

Section 2: Foundation

We should expect that the properties of molecules, and correspondingly the substances which they comprise, should depend on the details of the structure and bonding in these molecules. Now that we have developed an understanding of the relationship between molecular structure and chemical bonding, we analyze physical properties of the molecules and compounds of these molecules to relate to this bonding and structure. Simple examples of physical properties which can be related to molecular properties are the melting and boiling temperatures. These vary dramatically from substance to substance, even for substances which appear similar in molecular formulae, with some melting temperatures in the hundreds or thousands of degrees Celsius and others well below 0°C.

We seek to understand these variations by analyzing molecular structures.

To develop this understanding, we will have to apply more details of our understanding of atomic structure and electronic configurations. In our covalent bonding model, we have assumed that atoms “share” electrons to form a bond. However, our knowledge of the properties of atoms reveals that different atoms attract electrons with different strengths, resulting in very strong variations in ionization energies, atomic radii, and electron affinities. We seek to incorporate this information into our understanding of chemical bonding.

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