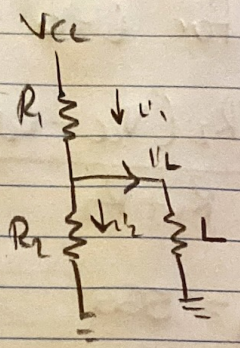
elelicit prelab2

P1



at node

$$-i_1 + i_L + I_2 = 0$$

$$\frac{V_0 - V_{cc}}{R_1} + i_L + \frac{V_0}{R_2} = 0$$

$$\frac{(V_0 - V_{cc})R_2 + V_0 R_1}{R_1 R_2} + i_L = 0$$

$$\frac{R_2 V_0 - V_{cc} R_2 + V_0 R_1}{R_1 R_2} + i_L = 0$$

$$\frac{V_0(R_1 + R_2) - V_{cc}(R_1)}{R_1 R_2} + i_L = 0$$

$$i_L = \frac{V_{cc} R_2 - V_0(R_1 + R_2)}{R_1 R_2}$$

$$\frac{V_{cc} R_2 - i_L R_1 R_2}{R_1 + R_2} = V_0$$

$$\frac{R_2(V_{cc} - i_L R_1)}{R_1 + R_2} = V_0$$

for $i=0$

$$\frac{R_2(V_{cc}-i_L R_1)}{R_1+R_2} = V_0$$

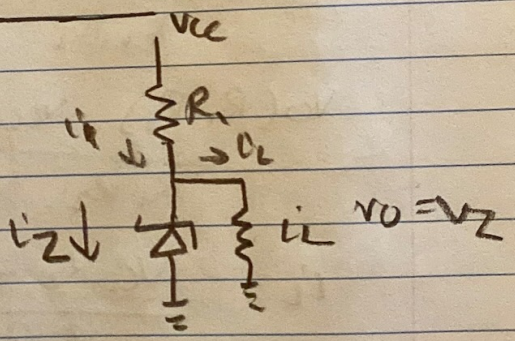
$V_0 = 6.19\ V$

$R_1 = 560$
$R_2 = 910$
$V_{cc} = 10$

ALL Calculations are in the excel sheets

graph in excel sheet

P2:



$R_1 = 560\Omega$

$$-i_1 + i_2 + i_L = 0$$

$$\frac{V_0 - V_{cc}}{R_1} + i_2 + i_L = 0$$

$$i_L = \frac{V_0}{R_L} = \frac{V_z}{R_L}$$

$$R_L = \frac{V_z}{i_L}$$

$$\frac{V_O - V_{CC}}{R_1} + \frac{V_O - 0.7}{R_D} + \frac{V_O}{R_L} = 0$$

$R_D = 2\ \Omega$
$R_1 = 560\ \Omega$
$V_{CC} = 10$

$V_O = V_2 \quad R_L = \frac{V_L}{i_L}$

$$\frac{V_O - V_{CC}}{R_1} + \frac{V_O - 0.7}{R_D} + i_L = 0$$

$$\frac{V_O}{R_1} - \frac{V_{CC}}{R_1} + \frac{V_O}{R_D} - \frac{0.7}{R_D} + i_L = 0$$

$$V_O \left(\frac{1}{R_1} + \frac{1}{R_D}\right) = \frac{V_{CC}}{R_1} + \frac{0.7}{R_D} + i_L$$

$$V_O = \left(\frac{10}{560} + \frac{0.7}{2} - i_L\right) \div \left(\frac{1}{560} + \frac{1}{2}\right)$$

$$= \left(\frac{103}{280} - i_L\right) \times \frac{560}{281}$$

$$\boxed{V_O = \frac{206}{281} - i_L \frac{560}{281}}$$

at $i = 0$

$$V_O = \frac{206}{281} = 0.733$$

rest of calculations in excel sheet

graph in excel sheet