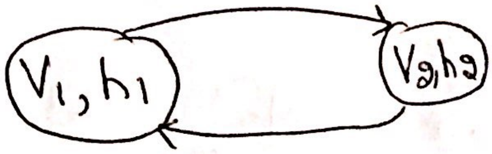
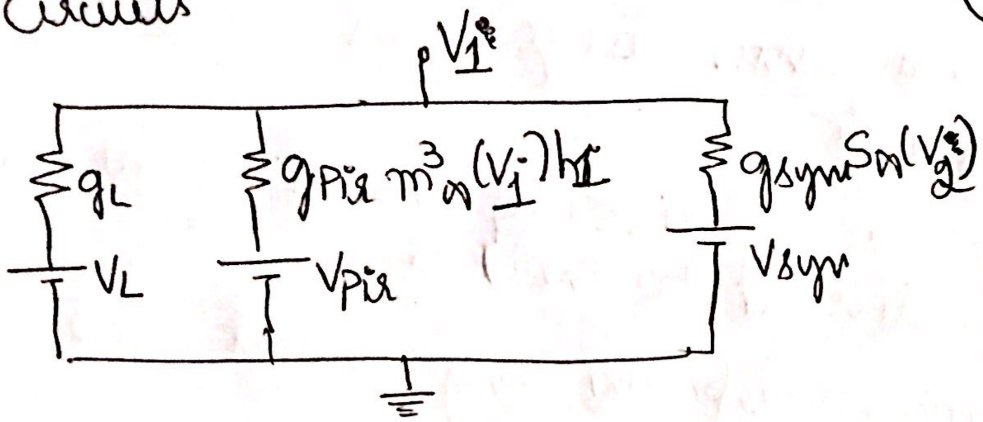
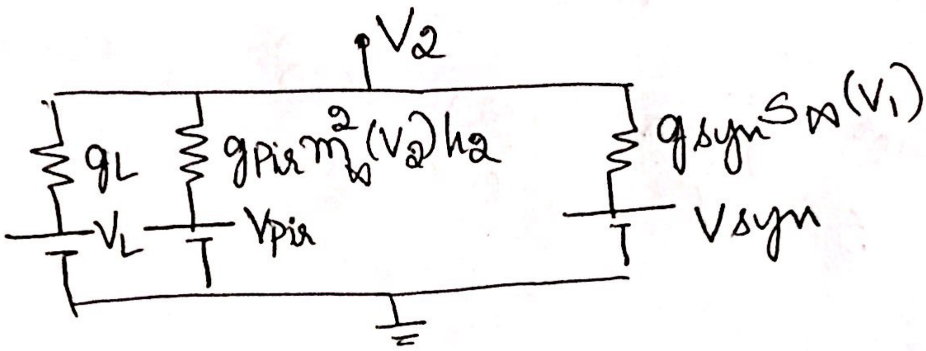
Mini Project - Spinal cord Oscillator.



Circuits





$g_{pir} = 0.3\, mS/cm^2$ $\theta_{syn} = -44\, mV$ $V_{pir} = 120$

$V_L = -60$ $V_{syn} = -80$ $C = 1\,\mu F/cm^2$ $g_L = 0.1\, mS/cm^2$

$K_{syn} = 2$ $\tau_0 = 10\, msec$ $\phi = 3$

$$C\frac{dV_1}{dt} = -g_{pir}\, m_\infty^3(V_1)\, h_1 (V_1 - V_{pir}) - g_L(V_1 - V_L) - g_{syn} S_\infty (V_1 - V_{syn})$$

$$\frac{dh_1}{dt} = \phi[h_\infty(V_1) - h_1]/\tau_h(V_1)$$

$$S_\infty(V_2) = 1/\cancel{\exp}\{1+\exp[-(V_j - \theta_{syn})/K_{syn}$$

$$m_\infty(V) = 1/\{1+\exp[-(V+65)/7.8]\}$$

$$h_\infty(V) = 1/\{1+\exp[(V+81)/11]\}$$

$\tau_h(V) = h_\infty(V) \exp[(V+162.3)/17.8]$

Figure 4 :- Two- cell system oscillate in-phase when post synaptic conductance obeys first order kinetics with slow decay rate.

1] $t = 300$ msec $\rightarrow$ depolarizing current of duration 50 msec is delivered to the cell

2] At $t = 1100$ msec $\rightarrow$ depolarizing current for 50 msec duration

$g_{L} = 0.05 mS/cm^2$

$g_{pir} = 0.5 mS/cm^2$ $g_{syn} = 0.2 mS/cm^2$

$\phi = 2$ $\theta_{syn} = -35 mV$ $K_r = 0.005$

Case I

$I_1 =$ heaviside$(t-300)$ - heaviside$(t-350)$ + heaviside$(t-1100)$ - heaviside$(t-1150)$;

$I_2 =$ heaviside$(t-300)$ - heaviside$(t-350)$ - heaviside$(t-1100)$ + heaviside$(t-1150)$;