Laboratory Manual for

INORGANIC CHEMISTRY

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Preface

Chemistry is an experimental science. Thus, it is important that students of chemistry do experiments in the laboratory to more fully understand that the theories in the textbooks are developed from critical evaluation of experimental data. The laboratory experiments can also aid the students in the study of science by clearly illustrating the principles and concepts involved. Finally, laboratory experimentation gives students the opportunity to develop laboratory techniques and other manipulative skills that students of science must master.

Questions are presented throughout each experiment. It is important to answer each question in the manual, as it will help to understand the experiment as well. In addition, you are encouraged to complete the report immediately after conducting the experiments as this is much more efficient than waiting until the night before the submission is due.

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Experiment 1

Predicting Molecular Shape and Polarity of a Compound using VSEPR Theory

OBJECTIVES

1. To draw Lewis structures of several compounds and make models of these structures in order to help you visualise the molecular shape based on Valence Shell Electron Pair Repulsion (VSEPR) theory.

2. To predict the molecular polarity for each compound.

INTRODUCTION

Valence Shell Electron Pair Repulsion (VSEPR) theory allows one to predict the electronic and molecular geometries of a molecule from its Lewis structure. These predictions are primarily based on the number of regions of electron density (REDs or VSEPs) around the central atom(s). In order to get correct answers from VSEPR theory, you must first have a correct Lewis structure. Therefore, the procedures for drawing Lewis structures from the textbook and lectures must be mastered. Remember that you must account for all valence electrons and you must show all of these electrons in the Lewis structure.

VSEPR theory merely proposes that the REDs will be arranged around the center atom in such a way that places them as far apart as possible. This arrangement may be referred to as the "electronic geometry". Each of the following is considered to be a single region of electron density:

- A non-bonding pair of electrons or lone pair.
- A covalent bond.
- A multiple covalent bond (i.e. a double bond or a triple bond).

The most common number of REDs and electronic geometries are summarised in the following table.