

## Chemistry 110

Bettelheim, Brown, Campbell & Farrell

Eighth Edition

Introduction to General,  
Organic and Biochemistry

### Chapter 11

Alkanes & Cycloalkanes

---

---

---

---

---

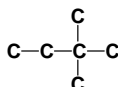
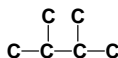
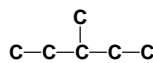
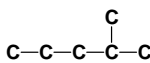
---

---

---

### Constitutional Isomerism in Alkanes

➤ Constitutional or Structural isomers are compounds that have the same molecular formulas, but different structural formulas. Example the *hexanes*,  $C_6H_{14}$ .



---

---

---

---

---

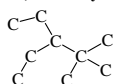
---

---

---

### IUPAC Systematic Naming of Alkanes

- Longest *continuous* carbon chain = Parent Alkane (PA)
- Locate any chain branching off PA, name as alkyl group.
- Assign smallest set of numbers to branch points counting from one end of PA.
- For multiple branching – Locate *identical* alkyl groups, indicate their number using *bi*, *di* (2); *tri* (3); *tetra* (4) ... Locate *different* alkyl groups.
- Construct the name by placing the alkyl groups in alphabetical order (ignoring Greek prefixes, dimethyl = m) preceded by *locator number* separated by hyphens from words and commas from numbers. There should be a locator number for each alkyl group, i. e. 2,2-dimethyl.



3-ethyl-2,2-dimethylpentane

A *nonane* isomer!

