AFCoKaRE Practice Problem 5.4

Purpose: This problem allows you to practice converting between generalized and species-specific rate expressions and calculating pre-exponential factors and activation energies for the Arrehenius expression.

Problem Statement: According to simple collision theory the rate coefficient for reaction (1) will depend upon temperature according to equation (2). Using the rate coefficient data in the table below, determine whether this is true, and, if it is, find the best values of the pre-exponential factor and the activation energy.

$$2\,A \rightarrow Y + Z \tag{1}$$

$$k_1 = k_{0,1} \sqrt{T} \exp\left(\frac{-E_1}{RT}\right) \tag{2}$$

Data for Practice Problem 5.4

T (°C)	k_1 (L mol^{-1} min^{-1})
10	2.63 x 10^{-4}
22	4.78 x 10^{-4}
40	1.52 x 10^{-3}
54	4.18 x 10^{-3}
65	9.07 x 10^{-3}
78	2.14 x 10^{-2}
89	4.2 x 10^{-2}
103	9.42 x 10^{-2}