Dr.BRR GOVERNMENT DEGREE COLLEGE, JADCHERLA

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Mahabubnagar, Telangana-509301

3.3.2 Number of books and chapters in edited volumes/books published and papers Published in national/ international conference proceedings per teacher during last five year

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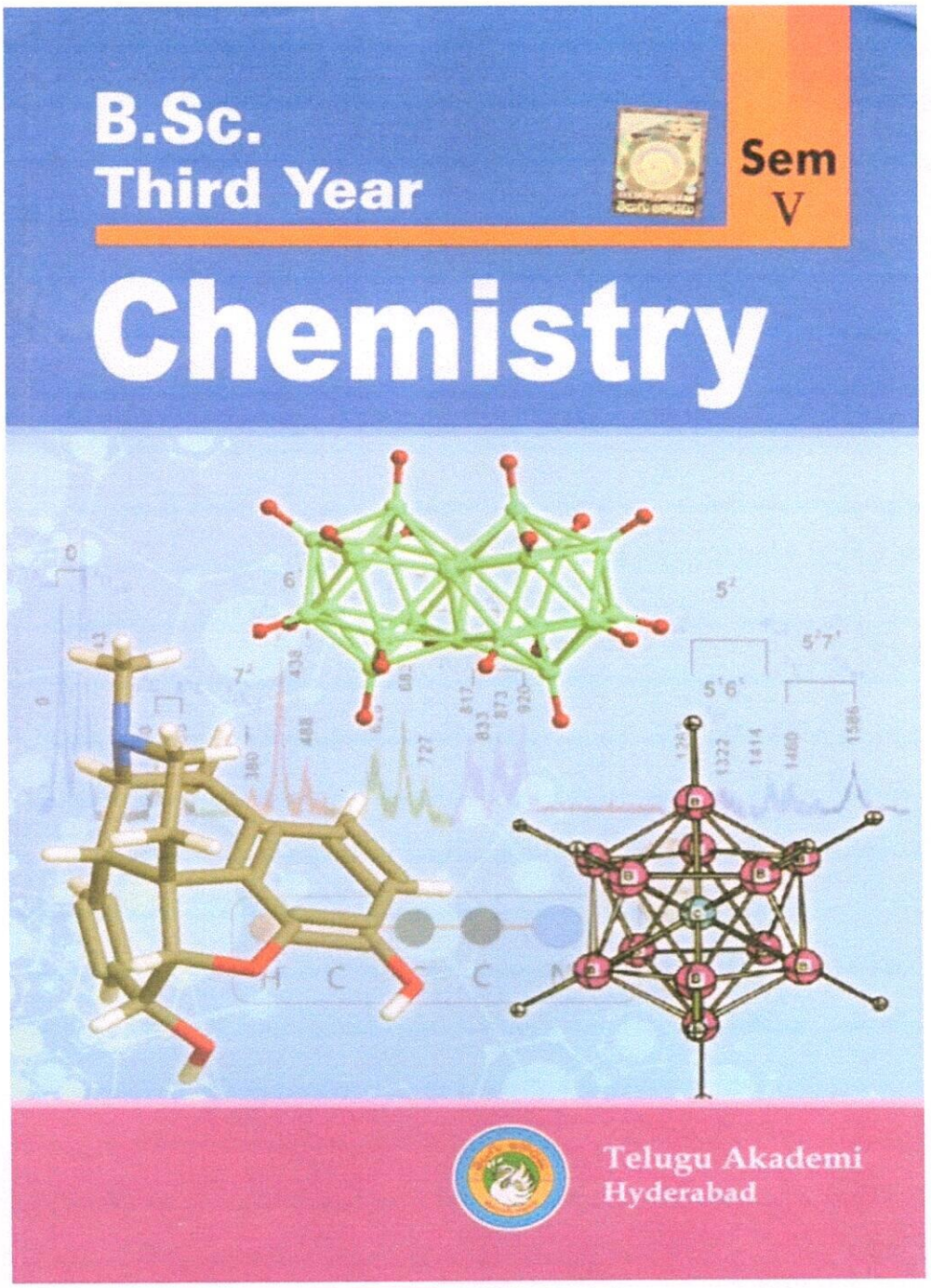
DEPARTMENT OF CHEMISTRY

Author of B.Sc III Year Book

Sri G. Satayanarayana Goud, the Staff of the Chemistry Department, has been one of the authors of B.Sc III Year Chemistry Semester V E/M, Telugu Akademi book.



Cover Page

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Chapter 1

Coordination Compounds - II

1.1 Crystal Field Theory

The crystal field theory replaced the valence bond theory and that successfully explains the limitation of valence bond theory.

J.H. Van Vleck and Hans Bethe proposed this theory for ionic crystals but later it was even applied to explain the electrostatic interactions between ligands and metal ion.

The VBT cannot explain the behavior of d^8 and d^9 complexes. It fails to account the quantitative connection between magnetic moment, colour with that of spectral properties. The crystal field theory successfully explains the draw backs of VBT.

The salient features of CFT are as follows.

(i) The crystal field theory explains about the nature of ligands which was not explained in VBT. The ligands in CFT are treated as ionic ligands or negative (–ve) point charges, like F^-, Cl^-, Br^- etc. and the neutral ligands like H_2O, NH_3 etc. are called as point dipoles since these ligands when approaches the central metal ion they align negative poles towards metal ions.

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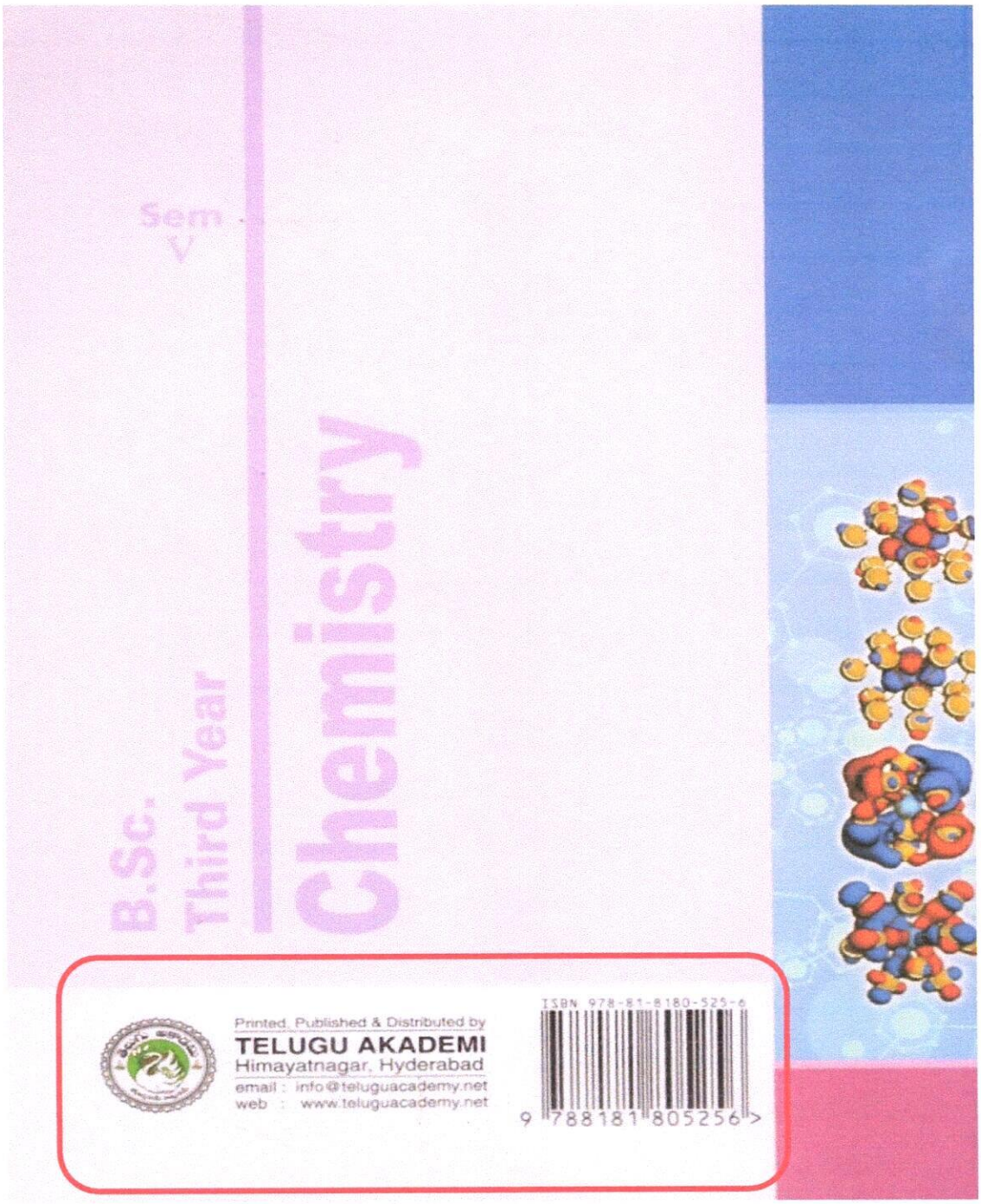

