|  |
| --- |
| **Date**: September 25-26, 2025 |
| **Subject**: Chemistry |
| **Grade**: 12 |
| **Duration**: 80 Minutes |
| **Topic**: Forces of Attraction |
| **Subtopic:** Types of Chemical Bonds |
| **Number of Students**: 12 [Girls: 10] [Boys: 2] |
| **General Objectives**:  *On Completion of this lesson, students will be able to*:   * Appreciate that the forces of attraction between particles influence the properties and behaviour of matter.   **Specific Objectives**:  *By the end of the lesson, students will be able to:*   1. Explain the formation of ionic bonds. 2. Explain the formation of covalent bonds, including orbital overlap leading to sigma and pi bonds. 3. Explain the formation of metallic bonds as a lattice of positive ions surrounded by a sea of mobile electrons. 4. Explain electronegativity and how it affects bond polarity. |
| **Key Scientific Attitudes:**  Critical thinking, communication, collaboration, cooperation, open-mindedness |
| **Content**   * ***Types of bonds*:**   + Ionic bond: electrostatic force of attraction between oppositely charged ions.   + Covalent bond: formed by orbital overlap (pi and sigma).   + Metallic bond: lattice of positive ions in a sea of delocalized electrons; explains conductivity, malleability, ductility. |
| **Instructional Sequence**  ***Engage:***   * **Demonstration / Prompt**: Show students three materials: table salt (NaCl), a piece of copper wire, and water. * Ask**:**   + Why does salt dissolve and conduct electricity in water, but copper conducts electricity as a solid?   + Why does water have a definite shape at room temperature while copper is metallic and malleable? * **Purpose**: Spark curiosity and connect observable properties to microscopic   ***Explore:***   * **Activity**: Group Card Sorting * Provide students with cards showing properties (e.g., “high melting point”, “good conductor when molten”, “shared electron pair”, “delocalized electrons”, “orbital overlap”, etc). * Students sort properties into ***ionic***, ***covalent***, and ***metallic*** categories. * Teacher circulates and prompts students to think about *why* those properties arise.   ***Explain:***   * Teacher provides structured explanation using models/diagrams:   1. Ionic bonds – electrostatic attraction between oppositely charged ions. Example: NaCl.   2. Covalent bonds – formed by orbital overlap: * **Sigma bonds** from head-on overlap. * **Pi bonds** from sideways overlap of p-orbitals. * Use Lewis structures + orbital diagrams to illustrate.   1. Metallic bonds – lattice of positive ions in a sea of delocalized electrons; explains conductivity, malleability, ductility.   2. **Electronegativity and polarity –** explain scale, show examples of polar vs nonpolar bonds (e.g., HCl vs Cl2)   ***Elaborate:***   * **Application Activity**:   + Students work in small groups on examples:     - Draw orbital overlap for H2 (sigma bond) and O2 (sigma + pi bond).     - Explain why NaCl has a high melting point compared to H2O.     - Predict whether bonds in HF, HCl, and Cl2 are polar or nonpolar based on electronegativity differences.     - Explain why metals conduct electricity while ionic compounds conduct only in molten/aqueous state.   + Each group presents one solution to class -> peer teaching reinforces understanding.   ***Evaluate:***   * Exit Ticket / Quick Quiz:   + State the difference between a sigma bond and a pi bond.   + Describe the metallic bonding model.   + Define electronegativity and explain how it relates to bond polarity.   + Why does NaCl conduct electricity only when molten or dissolved, but not as a solid? * Teacher collects for formative assessment. |