---

---

---

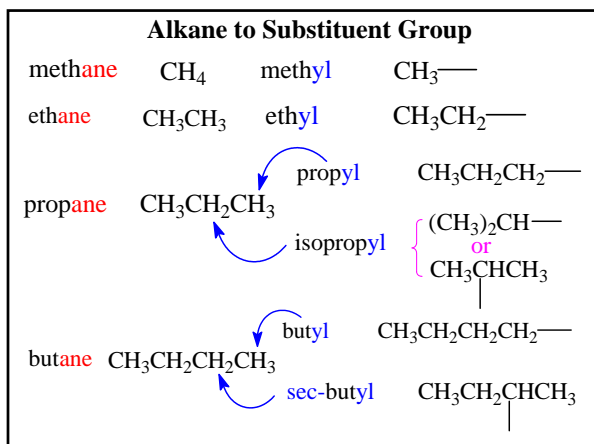
---

---

---

---

---




---

---

---

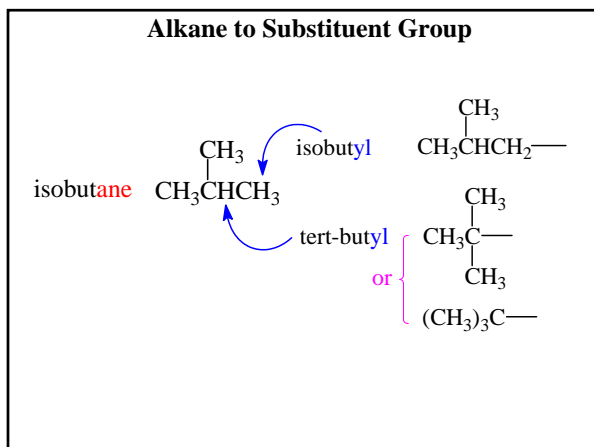
---

---

---

---

---




---

---

---

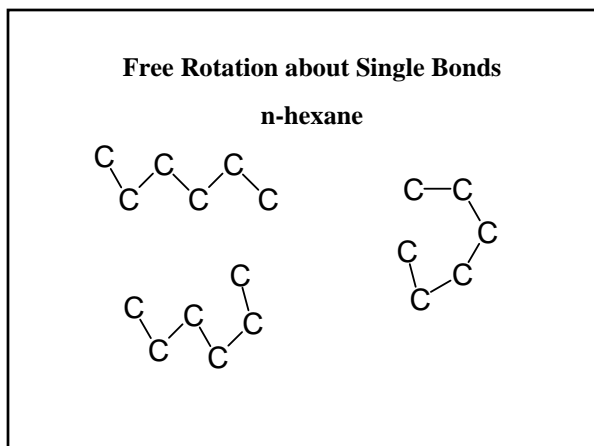
---

---

---

---

---




---

---

---

---

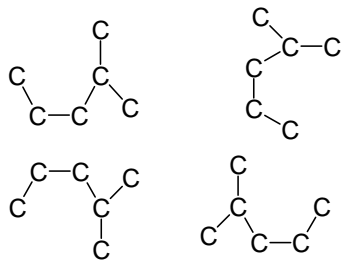
---

---

---

---

**Different Views of 2-Methylpentane**




---

---

---

---

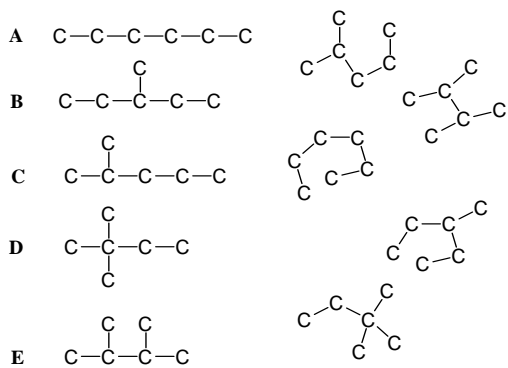
---

---

---

---

**Distinguishing Isomers**




---

---

---

---

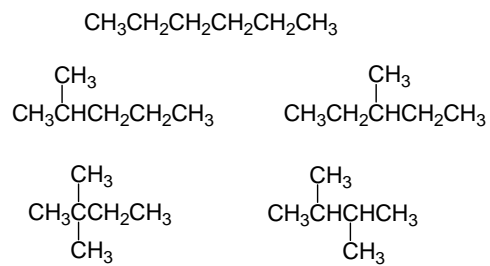
---

---

---

---

**Carbon Can Have Only Four Bonds**




---

---

---

---

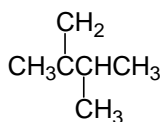
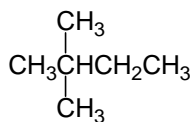
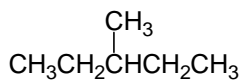
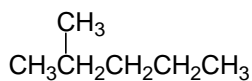
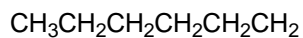
---

---

---

---

### What Is Wrong With Each of These?




---

---

---

---

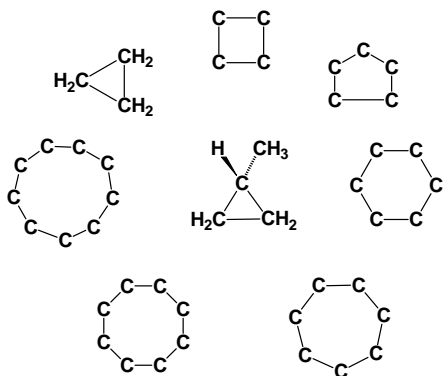
---

---

---

---

### Cycloalkanes




---

---

---

---

---

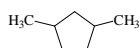
---

---

---

### IUPAC Systematic Naming of cycloAlkanes

- Largest carbon ring = Parent cycloalkane (PCA) – use *cyclo+*(name of straight chain having same number of carbon atoms as the ring)
- Locate any chain branching off PCA, name as alkyl group.
- For multiple branching assign consecutive numbers to ring positions that give lowest set – Locate identical alkyl groups and indicate their number using *bi*, *di* (2); *tri* (3); *tetra* (4) ... Locate *different* alkyl groups.
- Construct the name by placing the alkyl groups in alphabetical order (ignoring Greek prefixes, dimethyl = m) preceded by *locator number* separated by hyphens from words and commas from numbers. There should be a locator number for each alkyl group.



Methylcyclopentane

1,3-dimethylcyclopentane

---

---

---

---

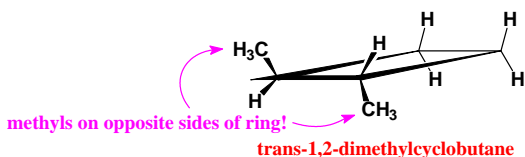
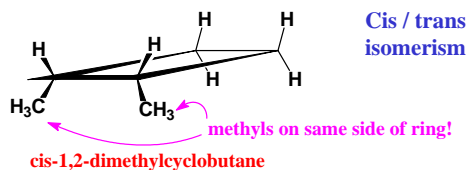
---

---

---

---

### The Shapes of Cycloalkanes



---

---

---

---

---

---

---

---

### Physical Properties of (Cyclo)Alkanes

- Alkanes are non-polar compounds because the difference in electronegativity between C & H is small.
- Alkanes have lower boiling points than most organic compounds of the same molecular weight, because London attractive forces are very weak.
- Constitutional isomers are different compounds and have different physical properties.
- Alkanes serve as the framework on which functional groups are chemically attached. Much like a bare mannequin they support what is attached to them.
- Alkanes are isolated mostly from petroleum by fractional distillation.

---

---

---

---

---

---

---

---