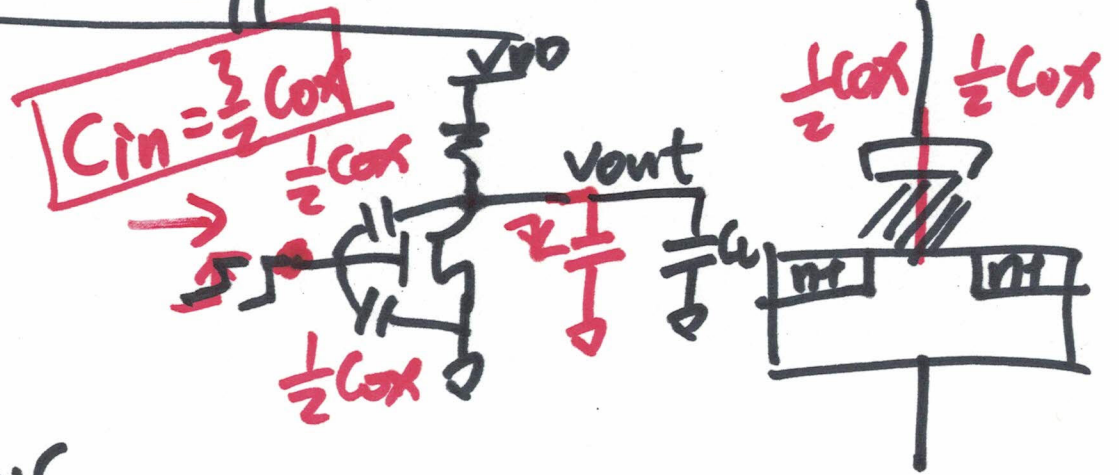
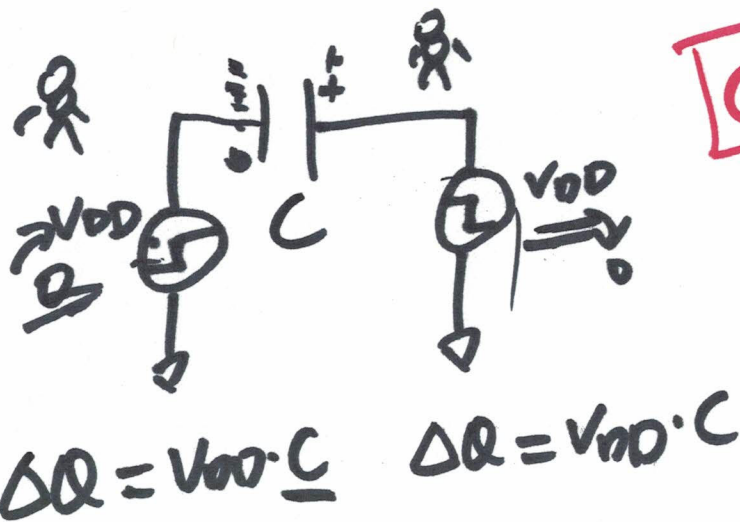
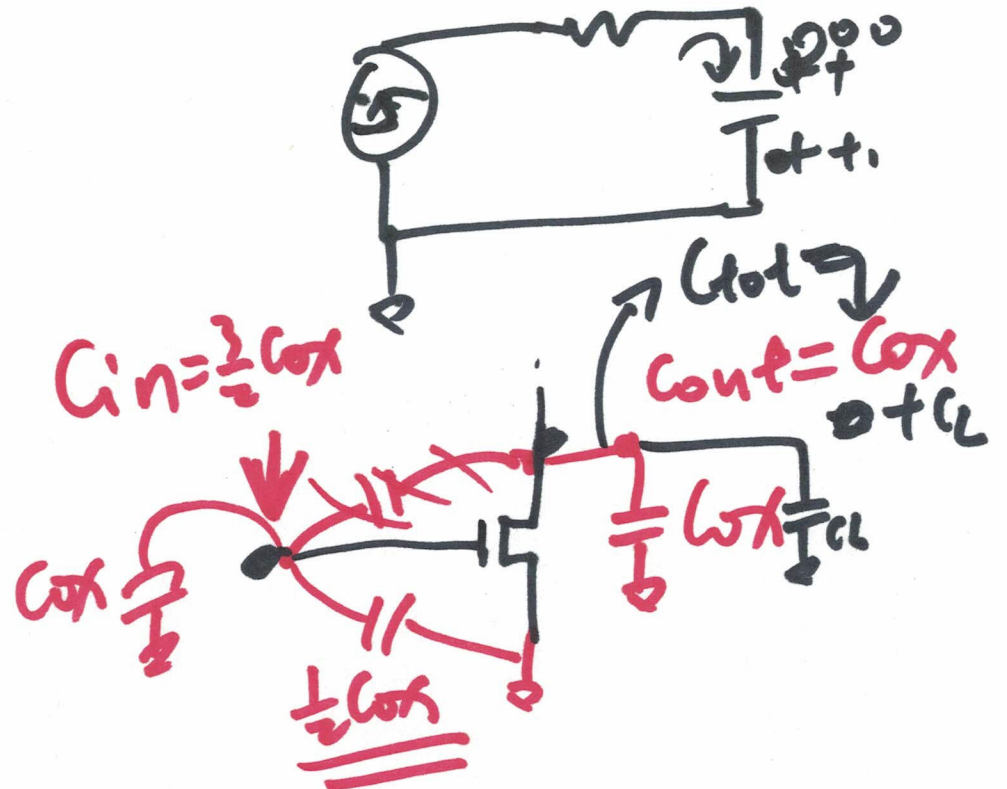
