CHEMISTRY ANSWER KEY

STD IX Second Term model paper 1

Section A: Answer any 4 questions.

(4 × 1 = 4 Marks)

1. **Define redox reactions with an example:**
   A redox reaction is a chemical reaction in which one substance gets oxidized (loses electrons) and another gets reduced (gains electrons).
   Example: $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$.
2. **Write the formula for the rate of a chemical reaction:**
   $\text{Rate} = \frac{\Delta[\text{Reactant}/\text{Product}]}{\Delta t}$
3. **Identify the oxidizing and reducing agents in $2Mg + O_2 \rightarrow 2MgO$:**
   - Oxidizing agent: O_2
   - Reducing agent: Mg
4. **Name the scientist who proposed the law of conservation of mass:**
   Antoine Lavoisier.
5. **Element with the highest electronegativity from F, Cl, Br, I:**
   Fluorine (F).

Section B: Answer any 4 questions.

(4 × 2 = 8 Marks)

6. **Differentiate between endothermic and exothermic reactions:**
   - **Endothermic Reaction:** Absorbs heat (e.g., $NH_4Cl + H_2O \rightarrow NH_4^+ + Cl^-$).
   - **Exothermic Reaction:** Releases heat (e.g., $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + \text{heat}$).
7. **Structure of water showing polar covalent bonds:**
   - Diagram: $H : O : H$ with δ^- on O and δ^+ on H atoms.
8. **Define "activation energy" with a diagram:**
   - Activation energy is the minimum energy required for a chemical reaction to occur.
   - Diagram: Energy profile showing reactants, activation energy peak, and products.
9. **Effect of temperature on reaction rate:**
   - Higher temperature increases the kinetic energy of particles, leading to more frequent and energetic collisions, thus increasing the reaction rate.
10. **Balance $KClO_3 \rightarrow KCl + O_2$:**
    Balanced equation: $2KClO_3 \rightarrow 2KCl + 3O_2$

Section C: Answer any 4 questions.

(4 × 3 = 12 Marks)

11. **Reaction mechanism:**
    - Step 1: Reactants combine to form an intermediate.
    - Step 2: The intermediate decomposes to give the product.
      Example: $NO_2 + CO \rightarrow NO + CO_2$.
12. **Oxidation number of sulfur in H_2SO_4:**
    - $H = +1, O = -2$.
    - $2(+1) + S + 4(-2) = 0$.
    - $S = +6$.
13. **Catalysts and their role:**
    Catalysts increase the rate of reaction without being consumed.
    - Example: MnO_2 in the decomposition of H_2O_2.
14. **Homogeneous vs. Heterogeneous Catalysts:**
    - **Homogeneous Catalyst:** Same phase as reactants (e.g., H_2SO_4 in esterification).
    - **Heterogeneous Catalyst:** Different phase (e.g., Pt in hydrogenation).
15. **Differences between oxidation and reduction:**
    - Oxidation: Loss of electrons, increase in oxidation state.
    - Reduction: Gain of electrons, decrease in oxidation state.
    - Example: $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$.

Section D: Answer any 4 questions.

(4 × 4 = 16 Marks)

16. **Rate equation $Rate = k[A]^2[B]$:**
    - Order of reaction: $2 + 1 = 3$.
    - Rate calculation:
      $Rate = 0.5[1]^2[2] = 1\ \mathrm{mol/L/s}$.
17. **Factors affecting reaction rates:**
    - Nature of reactants.
    - Concentration of reactants.
    - Temperature.
    - Catalyst.
    - Surface area (for solids).
18. **Antoine Lavoisier's contribution:**
    - Law of conservation of mass: Mass is neither created nor destroyed in a chemical reaction.
    - Example: $2H_2 + O_2 \rightarrow 2H_2O$, total mass of reactants equals total mass of products.
19. **Redox reactions and electron transfer:**
    - $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$:
        - Fe gets oxidized: $Fe \rightarrow Fe^{2+} + 2e^-$.
        - Cu^{2+} gets reduced: $Cu^{2+} + 2e^- \rightarrow Cu$.
20. **Energy profile diagram for an exothermic reaction:**
    - Diagram: Energy of products is lower than reactants, showing release of energy.
    - Example: Combustion of methane: $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + \mathrm{heat}$.