Prob. 19.17 - Arrhenius form of t-T shifting equation

General Arrhenius expression for relaxation time:

\[ \tau = \tau_0 \exp \frac{E^*}{RT} \]

Base-10 logarithmic form:

\[ \log \tau = \log \tau_0 + \frac{E^*}{2.303RT} \]

Logarithmic form at reference temperature:

\[ \log \tau_{\text{ref}} = \log \tau_0 + \frac{E^*}{2.303R T_{\text{ref}}} \]

Subtracting these two expressions:

\[ \log \tau - \log \tau_{\text{ref}} = \log a_T = \frac{E^*}{2.303R} \left( \frac{1}{T} - \frac{1}{T_{\text{ref}}} \right) \]

Prob. 19.18 - Time-temperature equivalence

![Graph showing the relationship between \( \log \tau \) and \( 1/(T, \text{K}) \). The slope is 2.303R, and E=222 kJ/mol.](image)