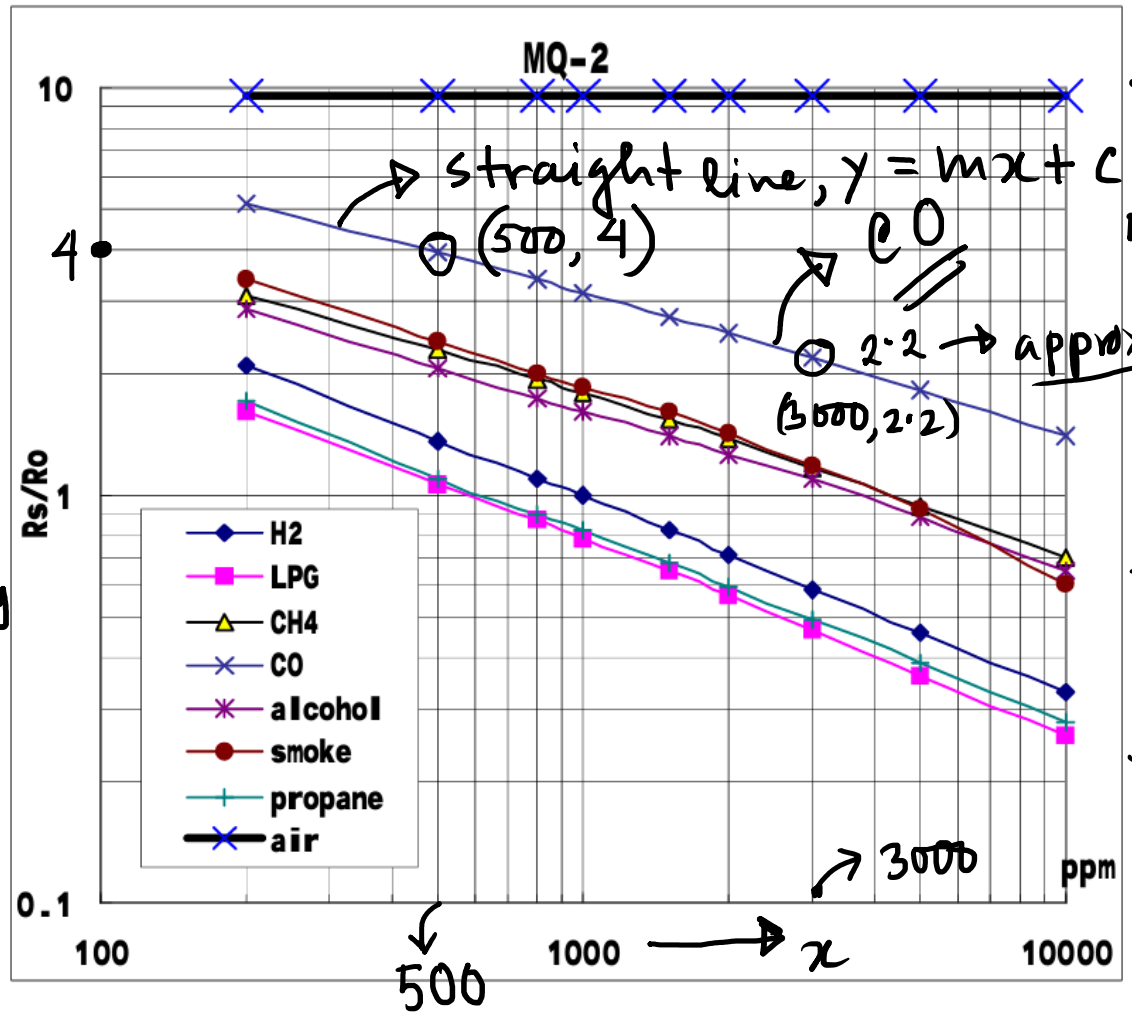
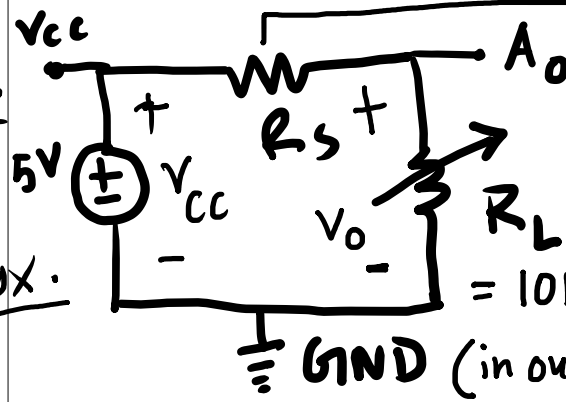


ckt for MQ-2: (Analog Value) → varies according to Gas level



A_0 → This value is converted to voltage level by dividing 2^{10} and multiplying by 5 V (in our case)

$$\therefore V_{cc} = 5V \quad \text{and} \quad V_o = \frac{\text{analog Read}(A_0)}{2^{10}} \times 5V$$

Let's say we want to convert A_0 to PPM value for CO Gas!!

First, determine the straight line equation for CO Gas, $y = mx + c$ where $y = \log_{10}\left(\frac{R_s}{R_o}\right)$ where $R_o = 20K\text{ohm}$ and $x = \log_{10}(ppm)$. We know two points on this straight line: (500, 4) & (3000, 2.2), then $m = \frac{\log(4) - \log(2.2)}{\log(500) - \log(3000)} = -0.33$

(500 → ppm, 4 → R_s/R_o)

Similary, $\log\left(\frac{R_s}{R_o}\right) = m \times \log(ppm) + c$

$\Rightarrow c = \log(4) - [-0.33 \times \log(500)]$

$= 1.50$

Then, the straight line for CO gas in MQ-2 is:

$$\log\left(\frac{R_s}{R_o}\right) = -0.33 \times \log(ppm) + c$$

straight line for CO :

$$\log\left(\frac{R_S}{R_0}\right) = -0.33 \times \log(PPM_{CO}) + c = -0.33 \times \log(PPM_{CO}) + 1.5$$

$$\Rightarrow \log_{10}(PPM_{CO}) = \frac{\log\left(\frac{R_S}{R_0}\right) - 1.5}{-0.33}$$

$$\therefore \boxed{PPM_{CO} = 10^{\frac{\log(R_S/R_0) - 1.5}{-0.33}}} \quad \text{---------- (i)}$$

$\rightarrow R_0 \Rightarrow$ 20Kohm in our case

How to get real time R_S value?

Since, we know, v_0, v_{in}, R_L, then we can apply VDR :

$$v_0 = \frac{R_L}{R_L + R_S} \times v_{in}$$

$$\Rightarrow R_L + R_S = \frac{v_{in}}{v_0} \times R_L$$

$$\therefore R_S = \left(\frac{v_{in}}{v_0} \times R_L - R_L\right)$$

Gas level change $\rightarrow$ we get v_0 $\rightarrow$ using VDR we get R_S value $\rightarrow$ feed it into eqn (i) $\rightarrow$ get PPM value of CO

In similar way, we calculated for "smoke" in my code !!