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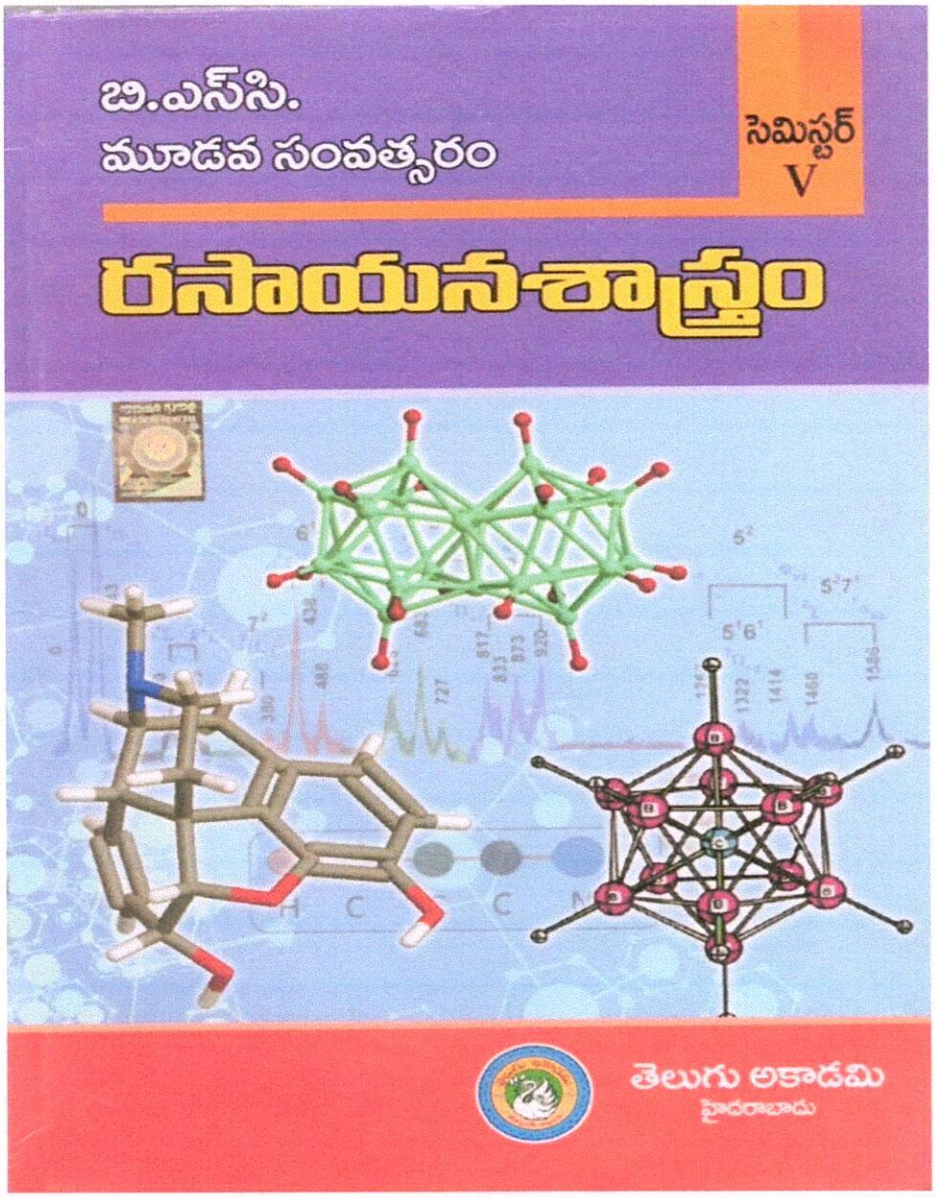

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మూడవ సంవత్సరం - సెమిస్టర్ - V

రసాయనశాస్త్రం

24858

రచయితలు

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ప్రొఫెసర్ (రిటైర్డ్), రసాయనశాస్త్ర విభాగం
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కాకతీయ ప్రభుత్వ కళాశాల
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ఉస్మానియా విశ్వవిద్యాలయం
హైదరాబాదు

ఆచార్య దేవదాస్ మన్వాల్
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ఉస్మానియా విశ్వవిద్యాలయం
హైదరాబాదు

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రీడర్ & హెడ్ (రిటైర్డ్)
రసాయనశాస్త్ర విభాగం, న్యూసైన్స్ కళాశాల
అమీర్‌పేట, హైదరాబాదు