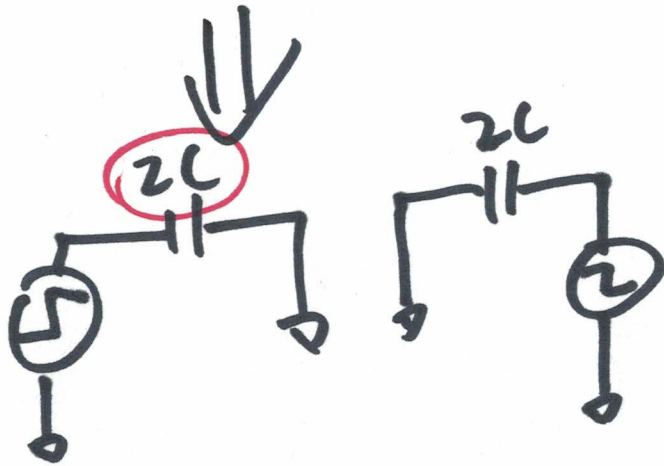
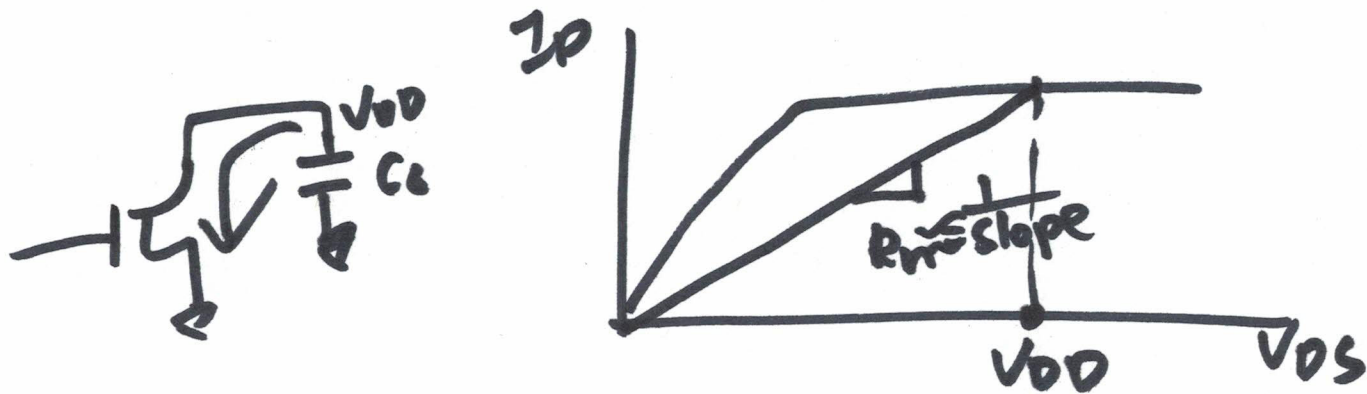


