

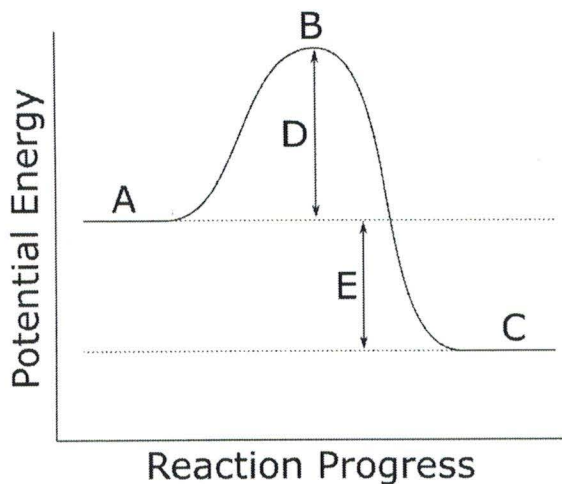
Quiz 14.3 – The Arrhenius Equation

Name: Key

Question 1

Name the two conditions required for a molecular encounter to lead to reaction

1) Sufficient energy 2) Proper Orientation



Question 2

Give the name for each item labeled on the reaction coordinate diagram at left

A: Reactants

B: Transition state

C: Products

D: Activation Energy

E: ΔH_{rxn}

A reaction is carried out at two temperatures, with the rate constant carefully measured. Data are given below:

$T (^{\circ}C)$	$k (M^{-1}s^{-1})$
288 K	1.6×10^{-4}
315 K	8.7×10^{-4}

Question 3

Give the activation energy and frequency factor for this reaction

$$\ln \left(\frac{1.6 \cdot 10^{-4} M^{-1}s^{-1}}{8.7 \cdot 10^{-4} M^{-1}s^{-1}} \right) = \frac{E_a}{8.314 J/mol \cdot K} \left(\frac{1}{315 K} - \frac{1}{288 K} \right) \rightarrow E_a = 47,300 J/mol \text{ or } 47.3 kJ/mol$$

$$1.6 \cdot 10^{-4} M^{-1}s^{-1} = A \cdot e^{\frac{-47,300 J/mol}{8.314 J/mol \cdot K \cdot 288 K}} \rightarrow A = 60,700 \frac{1}{M \cdot s}$$

Question 4

What is the overall reaction order for the reaction from Question 3?

2nd-Order (from units of k)