తెలుగు అకాడమి
హైదరాబాదు

Author of the Book

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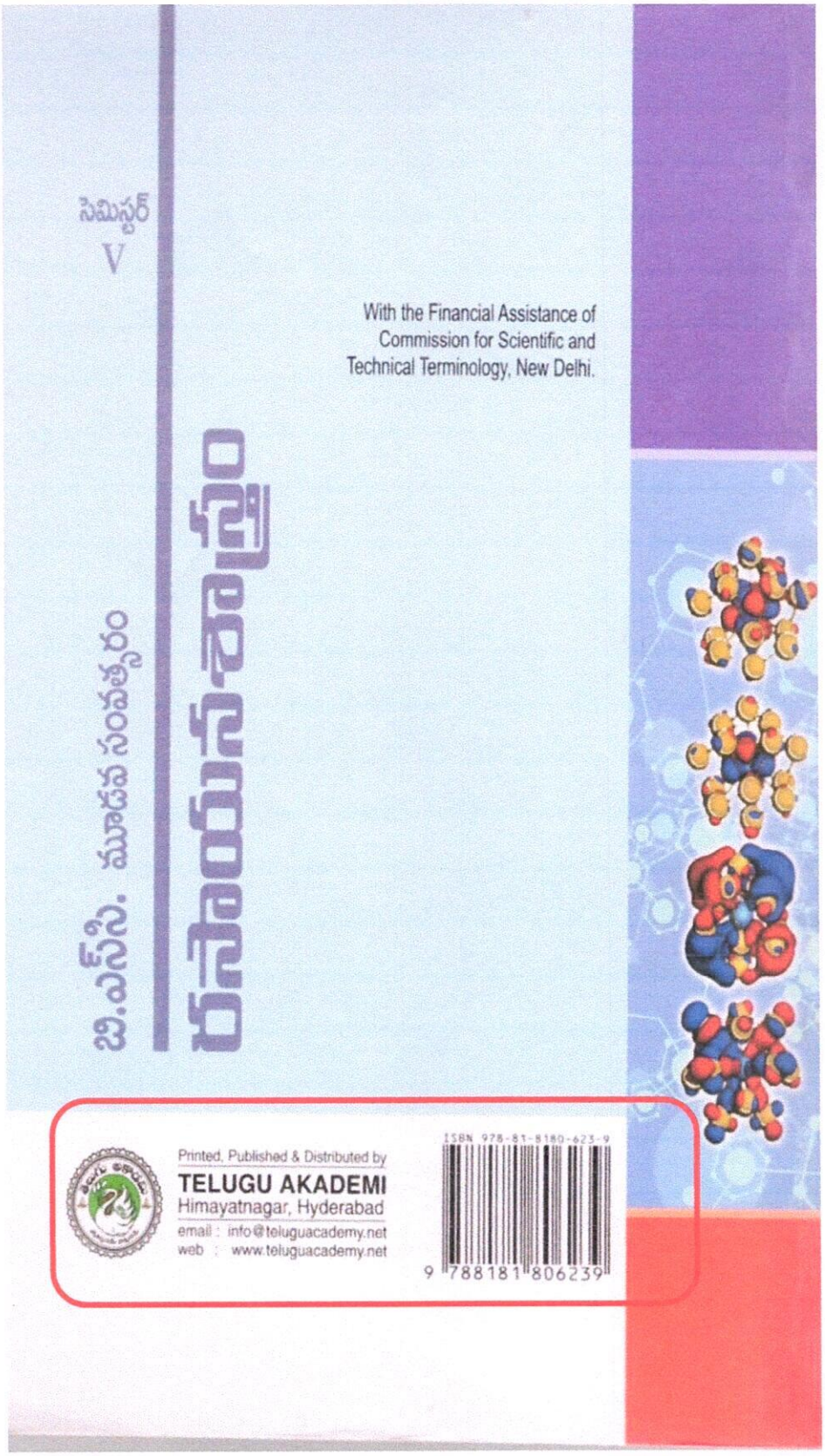
1.1 స్ఫటిక క్షేత్ర సిద్ధాంతం

స్ఫటిక క్షేత్ర సిద్ధాంతం సంయోజకతా బంధ సిద్ధాంతాన్ని సమర్థిస్తూ, దాని పరిమితిని విజయవంతంగా వివరించింది. జె.హెచ్. వాన్ వెక్, (J.H. Van Vleck), హన్స్ బెత్ (Hans Bethe) ఈ సిద్ధాంతాన్ని అయానిక స్ఫటికాలకు ప్రతిపాదించారు. కాని తర్వాత అది లైగాండ్‌లు, లోహ అయాన్‌ల మధ్య స్థిర విద్యుత్ అన్యోన్య చర్యలను వివరించడానికి కూడా ఉపయోగపడింది.

వేలెన్సీ బంధ సిద్ధాంతం d^8, d^9 సంశ్లిష్టాల యొక్క ప్రవర్తనను వివరించలేకపోయింది. ఇది అయస్కాంత భ్రామకం, రంగు, వర్ణపట ధర్మాల మధ్య పరిమాణాత్మక సంబంధాన్ని తెలియజేయడంలో విఫలమైంది. సంయోజకతా బంధ సిద్ధాంతంలోని లోపాలను స్ఫటిక క్షేత్ర సిద్ధాంతం విజయవంతంగా వివరించగలిగింది.

స్ఫటిక క్షేత్ర సిద్ధాంతంలోని ముఖ్యాంశాలు

(i) వేలెన్సీ బంధ సిద్ధాంతం వివరించలేని లైగాండ్‌ల స్వభావాన్ని స్ఫటిక క్షేత్ర సిద్ధాంతం వివరించగలిగింది. స్ఫటిక క్షేత్ర సిద్ధాంతంలోని లైగాండ్‌లు అయానిక లైగాండ్‌లు లేదా F^-, Cl^-, Br^- మొదలైన ఋణాత్మక బిందు ఆవేశాలు; H_2O, NH_3 లాంటి తటస్థ లైగాండ్‌లు. ఈ లైగాండ్‌లు కేంద్ర లోహ అయాన్‌కు దగ్గరగా చేరినప్పుడు తమ ఋణ ధ్రువం లోహ అయాన్‌వైపు అమర్చుకుంటాయి. అందుకే వీటిని ద్విధ్రువాలు అని కూడా అంటారు.



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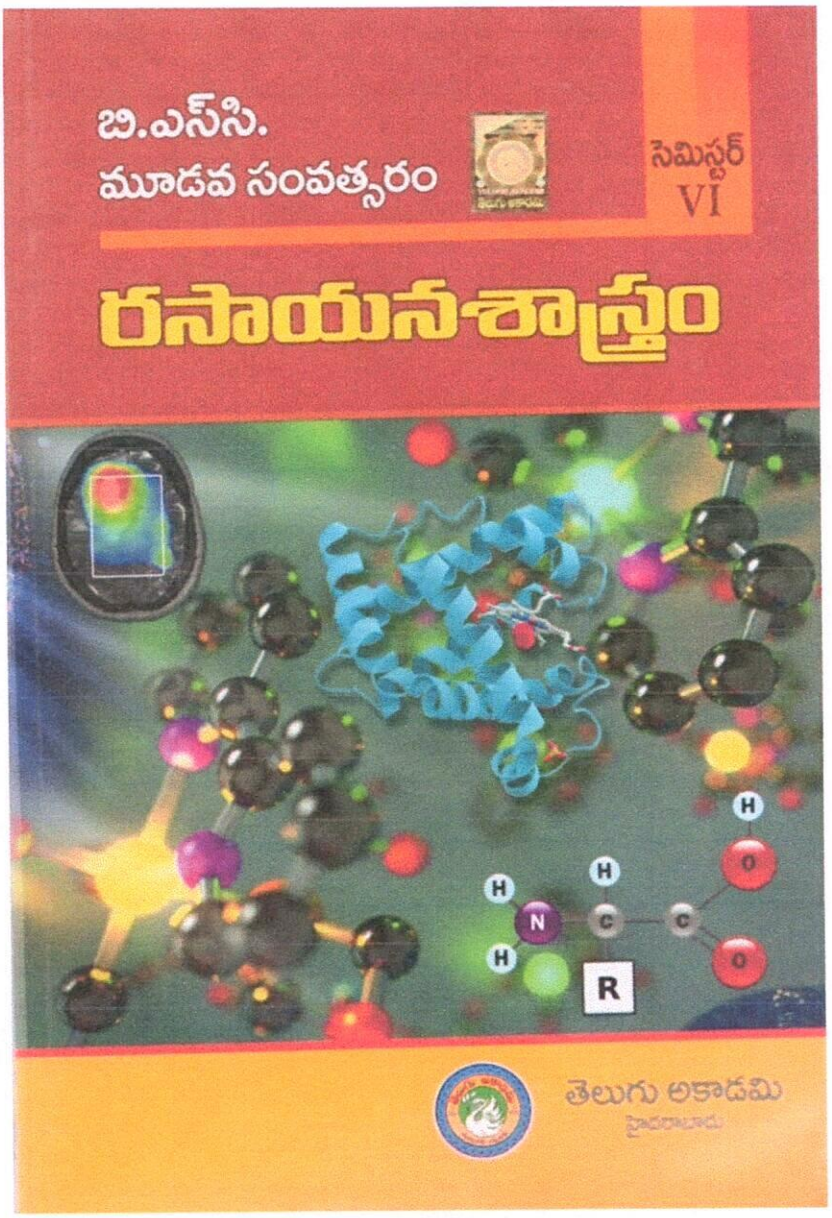

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మూడవ సంవత్సరం - సెమిస్టర్ - VI

