

Chemguide – questions

THE ARRHENIUS EQUATION

The Arrhenius equation looks like this:

$$k = Ae^{-\frac{E_A}{RT}}$$

k is the rate constant in the rate equation for a reaction., and the exponential part of the equation (to the right of A) measures the fraction of the molecules in a gas which have energies equal to or greater than the activation energy, E_A , at a temperature T.

A, known as the frequency factor or pre-exponential factor, can be taken as approximately constant over small temperature ranges.

1. Assuming A is constant over this range, work out how much faster a reaction with an activation energy of 40 kJ mol^{-1} would be at 40°C than at 20°C , assuming the concentrations of everything are the same. $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$.
2. Suppose you added a catalyst to a reaction at 21°C with an uncatalysed activation energy of 50 kJ mol^{-1} . The catalyst provides a route with an activation energy of 35 kJ mol^{-1} . How many times more molecules have enough energy to react at the lower activation energy?
 $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$.