

**College of science**

**Department of Biochemistry**

**Second class**

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### **Lecture 3 : Physical Properties and Conformations**

**Alkanes are saturated hydrocarbons consisting of carbon and hydrogen atoms, connected by single covalent bonds (C-C and C-H).**

#### **1. Physical Properties of Alkanes:**

**State of Matter:** Lower alkanes (1-4 carbon atoms) are gases (e.g., methane, ethane). Middle alkanes (5-16 carbon atoms) are liquids, while higher alkanes (17+ carbons) are solids at room temperature.

**Boiling Point:** Increases with molecular size and weight. More carbons = higher boiling points due to stronger van der Waals forces.

**Solubility:** Alkanes are nonpolar, so they are insoluble in water but soluble in organic solvents like benzene.

**Density:** Generally lower than water (around  $0.7\text{-}0.8\text{ g/cm}^3$ ), meaning they float on water.

#### **2. Conformations of Alkanes:**

**Conformation** refers to the different spatial arrangements of atoms that can result from rotation around single bonds.

### **Ethane Example:**

**Staggered Conformation:** The most stable arrangement where the hydrogen atoms are as far apart as possible, minimizing repulsion.

**Eclipsed Conformation:** Less stable because the hydrogen atoms are aligned, leading to greater repulsion.

This rotation around single bonds gives alkanes flexibility, affecting their physical properties and reactivity.

**Conclusion:** Alkanes exhibit a range of physical properties that vary with molecular size, and their flexibility in conformations (due to free rotation around single bonds) contributes to their stability and chemical behavior.