P26.

$\vec{i} = \langle 2, 7, 5 \rangle$ m

$\vec{f} = \langle 5, 6, 12 \rangle$ m

$\vec{E} = \langle 1000, 200, -510 \rangle \frac{N}{C}$

$V_f - V_i = ?$

$\Delta V = -\vec{E} \cdot \Delta \vec{r}$

$\Delta \vec{r} = \langle 5, 6, 12 \rangle - \langle 2, 7, 5 \rangle$

$\Delta \vec{r} = \langle 3, -1, 7 \rangle$ m

$$\Delta V = -\vec{E} \cdot \Delta \vec{r}$$

$$= -\langle 1000, 200, -510 \rangle \cdot \langle 3, -1, 7 \rangle$$

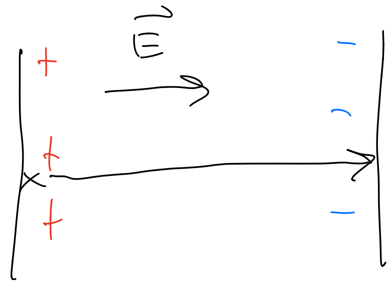
$$= -(3000 + (-200) - 3570)$$

$$= -(-570 - 200)$$

$$= -(-770) = 770$$

$\Delta V = 770$ V

P27.



$$\Delta V = -\vec{E}\cdot\Delta\vec{r}$$

$$\Delta V = |\vec{E}||\Delta\vec{r}|$$

$$|\vec{E}| = \frac{\Delta V}{|\Delta\vec{r}|} = \frac{36\ V}{10^{-3}\ m} = E = 3.6\times10^{4}\ \frac{V}{m}$$

P37:

