

SCH 4U Unit 4

Rates of Chemical Reactions

Students will be able to:

Objective 1

- define the following: homogeneous and heterogeneous reactions, concentration and reaction rate

Objective 2

- be able to understand rates of reactions quantitatively given the amount of a reactant used (or product produced) or a concentration vs time graph

Objective 3

- define or the following: activation (threshold) energy (E_a), activated complex (transition state), reaction coordinate and reaction profile

Objective 4

- define the particle kinetic energy distribution curve (Maxwell-Boltzmann distribution curve) and be comfortable using E_a on a Maxwell-Boltzmann curve

Objective 5

- interpret how reaction rate varies from the data from graphs of temperature or concentration versus reaction time

Objective 6

- define and identify the effect of the a catalyst on reaction path and the rate of chemical reactions

Objective 7

- explain on the basis of the collision theory, how various factors (concentration, temperature, ...) create differences in reaction rates and predict the effect on rates of reactions for changes in these factors

Objective 8

- define the following terms or concepts: reaction mechanism, intermediate product, elementary process, rate determining step, overall rate of reaction, overall equation, collision geometry (steric factor)

Objective 9

- sketch and interpret potential energy diagrams (reaction profiles) as follows: endothermic and exothermic reactions, both catalysed and uncatalysed reactions
- identify and calculate the reaction enthalpy and the activation energy for the forward and reverse reactions and for each reaction step

Objective 10

- identify the rate determining step for a reaction mechanism given either the rate of reaction for each step or a reaction profile of the reaction mechanism

Objective 11

- identify relatively fast or slow reactions given a series of relative reaction profiles or kinetic energy (Boltzmann) distribution curves with different activation energies

Objective 12

- identify and use qualitative results to predict the relative rates of reaction of a set of given chemical reactions

Objective 13

- interpret the data from graphs of concentration versus time of reaction and given how reaction rate varies with reactant concentration, write the appropriate rate law and identify the rate determining step

Objective 14

- identify the change in concentration of the reactant that would cause the greatest change in the rate of a reaction, given the reaction's rate expression

Objective 15

- define the following terms or concepts: rate law, order of a reactant with respect to a reaction, molecularity, overall order of reaction, rate constant "k", half-life, half-life period, 1st order reaction, 2nd order reaction

Objective 16

- identify any specific procedures, features, controls or results concerning any experiments carried out in class