Properties of ionic liquids (ILs) are required for the design of products and processes involving ILs. Although innumerable ILs may be generated through the combination of a variety of cations, anions, and substituents, only a small part of them have been reported to exist (have been synthesized). The available experimental data are generally limited and sometimes even contradictory. A detailed knowledge about the properties of ILs is critically important, especially for ILs not yet available. Based on collected experimental data from numerous literature sources, a series of group contribution models have been developed for estimating various properties (density, heat capacity, viscosity, surface tension, melting point) of ILs. To evaluate the predictive capability of the proposed or employed group contribution models, nearly 70% of the data sets (i.e., training sets) are used for correlation, and then the remaining data sets (i.e., test sets) not included in the training sets are used for prediction. The calculation results show that the proposed group contribution models can predict the properties of studied ILs with sufficient accuracy. These property estimation models can both be used easily and also provide estimation of important properties for previously unstudied ILs, some of which may be considered as potential solvents in many industrial applications.