$$\vec{i} = \langle 2, 5, 4\rangle\ m$$

$$\vec{f} = \langle 3, 5, 9\rangle\ m$$

$$\vec{E} = \langle 1000, 200, -500\rangle\ N/C$$

$$\Delta V = -\vec{E}\cdot\Delta\vec{r}$$

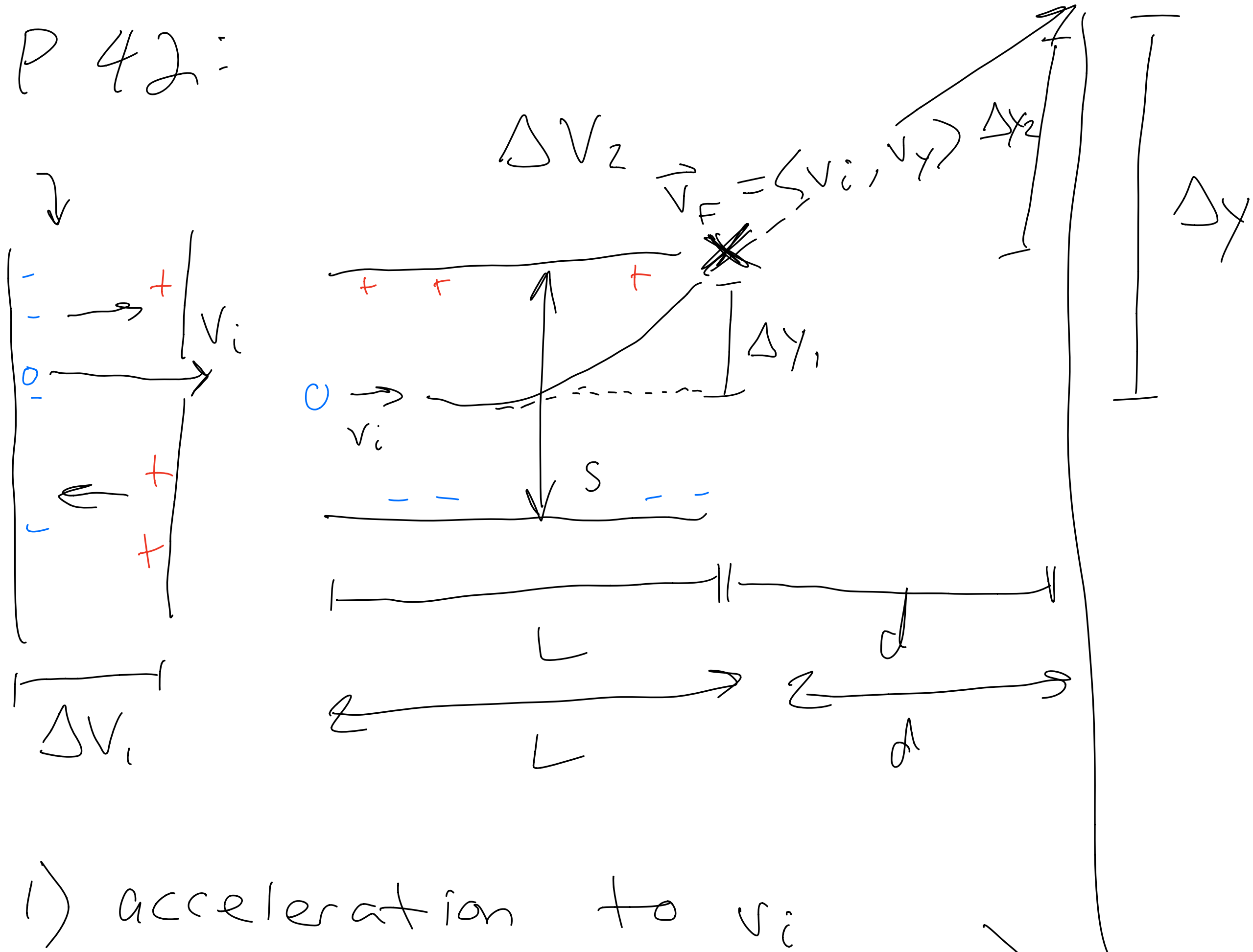
$$\Delta\vec{r} = \vec{f} - \vec{i} = \langle 1, 0, 5\rangle\ m$$

$$\Delta V = -\langle 1000, 200, -500\rangle\cdot\langle 1, 0, 5\rangle$$

$$= -(1000 + 0 - 2500)$$

$$= -(-1500) = \boxed{\Delta V = 1500\ V}$$

P 42:



1) acceleration to v_i
(before def plates)
ΔV_1

2) inside deflection plates
acceleration in the y dir

3) after deflection plates

1) v_i

$$|\Delta U| = |q \Delta V_1|$$

$$W = |e \Delta V_1|$$

$$\Delta K = W$$

$$\Delta K = K = W$$

$$K = e \Delta V_1 = \frac{1}{2} m v_i^2$$

$$v_i = \sqrt{\frac{2e\Delta V_1}{m}}$$

$$\vec{v} = \langle v_i, 0 \rangle$$

$$y = 0$$

$$|\vec{F}| = e|\vec{E}|$$

$$\Delta V_2 = (E)(s)$$

$$E = \frac{\Delta V_2}{s}, \quad F = \frac{e \Delta V_2}{s}$$

$$a_y = \frac{e\Delta V_2}{m s}$$

$$V_y = a_y t$$

$$\Delta y_1 = \frac{1}{2} a_y t^2$$

$$t = L / V_i$$

$$V_y = a_y \frac{L}{V_i} = \frac{e\Delta V_2}{m s} \frac{L}{V_i}$$

$$\Delta y_1 = \frac{1}{2} \frac{e\Delta V_2}{m s} \left(\frac{L}{V_i}\right)^2$$

$$V_i = \sqrt{\frac{2e\Delta V_1}{m}} , \quad V_i^2 = \frac{2e\Delta V_1}{m}$$

$$\Delta y_1 = \frac{1}{2} \frac{\cancel{e}\Delta V_2}{\cancel{m} s} L^2 \frac{\cancel{m}}{2\cancel{e}\Delta V_1}$$