రసాయనశాస్త్రం

రచయితలు

ఆచార్య దేవదాస్ మన్వాల్
ప్రొఫెసర్ & హెడ్ (రిటైర్డ్)
రసాయనశాస్త్ర విభాగం
ఉస్మానియా విశ్వవిద్యాలయం, హైదరాబాదు

ఆచార్య. పి. లీలావతి
రసాయనశాస్త్ర విభాగం
ఉస్మానియా విశ్వవిద్యాలయం
హైదరాబాదు

డా॥ బి. రమేష్
అసిస్టెంట్ ప్రొఫెసర్, రసాయనశాస్త్ర విభాగం
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హన్మకొండ, వరంగల్

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కాకతీయ విశ్వవిద్యాలయం
వరంగల్

శ్రీ జి. సత్యనారాయణ గౌడ్
అసిస్టెంట్ ప్రొఫెసర్, రసాయనశాస్త్ర విభాగం
డా.బి.ఆర్.ఆర్. ప్రభుత్వ కళాశాల
జడ్చర్ల, మహబూబ్‌నగర్

డా॥ ఎన్. యోగిబాబు
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పటాన్‌చెరు, సంగారెడ్డి

సంపాదకులు

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ఉస్మానియా విశ్వవిద్యాలయం
హైదరాబాదు

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డా॥ కె. వేంకటేశ్వరరావు
రీడర్ & హెడ్ (రిటైర్డ్)
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తెలుగు అకాడమి
హైదరాబాదు

Author of the Book

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మూలక రసాయన చర్యావిధానాలు

1.1 క్రియాశీల, జడ సంశ్లిష్టాలు

లైగాండ్‌ల ప్రతిక్షేపక చర్యారేటు మీద ఆధారపడి లోహ సంశ్లిష్టాలను రెండు రకాలుగా వర్గీకరించవచ్చు. హెన్రీ టాబే (Henry Taube) ఇచ్చిన నిర్వచనం ప్రకారం,

(i) తమ లైగాండ్‌లను, ఇతర లైగాండ్‌లతో వేగంగా ప్రతిక్షేపించుకొనే లోహ సంశ్లిష్టాలను, క్రియాశీల (labile) సంశ్లిష్టాలుగా పేర్కొనవచ్చు.

(ii) తమ లైగాండ్‌లను, ఇతర లైగాండ్‌లతో నెమ్మదిగా ప్రతిక్షేపించుకొనే, అంటే, లైగాండ్ ప్రతిక్షేపక చర్యారేటు తక్కువగా ఉండే లోహ సంశ్లిష్టాలను జడ (inert) సంశ్లిష్టాలు అంటారు.

హెన్రీ టాబే నిర్వచనం ప్రకారం, 25°C ఉష్ణోగ్రత వద్ద 0.1M సంశ్లిష్ట ద్రావణం ఒక నిమిషం లోపల లైగాండ్ ప్రతిక్షేపక చర్యను పూర్తిచేయగలిగితే ఆ లోహ సంశ్లిష్టం క్రియాశీల లోహ సంశ్లిష్టం. ఒక నిమిషం కంటే ఎక్కువ సమయం తీసుకుంటే అది జడ లోహ సంశ్లిష్టం.

ఉదా: $[Cu(NH_3)_4(H_2O)_2]^{2+}$ అనే క్రియాశీల సంశ్లిష్టాన్ని మరియు $[Co(NH_3)_6]^{3+}$ అనే జడ సంశ్లిష్టాన్ని పరిగణనలోకి తీసుకుందాం.

$[Cu(NH_3)_4(H_2O)_2]^{2+}$ క్రియాశీల సంశ్లిష్టం. దీని జలద్రావణం నీలి రంగులో ఉంటుంది. ఈ ద్రావణానికి గాఢ HCl కలిపినప్పుడు నీలి ద్రావణం వెంటనే $[CuCl_4]^{2-}$ ను ఇస్తూ ఆకుపచ్చ రంగులోకి మారుతుంది.

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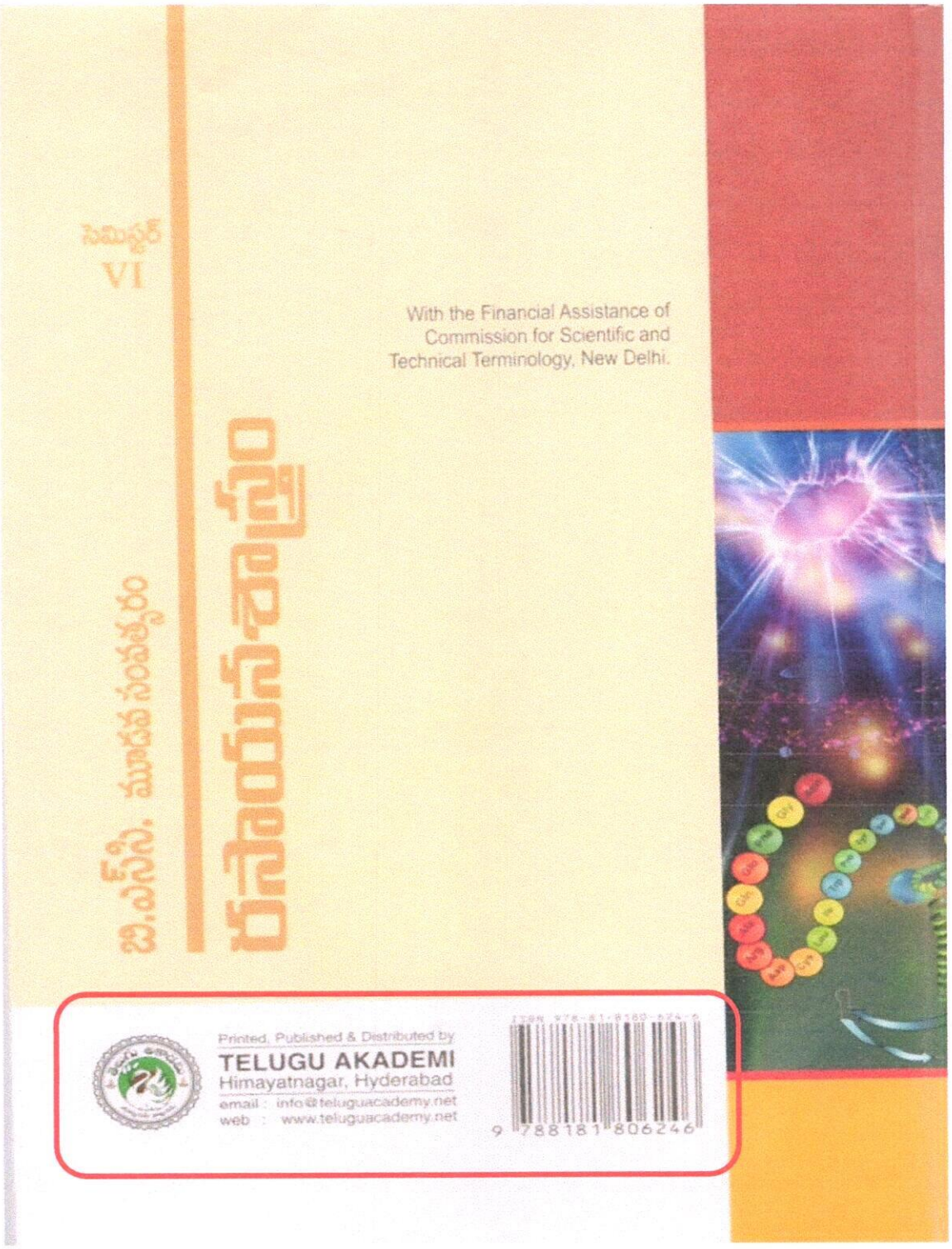

