$$\mathbf{Q} = \begin{bmatrix} \cdot & \beta\pi_T & \beta\pi_C & \alpha\pi_G \\ \beta\pi_A & \cdot & \alpha\pi_C & \beta\pi_G \\ \beta\pi_A & \alpha\pi_T & \cdot & \beta\pi_G \\ \alpha\pi_A & \beta\pi_T & \beta\pi_C & \cdot \end{bmatrix}$$