Quiz 18.1 – Reaction Rate Theories

Name:

Collision Theory

Nitrogen monoxide can be produced by the reaction:

$$N_2 + O_2 \longrightarrow 2\,NO$$
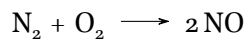
Find the encounter rate (Z) for this reaction in the atmosphere $(p_{N_2} \approx 0.8\,atm$ and $p_{O_2} \approx 0.2\,atm)$, then give an expression for the reaction rate.

Diffusion-Controlled Reactions

The rate constant of diffusion controlled reactions depends only on the temperature and the solvent viscosity (if the reaction distance is the same as the Stokes radius of the reactants). Find the rate constant k_d in water at $298\,K$ for such reactions. (recall that for water at room temperature $\eta = 0.00089\frac{kg}{m\,s}$)

Transition-State Theory

Describe the kinetic isotope effect in terms of transition-state theory

Invictus

By William Ernest Henley

Out of the night that covers me,
    Black as the pit from pole to pole,
I thank whatever gods may be
    For my unconquerable soul.

In the fell clutch of circumstance
    I have not winced nor cried aloud.
Under the bludgeonings of chance
    My head is bloody, but unbowed.

Beyond this place of wrath and tears
    Looms but the Horror of the shade,
And yet the menace of the years
    Finds and shall find me unafraid.

It matters not how strait the gate,
    How charged with punishments the scroll,
I am the master of my fate,
    I am the captain of my soul.