

1.3: Alkyl Substituents

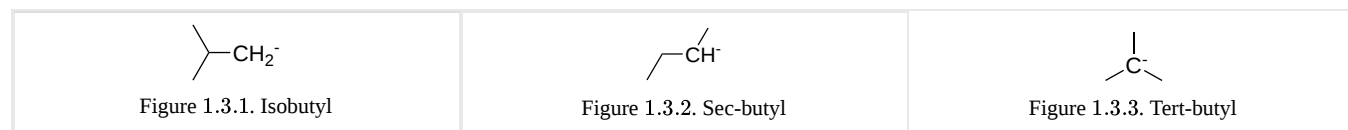
Learning Objective

- How to name organic molecules with alkyl substituents

An **alkane** can be appended onto an existing chain to create a branched molecule. This branched piece of the molecule is called a **substituent**. A substituent made from an alkane is called an **alkyl group**. Alkyl groups are named similarly to unbranched alkane chains.

Alkane	Condensed Structure	Alkyl Group	Condensed Structure
Methane	CH ₄	Methyl	CH ₃ -
Ethane	CH ₃ CH ₃	Ethyl	CH ₃ CH ₂ -
Propane	CH ₃ CH ₂ CH ₃	Propyl	CH ₃ CH ₂ CH ₂ -
Butane	CH ₃ CH ₂ CH ₂ CH ₃	Butyl	CH ₃ CH ₂ CH ₂ CH ₂ -

Alkyl groups can also be branched. For example, there are three constitutional isomers of the butyl substituent. In these diagrams, the negative charge on the carbon indicates the site of the bond from the substituent to the rest of the molecule.



When naming molecules according to the IUPAC system of substitutive nomenclature, remember **prefix-parent-suffix** (like unbelievable).

- prefix:** what are the substituents?
- parent:** how many carbons in the parent chain?
- suffix:** what is the family of compounds?

In the case of an alkane, the suffix is **-ane**.

? Practice Questions

- The name of this molecule is 2-methylhexane. Identify the alkyl group. Label the parent chain carbons from 1-6.

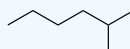


Figure 1.3.4: 2-methylhexane

- The name of this molecule is 3-methylheptane. Identify the alkyl group. Label the parent chain carbons from 1-7.

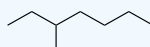


Figure 1.3.5: 3-methylheptane

- Identify the alkyl group in Molecule A. Label the parent chain carbons from 1-8. What is the name of this molecule?

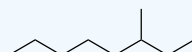


Figure 1.3.6: Molecule A

- Identify the alkyl group in Molecule B. Label the parent chain carbons. What is the name of this molecule?

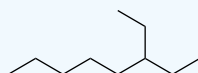


Figure 1.3.7: Molecule B

5. The name of this molecule is 2,3-dimethylpentane.

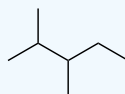


Figure 1.3.8: 2,3-dimethylpentane

What is the name of Molecule C?

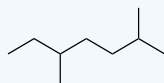


Figure 1.3.9: Molecule C

6. The name of this molecule is 4-ethyl-2-methyloctane.

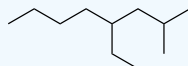


Figure 1.3.10: 4-ethyl-2-methyloctane

What is the name of Molecule D?

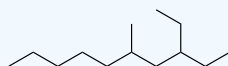


Figure 1.3.11: Molecule D

7. The name of this molecule is 4-isopropylnonane.

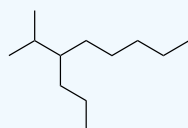


Figure 1.3.12: 4-isopropylnonane

What is the name of Molecule E?

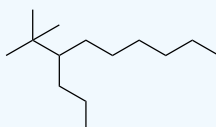


Figure 1.3.13: Molecule E

8. The name of this molecule is cyclobutane.



Figure 1.3.14: cyclobutane

What is the name of Molecule F?



Figure 1.3.15: Molecule F

9. The name of this molecule is methylcyclobutane.



Figure 1.3.16: methylcyclobutane

The name of this molecule is 1-ethyl-2-methylcyclohexane.

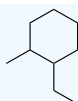


Figure 1.3.17: 1-ethyl-2-methylcyclohexane

What is the name of Molecule G?

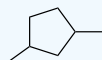


Figure 1.3.18: Molecule G

10. Write the steps that you use to name an alkane, in order, as instructions for a student who doesn't know how to do it.
11. Draw any alkane and go through the steps in naming your molecule.

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