1.

forward SDE $dx_t = f(x_t, t)dt + g(x_t, t)dW_t$

$\Rightarrow$ fokker-planck : $\frac{\partial p}{\partial t} = -\frac{\partial}{\partial x}(fp) + \frac{1}{2}\frac{\partial^2}{\partial x^2}(g^2 p)$

continuity equation : $\frac{\partial p}{\partial t} = -\frac{\partial}{\partial x}(up)$, $u = \frac{dx_t}{dt}$

$$\Rightarrow -\frac{\partial}{\partial x}(up) = -\frac{\partial}{\partial x}(fp) + \frac{1}{2}\frac{\partial^2}{\partial x^2}(g^2 p)$$

$$\Rightarrow up = fp - \frac{1}{2}\frac{\partial}{\partial x}(g^2 p)$$

$$u = f - \frac{1}{2p}\cdot p\frac{\partial g^2}{\partial x} - \frac{g^2}{2}\frac{\partial p}{\partial x}\frac{1}{p}$$

$$= f - \frac{1}{2}\frac{\partial g^2}{\partial x} - \frac{g^2}{2}\frac{\partial}{\partial x}(\log p)$$

$$\Rightarrow dx_t = \left[f(x_t, t) - \frac{1}{2}\frac{\partial}{\partial x}g^2(x_t, t) - \frac{g^2(x_t, t)}{2}\frac{\partial}{\partial x}(\log p(x_t, t))\right]dt$$