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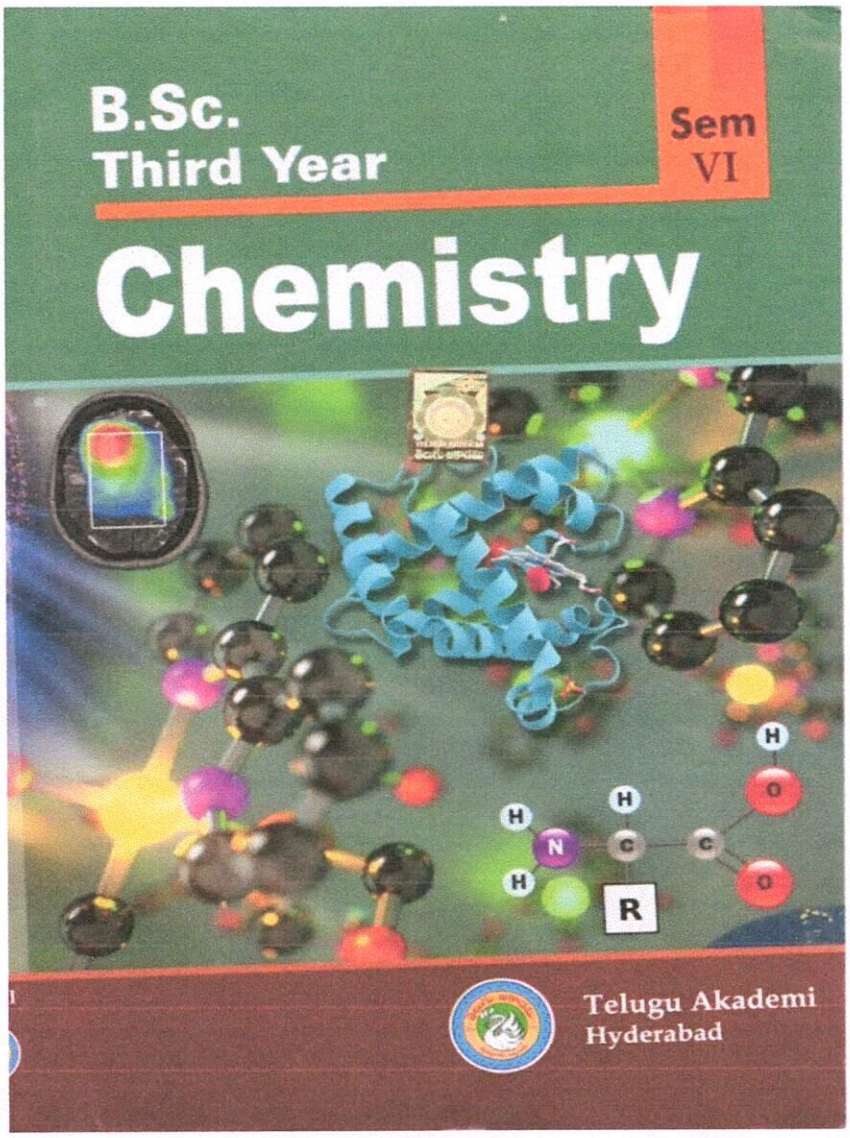

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Chapter 1

Inorganic Reaction Mechanism

1.1 Labile and Inert Complexes

Based on the rate of substitution of one ligand by another ligand, metal complexes are classified as labile and inert. According to Henry Taube this classification is explained in the following way.

(i) The complexes which rapidly substitute their ligands with another ligand are called labile complexes.

(ii) The complexes where ligand substitution reaction rate is slow are called inert complexes.

Henry Taube proposed that at 25°C, in 0.1M solution of complexes, if the substitution takes place in less than one minute, the complexes are considered as labile complexes and these complexes which take longer time than this to react are considered as inert complexes.

Eg. Let us consider the labile, $[Cu(NH_3)_4(H_2O)_2]^{2+}$ and inert $[Co(NH_3)_6]^{3+}$ metal complexes.

$[Cu(NH_3)_4(H_2O)_2]^{2+}$ is labile. Its aqueous solution is blue in colour. When conc. HCl is added to this solution, the blue solution immediately turns green giving $[CuCl_4]^{2-}$.

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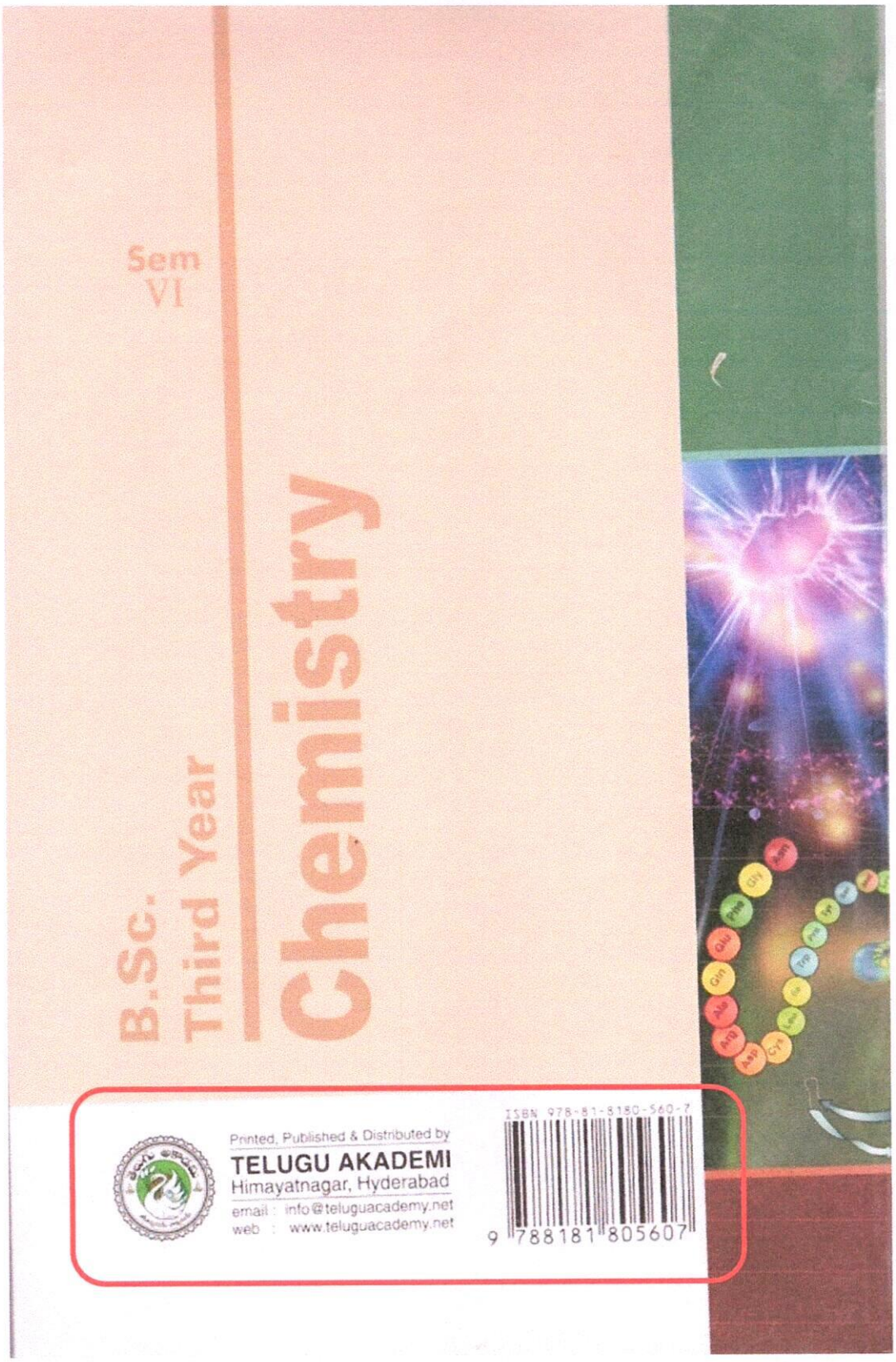