Miller Effect

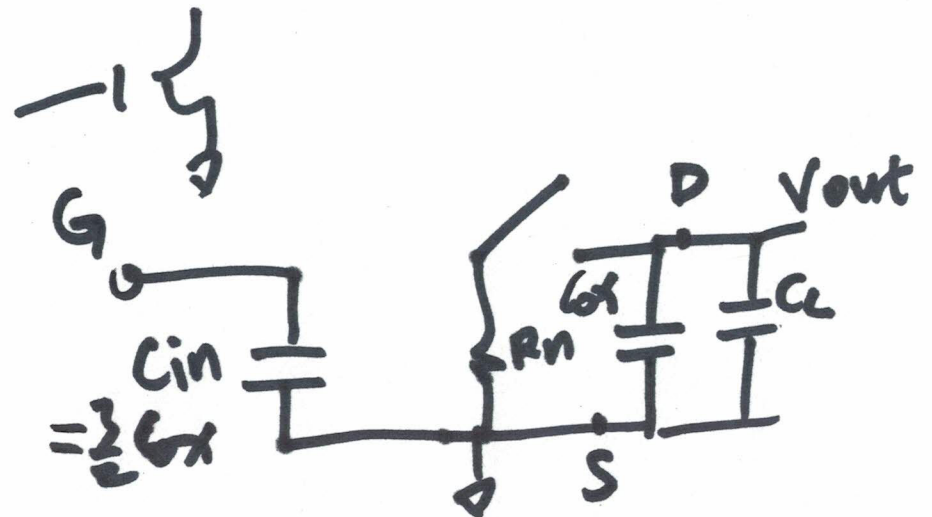
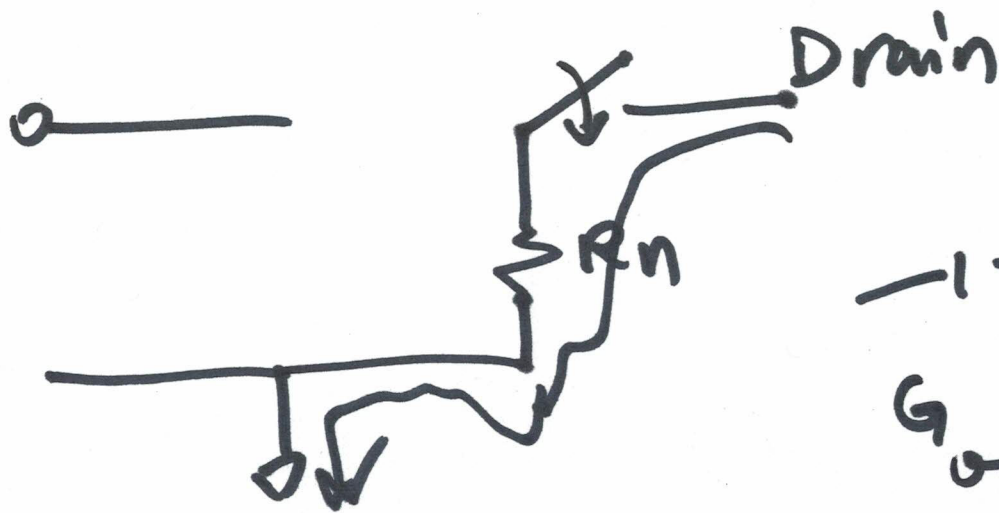


