$$z_n^{(\text{RNA})} \sim \mathcal{N}(0, I) \quad z_n^{(\text{PROT})} \sim \mathcal{N}(0, I)$$

$$l_n^{(\text{RNA})} \sim \log\mathcal{N}(\ell^{\text{RNA}}, \sigma_{\text{RNA}}^2) \quad l_n^{(\text{PROT})} \sim \log\mathcal{N}(\ell^{\text{PROT}}, \sigma_{\text{PROT}}^2)$$

$$\mu_{ng}^{\text{RNA}} = f_\mu^{\text{RNA}}(z_n^{\text{RNA}}) \quad \theta_g = f_\theta^{\text{RNA}}(z_n^{\text{RNA}})$$

$$\pi_{ng} = f_\pi^{\text{RNA}}(z_n^{\text{RNA}}) \quad \text{counts}_{x_{ng}} \sim \text{ZINB}(\mu_{ng}^{\text{RNA}} l_n^{\text{RNA}}, \theta_g, \pi_{ng})$$

$$\mu_{nt}^{\text{PROT}} = f_\mu^{\text{PROT}}(z_n^{\text{PROT}}) \quad \sigma_{nt}^{\text{PROT}} = f_\sigma^{\text{PROT}}(z_n^{\text{PROT}})$$

$$\text{counts}_{x_{nt}} \sim \mathcal{N}(\mu_{nt}^{\text{PROT}} l_n^{\text{PROT}}, \sigma_{nt}^{\text{PROT}})$$

$$w_{ng} \sim \text{Gamma}(f_w(z_n, s_n), \theta_g) \quad l_n \sim \text{LogNormal}(\ell_\mu^n, \ell_\nu^n)$$

$$y_{ng} \sim \text{Poisson}(l_n w_{ng}) \quad h_{ng} \sim \text{Bernoulli}(f_h(z_n, s_n))$$

$$\text{obs\_counts}_{x_{ng}} = \begin{cases} y_{ng} & h_{ng} = 0 \\ 0 & \text{otherwise} \end{cases}$$