$$\Delta y_1 = \frac{1}{4} \frac{\Delta V_2}{\Delta V_1} \frac{L^2}{s}$$

$$V_y = \frac{e\Delta V_2}{\ } \frac{L}{\ }$$

$m > \quad v_i$

$$\Delta y_2 = v_y t_1$$

$$t_1 = d/v_i$$

$$\Delta y_2 = v_y \frac{d}{v_i}$$

$$= \frac{e \Delta V_2}{m s} \frac{L}{v_i} \frac{d}{v_i}$$

$$\Delta y_2 = \frac{e \Delta V_2}{m s} \frac{L d}{v_i^2}$$

$$v_i^2 = \frac{2 e \Delta V_1}{m}$$

$$\Delta y_2 = \frac{\cancel{e} \Delta V_2}{\cancel{m} s} L d \frac{\cancel{m}}{2 \cancel{e} \Delta V_1}$$

$$\Delta y_2 = \frac{1}{2} \frac{\Delta V_2}{\Delta V_1} \frac{L d}{s}$$

$$\Delta y = \Delta y_1 + \Delta y_2$$

$$= \frac{1}{4}\frac{\Delta V_2}{\Delta V_1}\frac{L^2}{s} + \frac{1}{2}\frac{\Delta V_2}{\Delta V_1}\frac{Ld}{s}$$

$$\Delta y = \frac{1}{2}\frac{\Delta V_2}{\Delta V_1}\frac{L}{s}\left[\frac{L}{2} + d\right]$$

$$\Delta V_1 = 1.8 \times 10^4 \, V$$

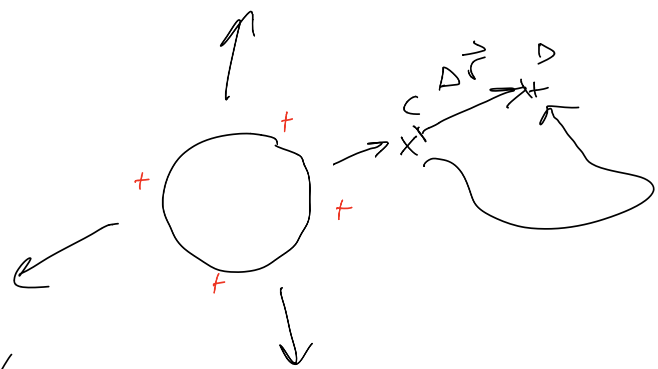
$$L = 8\,cm = 8 \times 10^{-2}\,m$$

$$s = 3\,mm = 3 \times 10^{-3}\,m$$

$$d = 0.3\,m$$

$$\Delta y \simeq 1\,cm$$

P 43:



