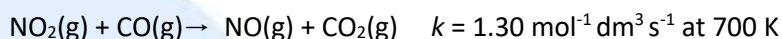


## HL Questions on Activation energy

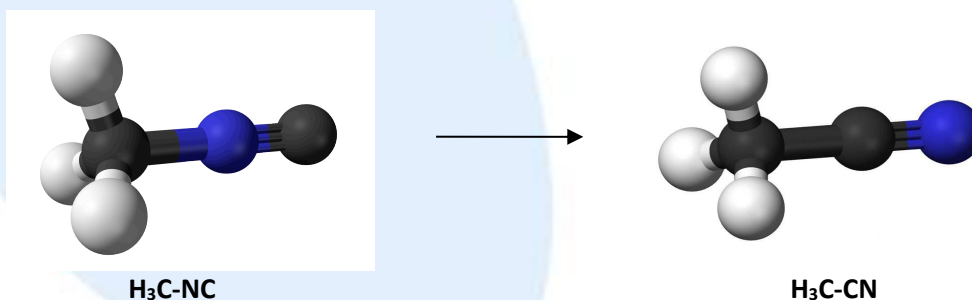
1. At a temperature of 700 K the rate constant for the redox reaction between nitrogen(IV) oxide and carbon monoxide is  $1.30 \text{ mol}^{-1} \text{ dm}^3 \text{ s}^{-1}$ .



- Deduce the overall order of this reaction.
- The activation energy is  $133.8 \text{ kJ mol}^{-1}$ .

Determine the temperature when the rate constant for the reaction will be  $20.0 \text{ mol}^{-1} \text{ dm}^3 \text{ s}^{-1}$ .

2. In the gas phase methyl isocyanide,  $\text{H}_3\text{CNC}$ , rearranges to form ethanenitrile,  $\text{H}_3\text{CCN}$ .



The table below shows the experimentally determined values of the rate constant for this rearrangement at different temperatures.

Temperature / °C	Rate constant / $\text{s}^{-1}$
190	$2.52 \times 10^{-5}$
199	$5.25 \times 10^{-5}$
230	$6.30 \times 10^{-4}$
251	$3.16 \times 10^{-3}$

- Determine the overall order of the reaction.
- Write the rate expression for the reaction.
- Using a graphical method, determine the activation energy for the rearrangement of methyl isocyanide.
- Determine the value of the rate constant for this reaction at **(i)**  $210^\circ\text{C}$  and **(ii)**  $283^\circ\text{C}$ .

