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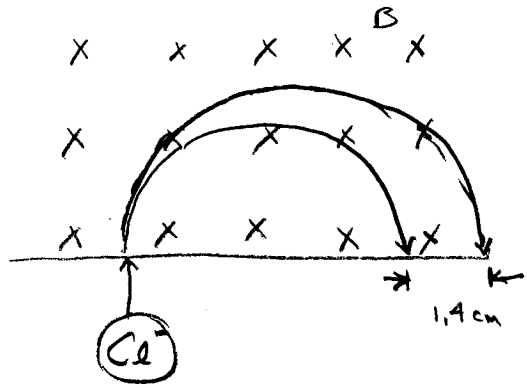

GIVEN: SINGLY IONIZED ^{35}Cl & ^{37}Cl

$B = 1.2\,T$

$\Delta DIAM = 1.4\text{ cm}$ $(\Delta r = .7\text{ cm})$

FIND: ΔV

$$q v B = m \frac{v^2}{r}$$

$$r = \frac{mv}{qB}$$

$$r_{Cl^{35}} = \frac{m_{Cl^{35}}\, v_{Cl^{35}}}{e \cdot B} \qquad r_{Cl^{37}} = \frac{m_{Cl^{37}}\, v_{Cl^{37}}}{e\, B}$$

BUT $\Delta U = K = e\Delta V = \frac{1}{2} m v^2$

$$v = \sqrt{\frac{2e\Delta V}{m}}$$

$$r_{Cl^{35}} = \frac{m_{Cl^{35}} \sqrt{\frac{2e\Delta V}{m_{Cl^{35}}}}}{eB} = \sqrt{\frac{m_{Cl^{35}}^2\, 2e\Delta V}{e^2 B^2\, m_{Cl^{35}}}} = \sqrt{\frac{m_{Cl^{35}}\, 2\Delta V}{eB^2}}$$

$$r_{Cl^{37}} = \sqrt{\frac{m_{Cl^{37}}\, 2\Delta V}{eB^2}}$$

$$\Delta r = r_{Cl^{37}} - r_{Cl^{35}} = \sqrt{\frac{m_{Cl^{37}}\, 2\Delta V}{eB^2}} - \sqrt{\frac{m_{Cl^{35}}\, 2\Delta V}{eB^2}} = \sqrt{\frac{2\Delta V}{eB^2}}\left(\sqrt{m_{Cl^{37}}} - \sqrt{m_{Cl^{35}}}\right)$$

$$= \sqrt{\frac{2\Delta V}{eB^2}}\left(\sqrt{37 m_p} - \sqrt{35 m_p}\right) = \sqrt{\frac{2\Delta V m_p}{eB^2}}\left(\sqrt{37} - \sqrt{35}\right)$$

$$\Delta r^2 = \frac{2\Delta V m_p}{eB^2}\left(\sqrt{37} - \sqrt{35}\right)^2$$

$$\Delta V = \frac{\Delta r^2}{\left(\sqrt{37} - \sqrt{35}\right)^2} \frac{eB^2}{m_p 2} = \frac{(7\times10^{-3}\,m)^2 (1.6\times10^{-19}\,C)(1.2\,T)^2}{(1.67\times10^{-27}\,kg)\; 2\left(\sqrt{37} - \sqrt{35}\right)^2}$$

$$\Delta V = 1.22\times10^5\,V$$

$$\frac{m^2 C\, T^2}{kg} = \frac{\cancel{m^2}\, \cancel{C}\, \frac{N^2 \cdot \cancel{s^2}}{C^2 \cancel{m^2}} \frac{m}{\cancel{s^2}}}{\cancel{kg}} = \frac{J}{C} = V \qquad \text{(UNITS CHECK!)}$$