

$$\frac{dv}{dt} = -I_{Leak} - I_{Ca} - I_{Na} - I_K \quad (S1)$$

$$\frac{db}{dt} = \frac{b_\infty - b}{\tau_b} \quad (S2)$$

$$\frac{dg}{dt} = \frac{g_\infty - g}{\tau_g} \quad (S3)$$

$$\frac{dh}{dt} = \frac{h_\infty - h}{\tau_h} \quad (S4)$$

$$\frac{dm}{dt} = \frac{m_\infty - m}{\tau_m} \quad (S5)$$

$$\frac{dn}{dt} = \frac{n_\infty - n}{\tau_n} \quad (S6)$$

$$\frac{dq}{dt} = \frac{q_\infty - q}{\tau_q} \quad (S7)$$

$$I_{Leak} = G_{Leak}(v - E_{Leak}) \quad (S8)$$

$$I_{Ca} = G_{Ca}b^2g^2(v - E_{Ca}) \quad (S9)$$

$$I_{Na} = G_{Na}mh(v - E_{Na}) \quad (S10)$$

$$I_K = G_Kn^2q^2(v - E_K) \quad (S11)$$

$$\tau_b = \frac{s\tau_b}{\exp\left(\frac{\theta_{\tau_b}-v}{\sigma_{\tau_b}^2}\right) + \exp\left(-\frac{\theta_{\tau_b}-v}{\sigma_{\tau_b}^1}\right)} \quad (S12)$$

$$\tau_g = \frac{s\tau_g}{\exp\left(\frac{\theta_{\tau_g}-v}{\sigma_{\tau_g}^2}\right) + \exp\left(-\frac{\theta_{\tau_g}-v}{\sigma_{\tau_g}^1}\right)} \quad (S13)$$

$$\tau_h = \frac{s\tau_h}{\exp\left(\frac{\theta_{\tau_h}-v}{\sigma_{\tau_h}^2}\right) + \exp\left(-\frac{\theta_{\tau_h}-v}{\sigma_{\tau_h}^1}\right)} \quad (S14)$$

$$\tau_m = \frac{s\tau_m}{\exp\left(\frac{\theta_{\tau_m}-v}{\sigma_{\tau_m}^2}\right) + \exp\left(-\frac{\theta_{\tau_m}-v}{\sigma_{\tau_m}^1}\right)} \quad (S15)$$

$$\tau_n = \frac{s\tau_n}{\exp\left(\frac{\theta_{\tau_n}-v}{\sigma_{\tau_n}^2}\right) + \exp\left(-\frac{\theta_{\tau_n}-v}{\sigma_{\tau_n}^1}\right)} \quad (S16)$$

$$\tau_q = \frac{s\tau_q}{\exp\left(\frac{\theta_{\tau_q}-v}{\sigma_{\tau_q}^2}\right) + \exp\left(-\frac{\theta_{\tau_q}-v}{\sigma_{\tau_q}^1}\right)} \quad (S17)$$

$$b_\infty = \frac{1}{\exp\left(\frac{\theta_{b_\infty}-v}{\sigma_{b_\infty}}\right) + 1} \quad (S18)$$

$$g_\infty = \frac{1}{\exp\left(-\frac{\theta_{g_\infty}-v}{\sigma_{g_\infty}}\right) + 1} \quad (S19)$$

$$h_{\infty} = \frac{1}{\exp\left(-\frac{\theta_{h_{\infty}}-v}{\sigma_{h_{\infty}}}\right) + 1} \quad (\text{S20})$$

$$m_{\infty} = \frac{1}{\exp\left(\frac{\theta_{m_{\infty}}-v}{\sigma_{m_{\infty}}}\right) + 1} \quad (\text{S21})$$

$$n_{\infty} = \frac{1}{\exp\left(\frac{\theta_{n_{\infty}}-v}{\sigma_{n_{\infty}}}\right) + 1} \quad (\text{S22})$$

$$q_{\infty} = \frac{1}{\exp\left(-\frac{\theta_{q_{\infty}}-v}{\sigma_{q_{\infty}}}\right) + 1} \quad (\text{S23})$$