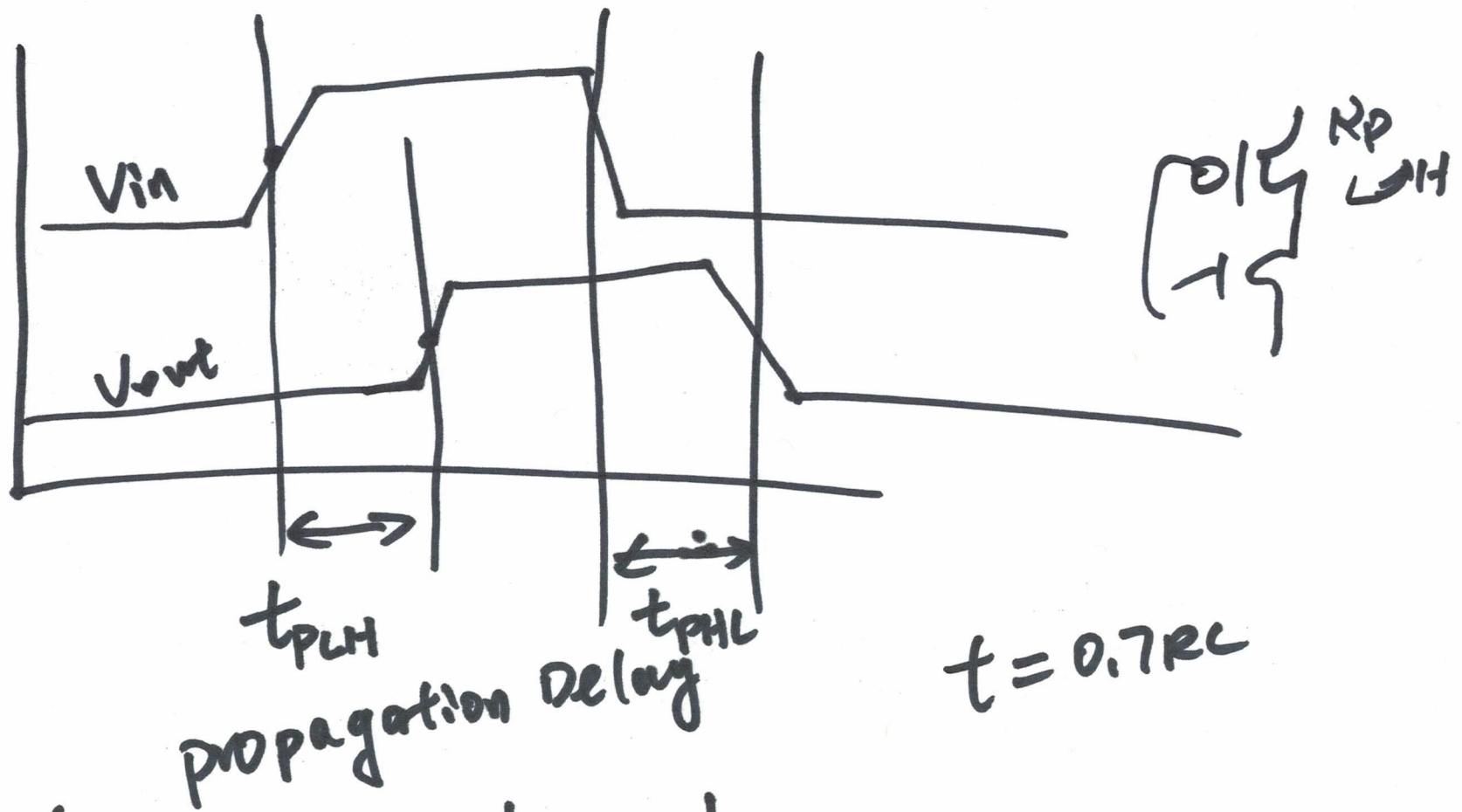
$$\frac{\Delta Q}{V_{DD}} = \underline{\underline{2C}}$$





$$R_n \approx \frac{V_{DD}}{I_D} = \frac{V_{DD}}{\frac{K_{Pn}}{2} \frac{W}{L} (V_{GS} - V_{THN})^2}$$

