times 10^{-12}$C, is fixed in space. Point A is 10.0 cm from Q and point B is 1.00 cm from Q.



(a) Calculate the magnitude of the potential difference between points A and B.

2.03 V

$$\Delta V = V_B - V_A = \frac{kQ}{r_B} - \frac{kQ}{r_A} = kQ\left(\frac{1}{r_B} - \frac{1}{r_A}\right)$$

$$\Delta V = \left(9.00\times 10^{9}\,\frac{N\cdot m^2}{C^2}\right)\left(2.50\times10^{-12}C\right)\left(\frac{1}{0.0100m} - \frac{1}{0.100m}\right)$$

$$\Delta V = 2.03\,\frac{N\cdot m}{C} = 2.03\,\frac{J}{C} = \boxed{2.03\text{ V}}$$

(b) If an electron is released from rest at point A, calculate the speed of the electron when it reaches point B.

8.44×10^5 m/s

Cons. of Energy

$$E_B = E_A$$

$$KE_B + EPE_B = KE_A + EPE_A$$

$$KE_B = EPE_A - EPE_B$$

$$KE_B = -(EPE_B - EPE_A)$$

$$KE_B = -(q_o \Delta V_{BA})$$

$$\frac{1}{2}mv_B^2 = -(-e\Delta V_{BA})$$

$$v_B = \sqrt{\frac{2e\Delta V_{BA}}{m}}$$

$$v_B = \sqrt{\frac{2(1.60\times10^{-19}C)(2.03V)}{9.11\times10^{-31}\,kg}}$$

$$\boxed{v_B = 8.44\times10^5 m/s}$$