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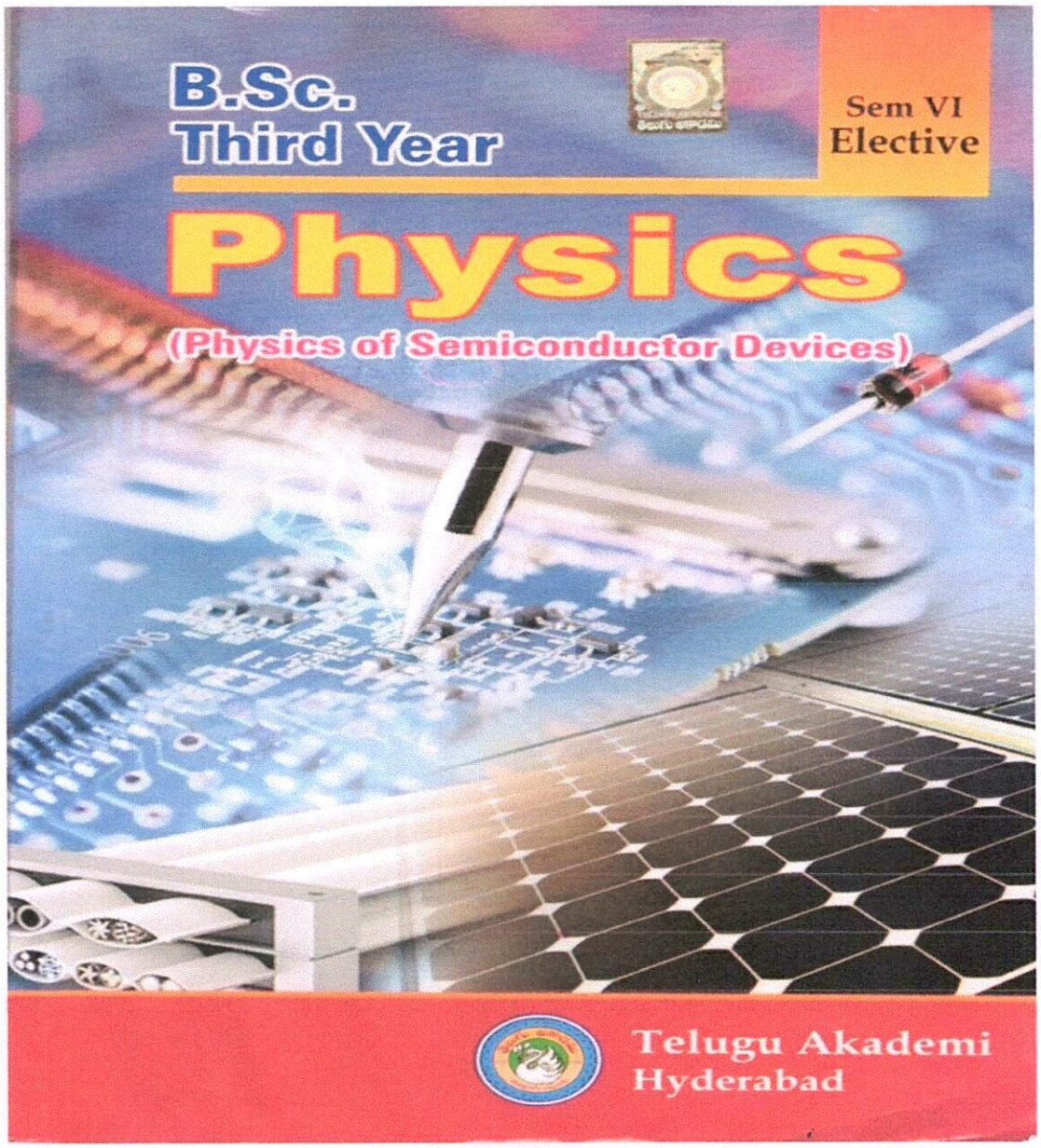

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I
UNIT

Semiconductor Physics

1.1 Introduction

An electronic device controls the flow of electrons. The study of electronic devices requires a basic knowledge on the relationship between the electrons and the other constituents of an atom. The flow of electrons within a solid can be investigated to acquire the knowledge about the differences between conductors, insulators and semiconductors and thereby getting understanding of p-type and n-type semiconductor materials. The nature of semiconductors, effect of impurities on their conduction will be studied in this unit. Semiconductors not only reduce the size of electronic devices but also work with the minimum energy losses. They also help in faster and efficient working of electronic devices.

1.2 Energy bands in solids

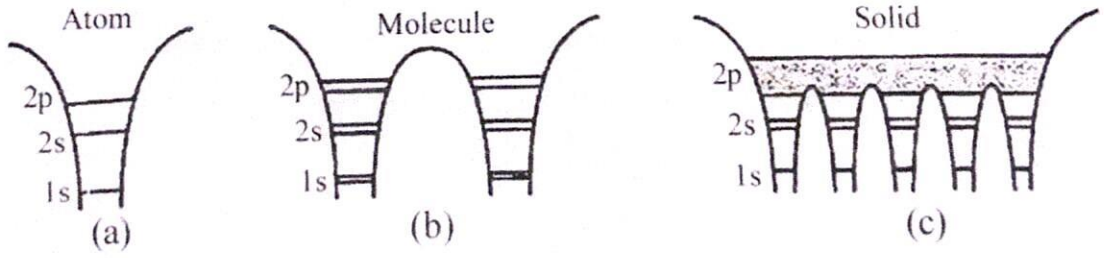
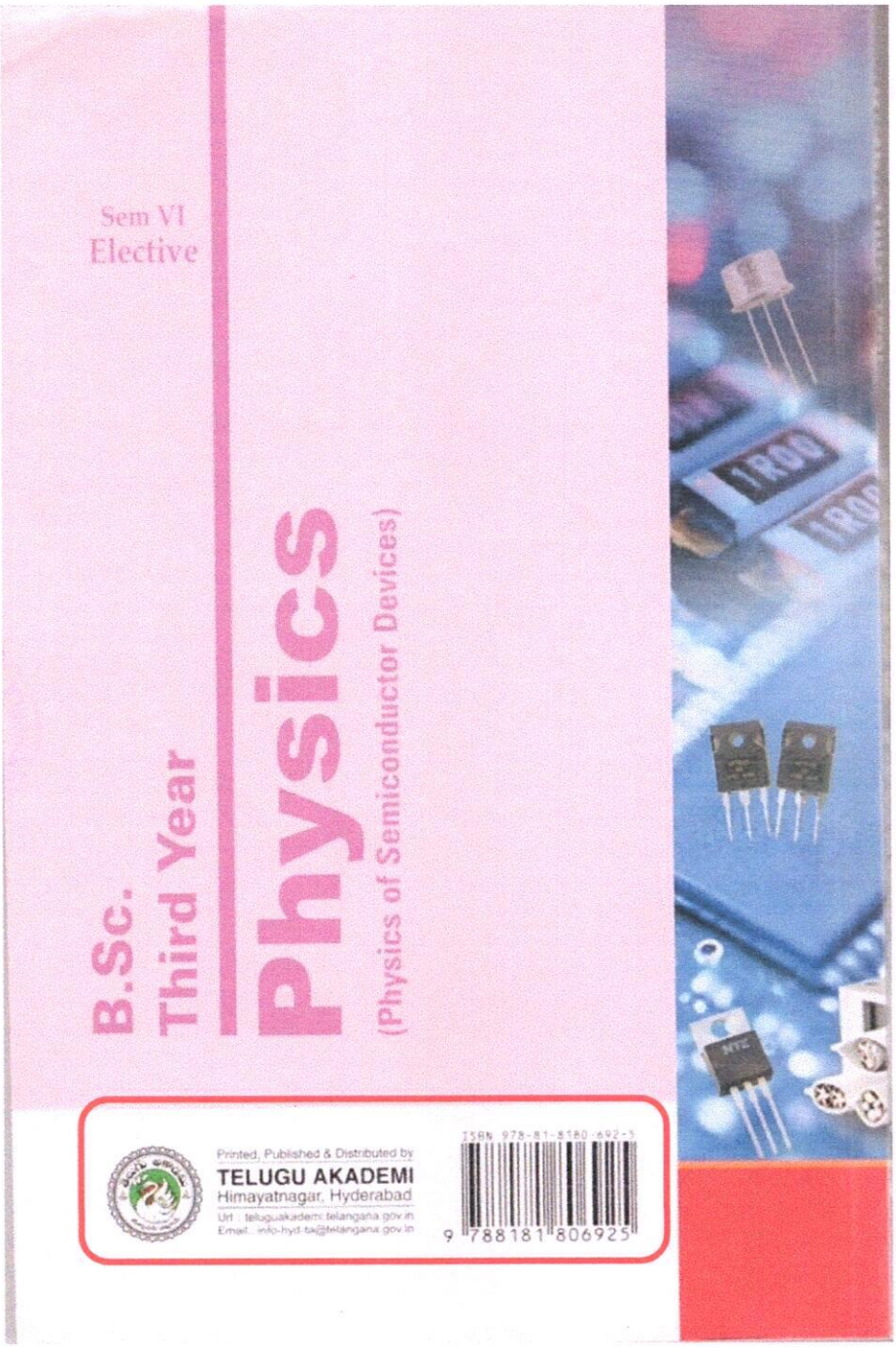