$\Delta V_{C \to D}$

$\vec{E} \cdot d\vec{r} = |\vec{E}||d\vec{r}|$

$$\Delta V = -\int \vec{E} \cdot d\vec{r}$$

$$\vec{E} = \frac{1}{4\pi\epsilon_0} \frac{Q}{r^2} \hat{r}$$

$$\Delta V = -\int_{r_1}^{r_2} \frac{1}{4\pi\epsilon_0} \frac{Q}{r^2} \, dr$$

0

C

$$= +\frac{1}{4\pi\epsilon_0} \frac{Q}{r} \Big|_{r_1}^{r_2}$$

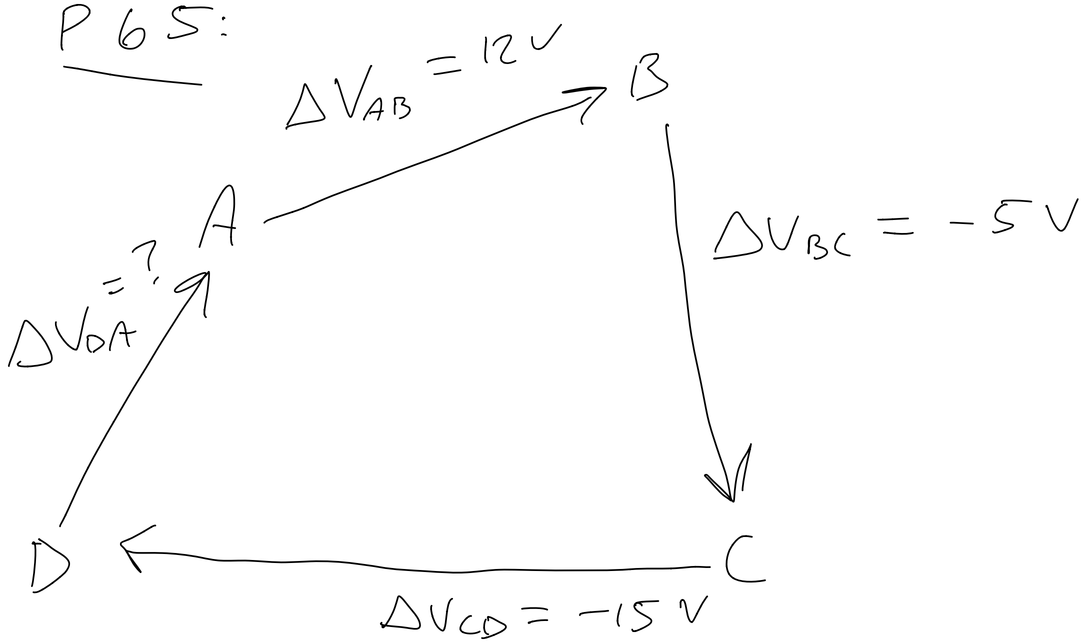
$$\Delta V = \frac{1}{4\pi\epsilon_0} Q \left[\frac{1}{r_2} - \frac{1}{r_1} \right]$$

$$= (9\times10^9)(4\times10^{-9}) \left[\frac{1}{0.06} - \frac{1}{0.02} \right]$$

$$36 * [-33.33]$$

$$\boxed{\Delta V = -1200 \text{ V}}$$

P65:



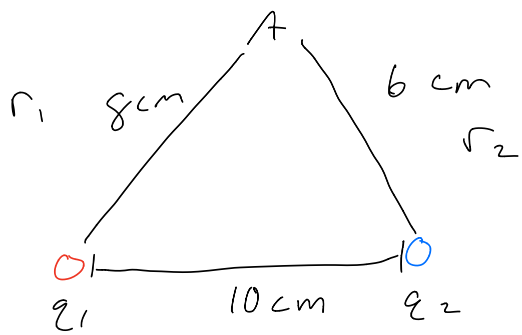
$$0 = \Delta V_{AB} + \Delta V_{BC} + \Delta V_{CD} + \Delta V_{DA}$$

$$= 12 - 5 - 15 + \Delta V_{DA}$$

$$0 = -8 + \Delta V_{DA}$$

$$\Delta V_{DA} = 8 V$$

P71.



