CHM 211 INORGANIC CHEMISTRY

Course Guide

COURSE GUIDE

CHM 211
INORGANIC CHEMISTRY II

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Introduction

In CHM 111, you studied the development of the periodic table and the concept of periodicity of elements. You also studied the chemistry of hydrogen, the alkali metals and the alkaline earth metals, which together constitute the s-block of the periodic table. You must have noticed that although the first element of each group of the s-block exhibits some anomalous behaviour, similarity existed amongst the elements. All the s-block elements, except hydrogen, are highly reactive metals and do not occur in nature in the elemental state; they exhibit only one stable oxidation state, which is equal to the number of electrons in the valence shell of their atoms. They show regular gradation in properties as a group is descended.

You also studied the chemistry of the group 13 elements. This course continues the study of the periodic trends in the properties of the elements.

What you will learn in this course

In CHM 211 you will study the chemistry of more p-block elements, which is very extensive and varied. The elements of a p-block group show similar oxidation states, halogens being exceptions. The first element of each of the p-block elements groups also exhibit anomalous behaviour. The differences between successive elements of a p-block group become more pronounced on descending the group so that a change from non-metallic to metallic character is clearly observed. Nevertheless, some points of similarity between the elements in a group, for example, valence relations, are always present.

Course Aims

This course aims to continue the study of the periodic trends in the properties of the elements, of the p-block, comparing their properties with those of the s-block where appropriate...

Course Objectives

We expect that after studying this course you should be able to:

- Discuss the periodic trends in the properties of p-block elements of Groups 14, 15, and 17.
- Describe the main features of the chemistry of the p-block elements of Groups 14, 15, and17.
- Compare the properties of p-block elements of Group 14, 15, and 17 with those of the s-block elements.

Working Through This Course

This course involves that you would be required to spend a lot of time to read. The content of this material is very dense and require you spending great time to study it. This accounts for the great effort put into its development in the attempt to make it very readable and comprehensible. Nevertheless, the effort required of you is still tremendous. I would advice that you avail yourself the opportunity of attending the tutorial sessions where you would have the opportunity of comparing knowledge with your peers.

Course Materials

You will be provided with the following material;

1. Course Guide
2. Study Units.

In addition, the course comes with a list of recommended textbooks which though are not compulsory for you to acquire or indeed read, are necessary as supplements to the course.

Study Units

The following are the Structures contained in this course:

Unit 1 **Elements of Group 14 (Carbon Group):** Occurrence, extraction and uses; Chemical and physical properties of members. Nature of oxides, hydrides, complexation behaviour and anomalous behaviour of carbon; Silica and silicates, chemistry of divalent silicon, germanium, tin and lead compounds.

Unit 2 **Elements of Group 15 (Nitrogen Group):** Occurrence, extraction and uses; Chemical and physical properties of members. Nature of oxides, hydrides, halides Oxyacids of elements; Nitrogen cycle and fixation; Phosphate fertilizers, anomalous behaviour of Oxygen.

Unit 3 **Elements of Group 17 (Fluorine Group):** Occurrence, extraction and uses; Chemical and physical properties of members. Nature of oxides, hydrides, Oxyacids of the elements; Psuedo halogens and pseudo halides; Anomalous behaviour of fluorine.

In Unit 1 we discuss the main features of the chemistry of Group 14 elements, namely, carbon, silicon, germanium, tin and lead. They exhibit a gradual change in their character. Carbon is a nonmetal; silicon and germanium are semi-metals; tin and lead are distinctly metallic in nature. Their common oxidation states are II and IV.

In Unit 2 we discuss the salient features of the chemistry of nitrogen, phosphorus, arsenic, antimony and bismuth which constitute Group 15 of the periodic table. The most striking feature of the chemistry of this group is the differences in the properties of the elements. The variation in properties is vast, the elements range from highly electronegative nonmetal, nitrogen, to the very weakly electropositive metal, bismuth, via the semimetals arsenic and antimony. These elements exhibit a wide range of oxidation states.

In Unit 3 we discuss the chemistry of Group 17 elements, namely, fluorine, chlorine, bromine, iodine and astatine. These elements are collectively called halogens. As their atoms are only one electron short of the noble gas configuration, the elements readily form halide ions, X^- or a single covalent bond. Halogens are the most electronegative elements in their respective periods and their chemistries are essentially non-metallic. Although first member of the group i.e. Fluorine exhibits anomalous behaviour, the elements of this group in general show similar chemistries.

Textbooks and References

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