Fig. 1.1



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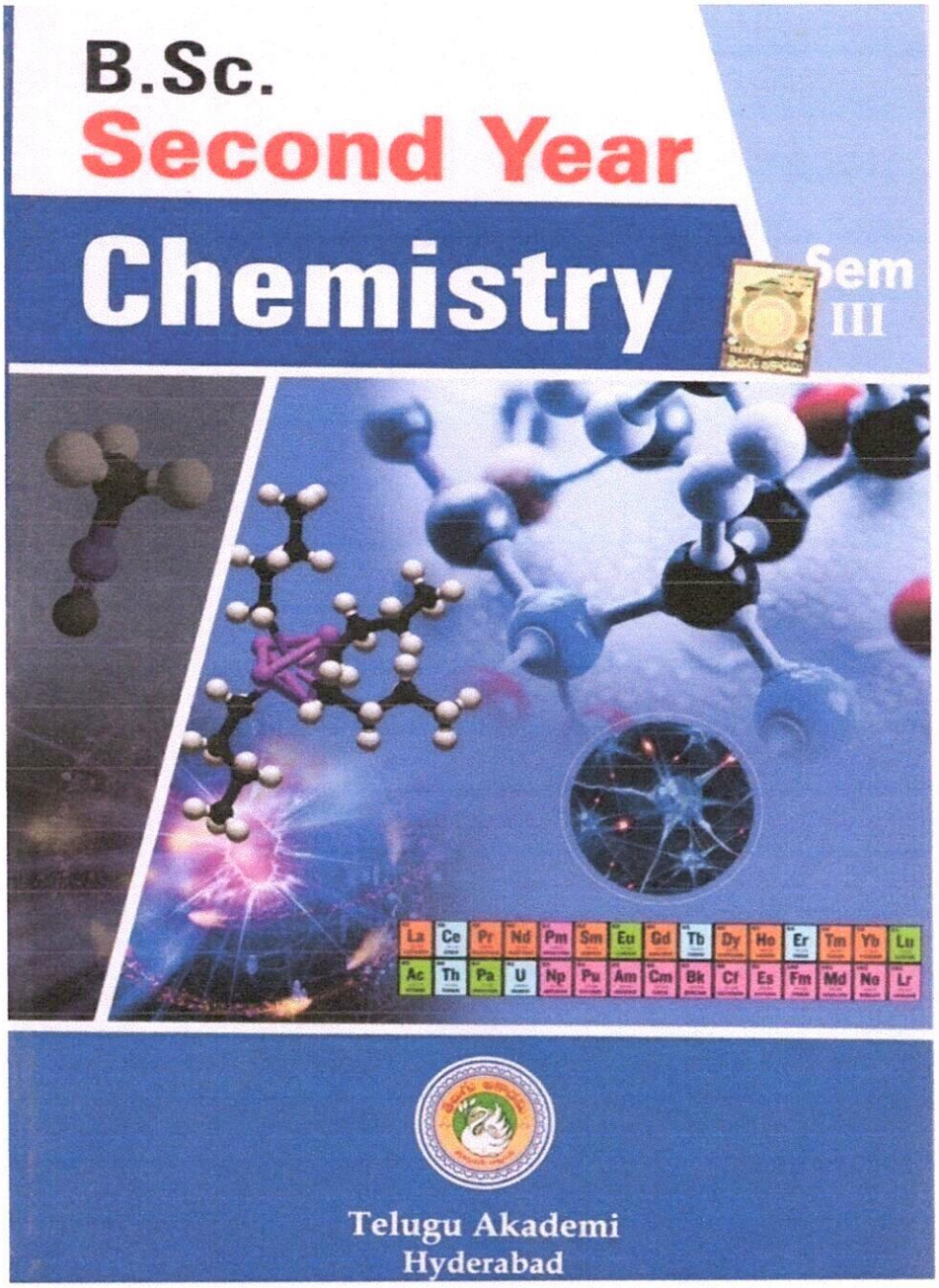

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Chapter 1

Chemistry of f-Block Elements

Introduction

The elements which have partly filled (n-2) f-orbitals are called f-block elements or inner transition elements. In these elements, the differentiating electron enters the f-orbitals. So, these are also called as f-block elements. Based upon the filling of 4f and 5f orbitals, these elements are divided into two series as lanthanides and actinides.

Lanthanides

1.1 Chemistry of Lanthanides

In these elements, the differentiating electron goes to 4f - orbitals. These elements are called lanthanides or lanthanones or 4f - block elements. In these elements 4f orbitals are being successively filled. According to this only 13 elements (Ce_{58} to Yb_{70}) should be the members of this series, because in La_{57}, 4f orbitals are empty and in Lu_{71}, 4f orbitals are completely filled. However, all the fifteen elements from La to Lu are considered as lanthanides. All these elements have similar physical and chemical properties.

These are very reactive metals like alkaline earth metals. However, they show very little difference in their chemical reactivity. They burn in air to give sesquioxides, Ln_2O_3 except Ce. The Ce gives CeO_2. They combine with H_2 at elevated temperatures to form non-stoichiometric hydrides.

