

GENERAL CHEMISTRY

STANDARD 5.9

5.9: Arrange a group of chemicals in order of increasing freezing or boiling point by considering intermolecular forces

INTRODUCTION

- The stronger the intermolecular force, the higher the boiling point
 - Substances with greater intermolecular forces will have greater freezing and boiling temperatures
 - The result of the increased energy needed to pull the molecules away from each other
- What to consider when looking at intermolecular forces:
 - If hydrogen is present, hydrogen bonding is likely
 - If the molecule is polar with no hydrogen, dipole-dipole interactions likely
 - If an ion is involved with a polar molecule, ion-dipole interactions likely
 - If a molecule is nonpolar, London Dispersion forces likely
 - The larger the molecule, the stronger the Dispersion forces

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EXAMPLES

- Arrange the following chemicals in order of increasing boiling point
 - Fluorine
 - Chlorine
 - Bromine

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- Arrange the following chemicals in order of increasing boiling point
 - CH_3OH
 - RbF
 - CO_2
 - CH_3Br
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

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 - CH_3OH **Dispersion, Dipole-Dipole, Hydrogen Bonding**
 - RbF **Ionic (strongest)**
 - CO_2 **Dispersion (48 g/mol)**
 - CH_3Br **Dispersion, Dipole-Dipole**
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ **Dispersion (58 g/mol)**

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