CHEMISTRY ANSWER KEY

STD IX Second Term model paper 2

Section A: Answer any 4 questions.

(4 × 1 = 4 Marks)

1. **Rate of a chemical reaction:**
   The rate of a reaction is the change in concentration of reactants or products per unit time.
2. **Catalyst definition and example:**
   A catalyst is a substance that increases the rate of a chemical reaction without being consumed. Example: Manganese dioxide (MnO2MnO_2MnO2) in the decomposition of hydrogen peroxide.
3. **Decomposition reaction and example:**
   A decomposition reaction is a chemical reaction where one compound breaks down into two or more substances.
   Example: $CaCO_3 \rightarrow CaO + CO_2$
4. **Chemical formula of magnesium nitride:**
   Mg_3N_2
5. **Why does reaction rate increase with temperature?**
   An increase in temperature increases the kinetic energy of particles, leading to more frequent and energetic collisions.

Section B: Answer any 4 questions.

(4 × 2 = 8 Marks)

6. **Effect of surface area on reaction rate:**
   - Larger surface area increases the rate of reaction as more particles are exposed to react.
   - Example: Powdered calcium carbonate reacts faster with acid than a solid piece of calcium carbonate.
7. **Decomposition of hydrogen peroxide:**
   Balanced equation: $2H_2O_2 \rightarrow 2H_2O + O_2$ Role of MnO_2 Acts as a catalyst to speed up the decomposition.
8. **Homogeneous vs. Heterogeneous catalysts:**
   - Homogeneous: Catalyst and reactants are in the same phase (e.g., H_2SO_4 in esterification).
   - Heterogeneous: Catalyst and reactants are in different phases (e.g., Pt in hydrogenation).
9. **Collision theory and its importance:**

- States that for a reaction to occur, particles must collide with enough energy and proper orientation.
- It explains how temperature, concentration, and catalysts influence reaction rates.

10. **Thermal decomposition of calcium carbonate:**
    Reaction: $CaCO_3 \rightarrow CaO + CO_2$
    Products: Calcium oxide and carbon dioxide.

Section C: Answer any 4 questions.

(4 × 3 = 12 Marks)

11. **Haber process:**
    - Reaction: $N_2 + 3H_2 \leftrightarrow 2NH_3$
    - Catalyst: Iron (Fe).
    - Conditions: 200 atm pressure, 450°C temperature.
    - Used for large-scale ammonia production.
12. **Effect of concentration on reaction rate:**
    - Higher concentration increases the frequency of collisions, leading to a faster reaction.
    - Example: The reaction between magnesium and hydrochloric acid occurs faster with concentrated HCl than with dilute HCl
13. **Displacement reaction and real-life application:**
    - Reaction where a more reactive element displaces a less reactive element from its compound.
    - Example: $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
    - Application: Extraction of metals.
14. **Decomposition of ammonium dichromate:**
    Reaction: $(NH_4)_2Cr_2O_7 \rightarrow Cr_2O_3 + N_2 + 4H_2O$
    - Products: Chromium(III) oxide, nitrogen gas, and water vapor.
    - Type of reaction: Thermal decomposition.
15. **Increasing rate of reaction between zinc and dilute HCl**
    - Methods:
        1. Increase the temperature to provide more energy for collisions.
        2. Use powdered zinc to increase surface area.

Section D: Answer any 4 questions.

(4 × 4 = 16 Marks)

16. **Energy profile diagram for exothermic reaction:**
    - Diagram: Energy of reactants > energy of products.
    - Features: Activation energy is a peak, and the energy difference shows heat release.
    - Example: Combustion of methane.
17. **Factors affecting reaction rates:**
    - Nature of reactants: Ionic reactions occur faster than covalent reactions.
    - Concentration: Higher concentration increases collisions.
    - Temperature: Higher temperature increases kinetic energy.
    - Catalyst: Lowers activation energy.
    - Surface area: More surface area increases collision frequency.
18. **Classify reactions:**
    - $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$: Displacement.
    - $2H_2O_2 \rightarrow 2H_2O + O_2$: Decomposition.
    - $NaOH + HCl \rightarrow NaCl + H_2O$: Double decomposition.
    - $2Mg + O_2 \rightarrow 2MgO$: Combination.
19. **Role of catalyst in Contact process:**
    - Catalyst: Vanadium pentoxide (V2O5V_2O_5V2O5).
    - Reaction:
        1. $2SO_2 + O_2 \leftrightarrow 2SO_3$.
        2. $SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$.
    - Importance: Increases reaction rate for sulfuric acid production.
20. **Effect of temperature on reaction rate:**
    - Experiment:
        1. Mix sodium thiosulphate and hydrochloric acid at different temperatures.
        2. Measure the time taken for a precipitate to form.
    - Observation: Reaction occurs faster at higher temperatures.

- Explanation: Higher temperature increases particle collisions.