$$V = \frac{1}{4\pi\epsilon_0}\frac{q}{r}$$

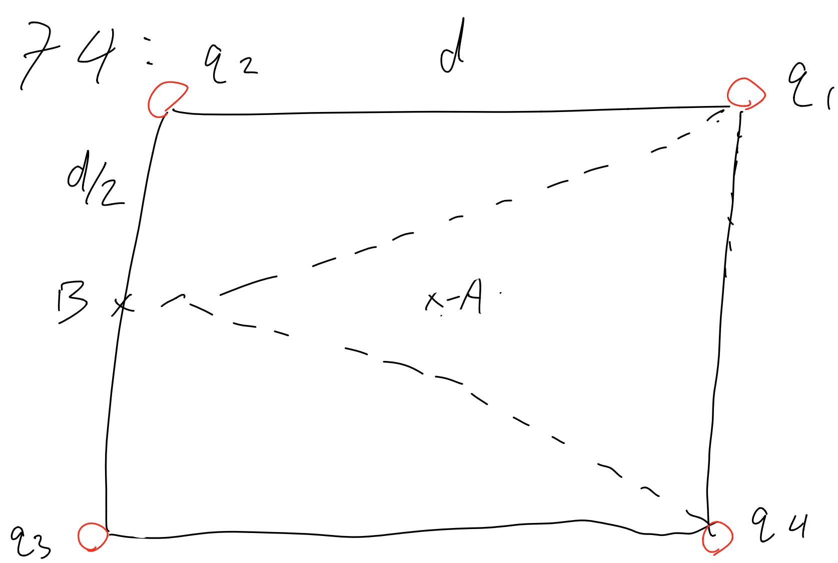
$$V = V_1 + V_2$$

$$= \frac{1}{4\pi\epsilon_0}\left(\frac{q_1}{r_1} + \frac{q_2}{r_2}\right)$$

$$= 9\times10^{9}\left[\frac{4\times10^{-9}}{0.08} - \frac{6\times10^{-9}}{0.06}\right]$$

$$\boxed{V = -450\ V}$$

P74:



$$V = \frac{1}{4\pi\epsilon_0} \frac{q}{r}$$

$$r = \sqrt{\frac{d^2}{4} + \frac{d^2}{4}} = \sqrt{\frac{1}{2} d^2}$$

$$r = \frac{1}{\sqrt{2}} d$$

$$V = V_1 + V_2 + V_3 + V_4$$

$$\boxed{V_A = \frac{1}{4\pi\epsilon_0} \frac{\sqrt{2}}{d} \left[q_1 + q_2 + q_3 + q_4 \right]}$$

$$V_1 = \frac{1}{4\pi\epsilon_0} \frac{q_1}{r}, \quad r = \sqrt{d^2 + \frac{d^2}{4}} = \sqrt{\frac{5}{4} d^2} = \frac{1}{2}\sqrt{5}\, d$$

$$V_1 = \frac{1}{4\pi\epsilon_0} \frac{2 q_1}{\sqrt{5}\, d}$$

$$V_4 = \frac{1}{4\pi\epsilon_0} \frac{2 q_4}{\sqrt{5}\, d}$$

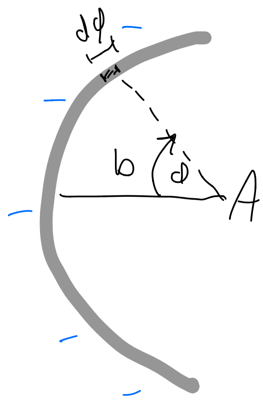
$$V_2 = \frac{1}{4\pi\epsilon_0} \frac{q}{d/2} = \frac{2 q_2}{4\pi\epsilon_0} \frac{1}{d}$$

$$V_3 = \frac{1}{4\pi\epsilon_0} \frac{2 q_3}{d}$$

$$\boxed{V_B = \frac{1}{2\pi\epsilon_0} \frac{1}{d} \left[\frac{1}{\sqrt{5}} q_1 + q_2 + q_3 + \frac{1}{\sqrt{5}} q_4 \right]}$$

P 86:

$$\text{Chg} = -q$$



$$dq = \lambda\, d\phi, \qquad \lambda = \frac{-q}{\pi}$$

$$dq = -q\,\frac{d\phi}{\pi}$$

$$dV = \frac{1}{4\pi\epsilon_0}\,\frac{dq}{r} \qquad r = b$$

$$dV = -\frac{1}{4\pi\epsilon_0}\,\frac{q\,d\phi}{\pi b}$$

$$V = -\frac{1}{4\pi^2\epsilon_0}\,\frac{q}{b}\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} d\phi \qquad \pi$$

$$V = -\frac{1}{4\pi\epsilon_0}\,\frac{q}{b}$$