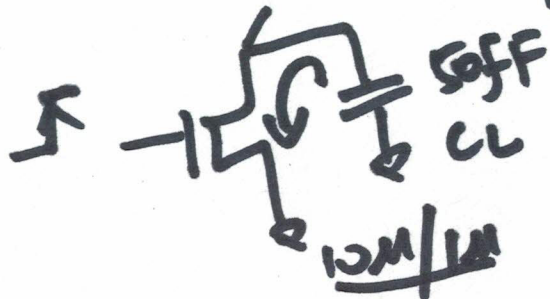




$$t = 0.7RC$$

Example: P320

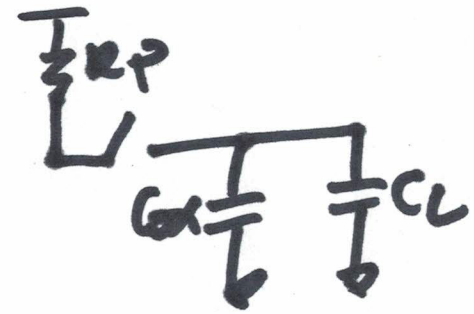
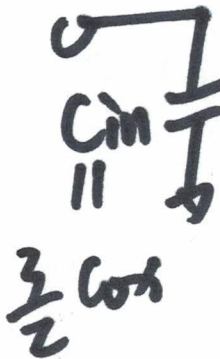
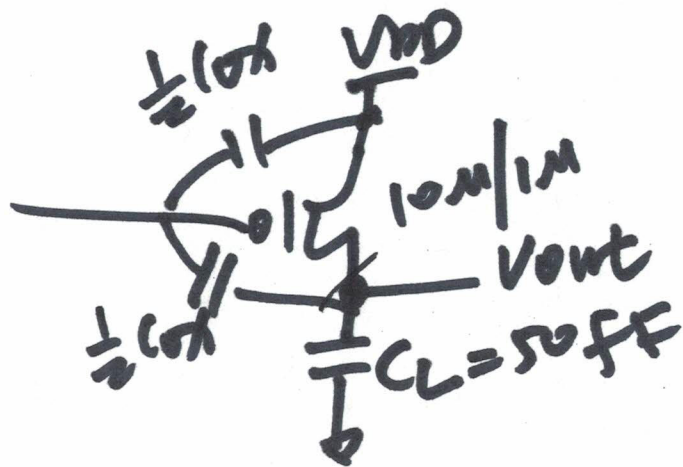
	Size	$R_{n,p}$	$C_{ox,n,p}$
NMOS	10μm/1μm	1.5K	17.5fF
Vout PMOS	30μm/1μm	1.5K	52.5fF



$$t_{PHL} = 0.7 R_{eq} C_L = 0.7 \times 1.5K \times (C_{ox} + C_L)$$

Circuit diagram of an inverter. The input is connected to the gate of the NMOS transistor. The output is connected to the drain of the NMOS transistor. The NMOS transistor has a width of 10μm and a length of 1μm. The PMOS transistor has a width of 30μm and a length of 1μm. The output capacitance is 50fF.

③



$$t_{\text{put}} = 0.7 \times R_p \times (C_{\text{tot}})$$

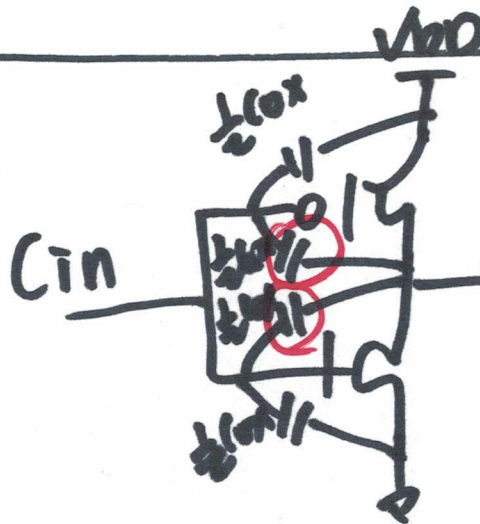
$$= 0.7 \times 4.5 \text{ K} \times (17.5 \text{ fF} + 50 \text{ fF})$$

$$\begin{cases} R_p = 4.5 \text{ K} \\ C_{\text{oxp}} = 17.5 \text{ fF} \end{cases}$$

