

10.1: Prelude to Solids, Liquids and Solutions

By comparison with [gases](#), [solids](#) and [liquids](#) have microscopic structures in which the constituent particles are very close together. The volume occupied by a given amount of a solid or liquid is much less than that of the corresponding gas. Consequently solids and liquids collectively are called condensed phases. The properties of solids and liquids are much more dependent on intermolecular forces and on atomic, molecular, or ionic sizes and shapes than are the properties of gases.

microscopic images of this lattice in NaCl and CO₂.



Despite their greater variation with changes in molecular structure, some properties of condensed phases are quite general. In a solid, for example, microscopic particles are arranged in a regular, repeating crystal [lattice](#). Above you can see microscopic images of this lattice in NaCl and CO₂. On a macroscopic scale the 3 crystals on the right each show unique, repeating shapes due to their microscopic lattices. There are only a limited number of different ways such a lattice can form, and so it is worth spending some time to see what they are, which we will do later in the chapter.

Similarly, useful generalizations can be made regarding the properties of liquids and about changes of phase - when a solid melts, a liquid vaporizes, and so on.

The liquid phase, where microscopic particles are close together but can still move past one another, provides an ideal medium for chemical reactions. Reactant molecules can move toward one another because they are not held in fixed locations as in a solid, and a great many more collisions between molecules are possible because they are much closer together than in a gas. Such collisions lead to breaking of some bonds and formation of new ones, that is, to chemical reactions. This molecular intimacy without rigidity, combined with ease of handling of liquids in the laboratory, leads chemists to carry out many reactions in the liquid phase. Usually such reactions involve solutions of reactants in liquid solvents. Consequently we shall examine some general properties of [solutions](#) as well.

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