Concept analysis for rates of chemical reaction

- **Concept label : rates of chemical reaction**
- **Concept definition: rate of chemical reaction is the change in the concentrations of reactants or products as a function of time**
- **Concept type : absract**

- Attribute

a.Critical : chemical kinetics,rate of chemical reaction, the concentration of reactants or products, function of time

b. Variable : time, temperature, concentration, pressure, catalyst, activation energy, surface area, average reaction rate, instaneous reaction rate, initial reaction rate

- Concept position :

a. Supper ordinate: chemical kenitics
b. Coordinate: equilibrium reaction
c. Subordinates: concentration and time

Example : A→B, rate = Δ[A]/Δt

None example : equilibrium constant

Collision theory

- Concept label : collision theory
- Concept definition : collision theory states that in order for a chemical reaction to occur the reactant atom or molecules must collide with each other.
- Concept type : abstract

- Attribute :

a. Critical : collision theory, reactant atoms or molecules, orientation of molecules(effective and ineffective collision),transition state
b. Variable: activation energy, frequency of collision, kinetic energy, temperature, energy barrier, reaction mechanisms

- Position

a. Supper ordinate: chemical kinetics
b. Coordinate : transition sate theory
c. subordinate: atoms, molecules,

Examples : the collision between the molecules of O_3 and NO to produce NO_2 and O_2

Non example :

Concept analysis for activation energy

- Concept label : activation energy
- Concept definition : the minimum amount of energy that the particles or reactants must have in order to react together .
- Concept type : abstract
- Attribute :

a. Critical : minimum amount of energy, react together , energy released or absorbed, exothermic reaction or endothermic reaction, activation energy
b. Variable : catalyst, heat of reactant and heat of product

- Concept position:

a. Supper ordinate :rate of reaction
b. Coordinate : activation energy barrier
c. Subordinate: exothermic and endothermic reaction

Example :

Concept analysis for catalyst

- Concept label: catalyst
- Concept definition : a catalyst is a substance that increases the rate of a reaction with out being changed during the reaction or a substance that permits reactions to proceed at lower energy than normally required.
- Concept type : concrete

- Attribute :

a. Critical : rate of reaction, catalyst, with out being changed, catalyzed reaction , un catalyzed reaction,
b. Variable : activation energy, heat of reaction, speed of reaction,

- Concept position :

a. Supper ordinate: chemical kinetics
b. Coordinate : Reaction inhibitors
c. Subordinates : none

Example : Pt, Fe, Ni, enzymes

Non example : Na, water, Hydrogen

Rate laws

- Concept label : rate laws
- Concept definition : the rate law for a chemical reaction is an equation that relates the rate of the disappearance of reactants or the rate of appearance of products to the concentration of the reactants
- Concept type : Abstract

- Attribute :

a. Critical: rate law , rate of disappearance or disappearance, rate of reaction, rate equation integrated rate law, differential rate law,
b. Variable : concentration , rate order , rate constant, time,

- Position :

a. Supper ordinate : chemical kinetics
b. Coordinate : law of mass action
c. Subordinate : rate order

Example : the rate law for general reaction

aA + bB ------- cC + dD is, rate = K[A]m[B]n

Non example: Keq= [C]c[D]d/[A]a[B]b

Concept analysis for Rate order

- Concept label : rate order
- Concept definition : the order of reaction with respect to certain reactant is defined as the index or exponent to which its concentration term in the rate equation is raised.
- Concept type : abstract
- Attribute :

a. Critical : order of reaction, certain reactants, index or exponent , rate equation
b. Variable: concentration, reactant,

- Position :

a. Supper ordinate : rate of reaction
b. Coordinate : none
c. Subordinate : none

Example : zero order, first order, second order, …

Non example :

Half life time

- Concept label : half life time
- Concept definition : Half-life is the time taken for the concentration of a reactant to drop to half of its original value.
- Concept type : abstract
- Attribute :

a. Critical : half life , half of its original value,

b. Variable : time, concentration

- Position :

a. Supper ordinate : rate of reaction
b. Coordinate : rate law
c. Subordinate : rate constant, concentration