Rehm–Weller equation

Empirical correlation found between the observed second-order rate constant, $k_q$, for an intermolecular electron-transfer reaction and the Gibbs energy of the photoinduced electron transfer process within the encounter complex ($\Delta_{ET}G^o$):

$$k_q = \frac{k_d}{1 + \frac{k_d}{K_d Z} \left[ \exp \left( \frac{\Delta G_l^f}{RT} \right) + \exp \left( \frac{\Delta_{ET}G^o}{RT} \right) \right]}$$

with $k_d$ and $k_{-d}$ the rate constant for the formation and separation, respectively, of the encounter (precursor) complex, $K_d = k_d/k_{-d}$, $Z$ the universal collision frequency factor, $R$ the gas constant, $T$ the absolute temperature and $\Delta G^2$ the activation Gibbs energy of the forward electron transfer reaction.

Note:
In the original formulation of this equation the value $\frac{k_d}{K_d Z} = 0.25$ in acetonitrile was used.

Source:
PAC, 2007, 79, 293 (Glossary of terms used in photochemistry, 3rd edition (IUPAC Recommendations 2006)) on page 413