$$\mathcal{L}_{\text{GAN}}(G, D_Y, X, Y) = \mathbb{E}_{y \sim p_{\text{data}(y)}}[\log D_Y(y)] + \mathbb{E}_{x \sim p_{\text{data}(x)}}[\log(1 - D_Y(x))]$$

$$\mathcal{L}_{\text{cyc}}(G, F) = \mathbb{E}_{x \sim p_{\text{data}(x)}}[||F(G(x)) - x||_1] + \mathbb{E}_{y \sim p_{\text{data}(y)}}[||F(G(y)) - y||_1]$$

$$\mathcal{L}_{\text{idt}}(G, F) = \mathbb{E}_{y \sim p_{\text{data}(y)}}[||G(y) - y||_1] + \mathbb{E}_{x \sim p_{\text{data}(x)}}[||F(x) - x||_1]$$

$$\mathcal{L}_{\text{vgg}}(G, F) = \mathbb{E}_{y \sim p_{\text{data}(y)}}[||\Phi(G(y)) - \Phi(y)||_2] + \mathbb{E}_{x \sim p_{\text{data}(x)}}[||\Phi(F(x)) - \Phi(x)||_2]$$

$$\mathcal{L}(G_{A2B}, G_{B2A}, D_A, D_B, I_A, I_B) = \mathcal{L}_{\text{GAN}}(G_{A2B}, D_B, I_A, I_B) + \mathcal{L}_{\text{GAN}}(G_{B2A}, D_A, I_B, I_A)$$

$$+ \lambda_{\text{cyc}}\mathcal{L}_{\text{cyc}}(G_{A2B}, G_{B2A}) + \lambda_{\text{idt}}\mathcal{L}_{\text{idt}}(G_{A2B}, G_{B2A}) + \lambda_{\text{vgg}}\mathcal{L}_{\text{vgg}}(G_{A2B}, G_{B2A})$$