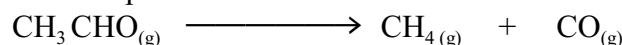


Arrhenius Equation Problems

1. The rate constant, k , was determined for the decomposition of hydrogen iodide at various temperatures. The results giving in k for a range of temperatures are given below.

Temperature T (K)	$\ln k$	T^{-1} (K^{-1})
550	- 15.6	$1.82 * 10^{-3}$
600	- 12.2	$1.67 * 10^{-3}$
650	- 9.4	$1.54 * 10^{-3}$
700	-7	$1.43 * 10^{-3}$
750	- 4.9	$1.33 * 10^{-3}$

- a) Plot a graph of $\ln k$ against T^{-1} . (Take the $\ln k$ axis from - 20 to 0 and the T^{-1} axis from $1.2 * 10^{-3}$ to $1.9 * 10^{-3} K^{-1}$.)
- b) Calculate the gradient (slope) of your graph and use it to determine a value for the activation energy, E_a , stating its units.
- c) Without obtaining the actual value, state two different ways in which the value of A in the Arrhenius equation could be determined.
2. The rate constants for the decomposition of ethanol:



Were measured at five different temperatures, the data are shown in the table below:

<u>Rate Constant</u> <u>k ($M^{-1}s^{-1}$)</u>	<u>Temperature</u> <u>T(K)</u>
0.011	700
0.035	730
0.105	760
0.343	790
0.789	810

Plot $\ln k$ versus $1/T$ and determine E_a ($KJ mol^{-1}$) for the above reaction.

3. $N_2O \longrightarrow N_2 + O$
- The second order rate constant for the decomposition of nitrous oxide (N_2O) into $N_{2(g)}$ and O (atom) has been measured at different temperatures as shown below.
- Determine E_a for the above reaction.

<u>Rate Constant</u> <u>k ($1/Ms$)</u>	<u>Temperature</u> <u>T ($^{\circ}C$)</u>
$1.87 * 10^{-3}$	600
0.0113	650
0.0569	700
0.244	750