The rate of diffusion is the flux (J) of atoms down a concentration gradient across a unit area over measured in a unit period of time.

$$J = -D\frac{dc}{dx}$$

where, D = diffusion coefficient, c = concentration, and x = direction.

The rate of heat conduction is the flux of heat down a temperature gradient across a unit area measured in a unit period of time.

$$J = -K\frac{dT}{dx}$$

where, K = thermal conductivity, T = temperature, and x = direction.