

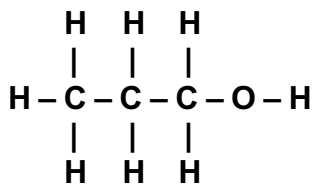
## van der Waals Bonds

Name \_\_\_\_\_

1) What are the two types of van der Waals bonds?

2) If a molecule is polar which kind of van der Waals bond can it form?

3) Does the molecule below have a polar region? If so, label which part of the molecule is slightly positive and which part is slightly negative. (You will need to think about the electronegativity of all the pairs of atoms that are bonded together.)



Pentanol

4) The following molecule is polar. Draw a liquid consisting of at least 7 copies of this molecule and indicate the dipole-dipole bonds that form between the molecules by drawing a dashed line.



Carbon Monoxide

(over)

5) What are the two factors that affect the strength of van der Waals attractions between molecules?

6) Assume you have six different substances described by the six different molecules below. Number them from the lowest boiling point to the highest and explain why you chose that order.

<p>Propanediol</p> $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\   \quad   \quad   \\ \text{H}-\text{O}-\text{C}-\text{C}-\text{C}-\text{O}-\text{H} \\   \quad   \quad   \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$	<p>Methane</p> $\begin{array}{c} \text{H} \\   \\ \text{H}-\text{C}-\text{H} \\   \\ \text{H} \end{array}$	<p>Pentane</p> $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\   \quad   \quad   \quad   \quad   \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\   \quad   \quad   \quad   \quad   \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$
<p>Hydrogen</p> $\text{H}-\text{H}$	<p>Methanol</p> $\begin{array}{c} \text{H} \\   \\ \text{H}-\text{C}-\text{O}-\text{H} \\   \\ \text{H} \end{array}$	<p>Butanol</p> $\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\   \quad   \quad   \quad   \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{O}-\text{H} \\   \quad   \quad   \quad   \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$