$$C = \epsilon \frac{A}{d}$$



$$R = \rho \frac{L}{A}$$



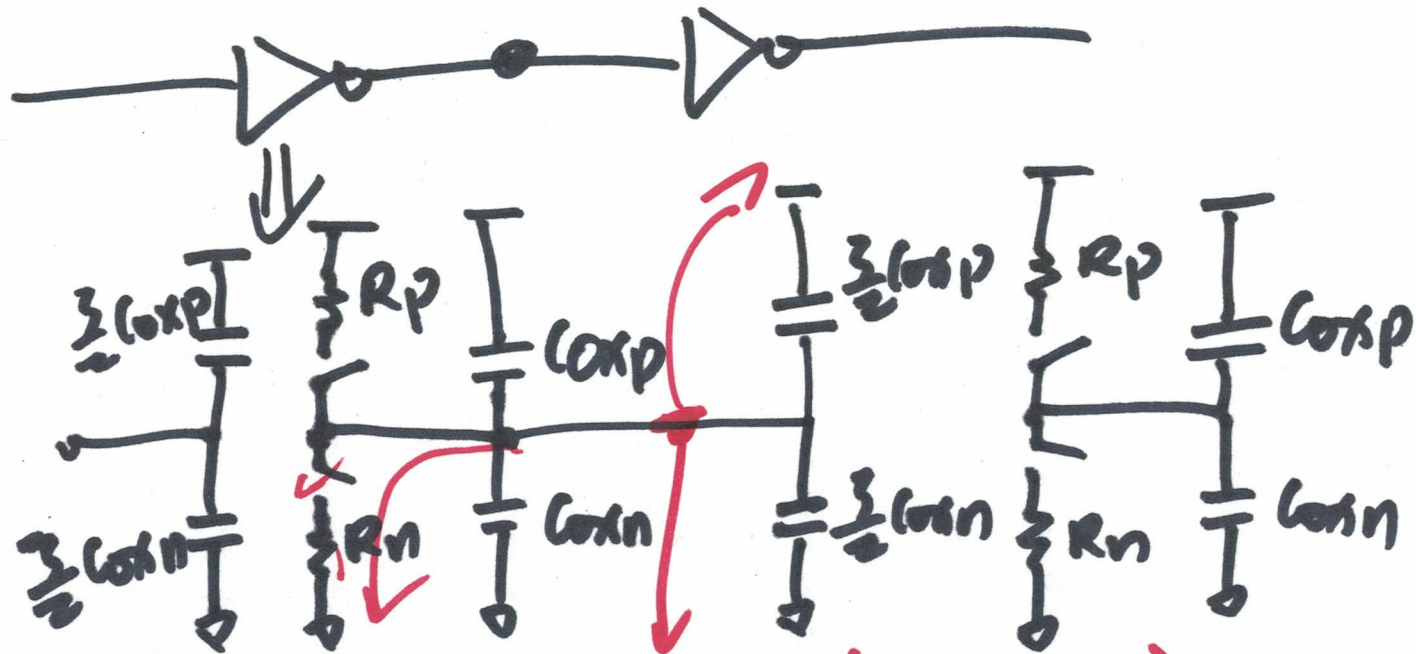
$$C_{\text{out}} = C_{\text{oxn}} + C_{\text{oxp}}$$

$$C_{\text{in}} = C_{\text{oxp}} + C_{\text{oxn}} + \frac{1}{2} C_{\text{oxp}} + \frac{1}{2} C_{\text{oxn}}$$

$$= \frac{3}{2} (C_{\text{oxp}} + C_{\text{oxn}})$$

(4)

$$\begin{cases} t_{pHL} = 0.7 \times R_n \times C_{out} \\ \underline{\underline{= 0.7 \times R_n \times (C_{in} + C_{xp})}} \\ t_{put} = 0.7 \times R_p \times (C_{in} + C_{xp}) \end{cases}$$



$$\begin{cases} t_{pHL} = 0.7 \times R_n \times C_{tot} \\ t_{put} = 0.7 \times R_p \times C_{tot} \end{cases}$$

$$\underline{\underline{C_{tot} = \sum (C_{xp} + C_{xn})}}$$