

Alcohol Water Solubility

Alcohols with four or more carbon atoms typically begin to show reduced water solubility, as the increasing hydrophobic hydrocarbon chain overrides the hydrophilic hydroxyl (-OH) group. While alcohols with 1–3 carbons (methanol, ethanol, propanol) are completely soluble, 4-carbon alcohols (butanol) are only partially soluble.

- **1–3 Carbons:** Completely soluble.
- **4 Carbons (Butanol):** Partially soluble (solubility drops significantly).
- **5+ Carbons:** Generally considered largely or completely insoluble (e.g., 1-pentanol, 1-hexanol).
[2, 3, 4, 5, 6]

Factors Affecting Solubility

- **Hydrophobic Chain:** As the alkyl chain grows, it becomes less polar, reducing the ability to mix with water.
- **Branching:** Branching of the carbon chain increases water solubility compared to straight-chain alcohols of the same formula.
- **Hydroxyl Groups:** Multiple -OH groups (e.g., glycols) increase solubility, regardless of the carbon chain length. [2, 4, 7, 8, 9]

AI can make mistakes, so double-check responses

[1] <https://brainly.com/question/43257649>

[2] <https://brainly.com/question/50405833>

[3] <https://dept.harpercollege.edu/chemistry/chm/100/dgodambe/thedisk/qual/solubil.htm>

[4] <https://www.quora.com/Why-is-alcohol-only-soluble-in-water-with-less-than-four-carbon-atoms-but-not-five-or-six>

[5] [https://chem.libretexts.org/Courses/Sacramento_City_College/SCC%3A_Chem_309_-_General_Organic_and_Biochemistry_\(Bennett\)/Text/10%3A_Organic_Functional_Groups_-_Introduction_to_Acid-Base_Chemistry/10.01%3A_Physical_Properties_of_Alcohols](https://chem.libretexts.org/Courses/Sacramento_City_College/SCC%3A_Chem_309_-_General_Organic_and_Biochemistry_(Bennett)/Text/10%3A_Organic_Functional_Groups_-_Introduction_to_Acid-Base_Chemistry/10.01%3A_Physical_Properties_of_Alcohols)

[6] <https://www.passmyexams.co.uk/GCSE/chemistry/alcohol-physical-properties.html>

[7] <https://pubs.acs.org/doi/10.1021/acs.jchemed.2c01107>

[8] <https://www.quora.com/What-is-the-relationship-between-the-number-of-carbon-atoms-that-an-alcohol-has-and-its-solubility-in-water-and-petroleum-ether>

[9] <https://www.quora.com/Why-are-higher-alcohols-with-longer-chain-less-soluble-in-water-than-lower-alcohols>