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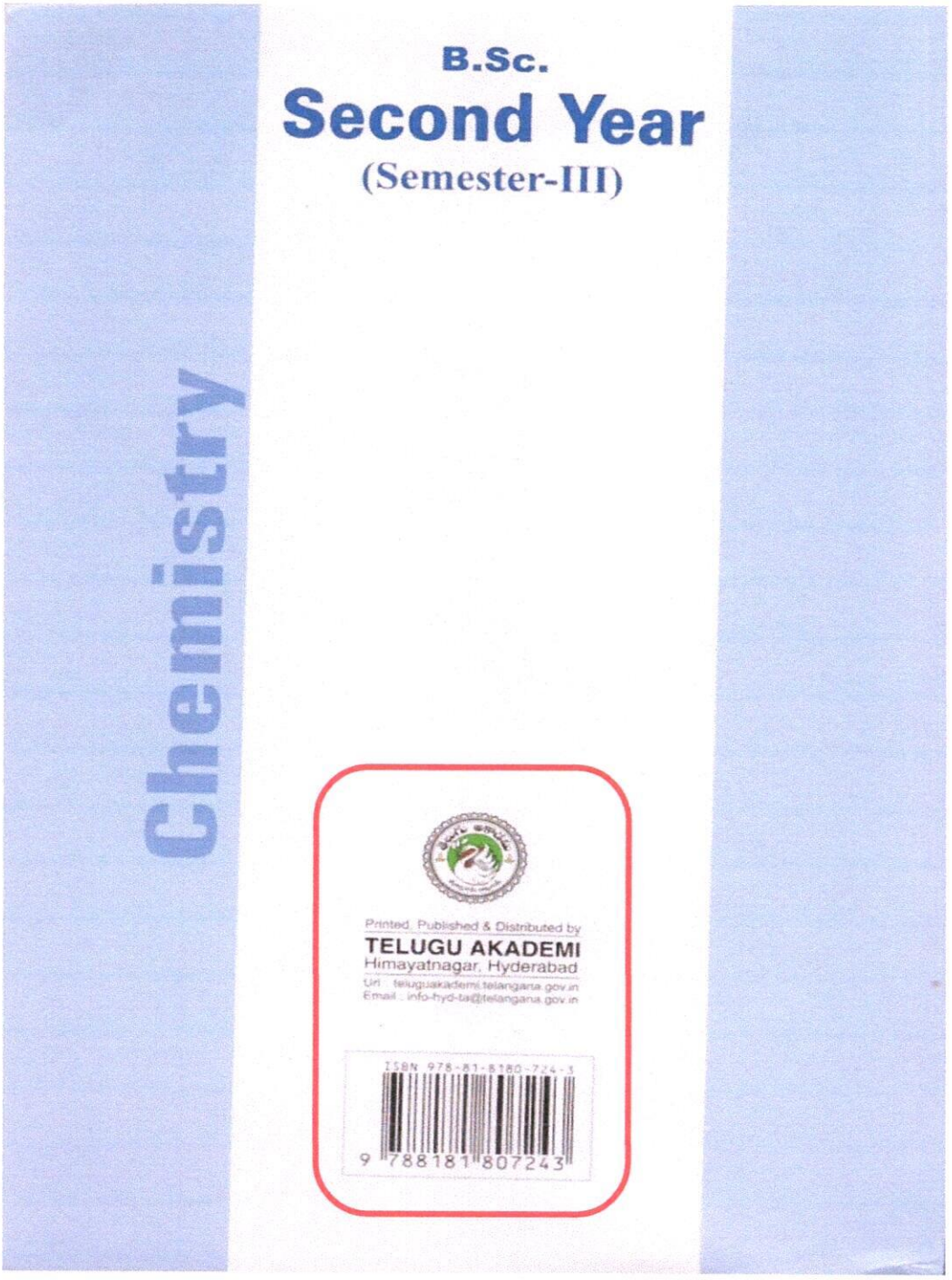

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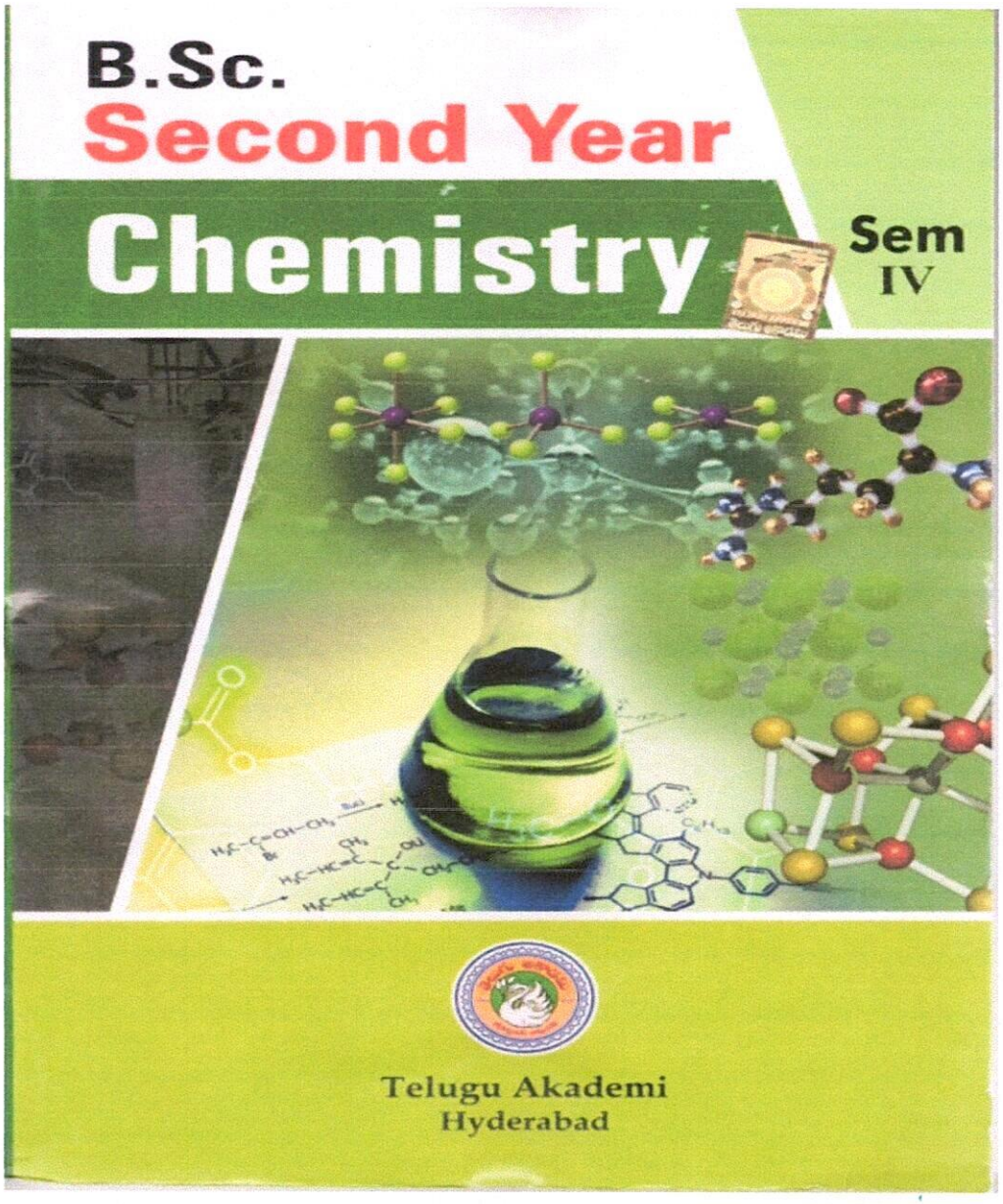

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Chapter 1

Coordination Compounds - II

1.1 Crystal Field Theory

The crystal field theory replaced the valence bond theory and that successfully explains the limitation of valence bond theory.

J.H. Van Vleck and Hans Bethe proposed this theory for ionic crystals but later it was even applied to explain the electrostatic interactions between ligands and metal ion.

The VBT cannot explain the behavior of d^8 and d^9 complexes. It fails to account the quantitative connection between magnetic moment, colour with that of spectral properties. The crystal field theory successfully explains the draw backs of VBT.

The salient features of CFT are as follows.

(i) The crystal field theory explains about the nature of ligands which was not explained in VBT. The ligands in CFT are treated as ionic ligands or negative (–ve) point charges, like F^-, Cl^-, Br^- etc. and the neutral ligands like H_2O, NH_3 etc. are called as point dipoles since these ligands when approaches the central metal ion they align negative poles towards metal ions.

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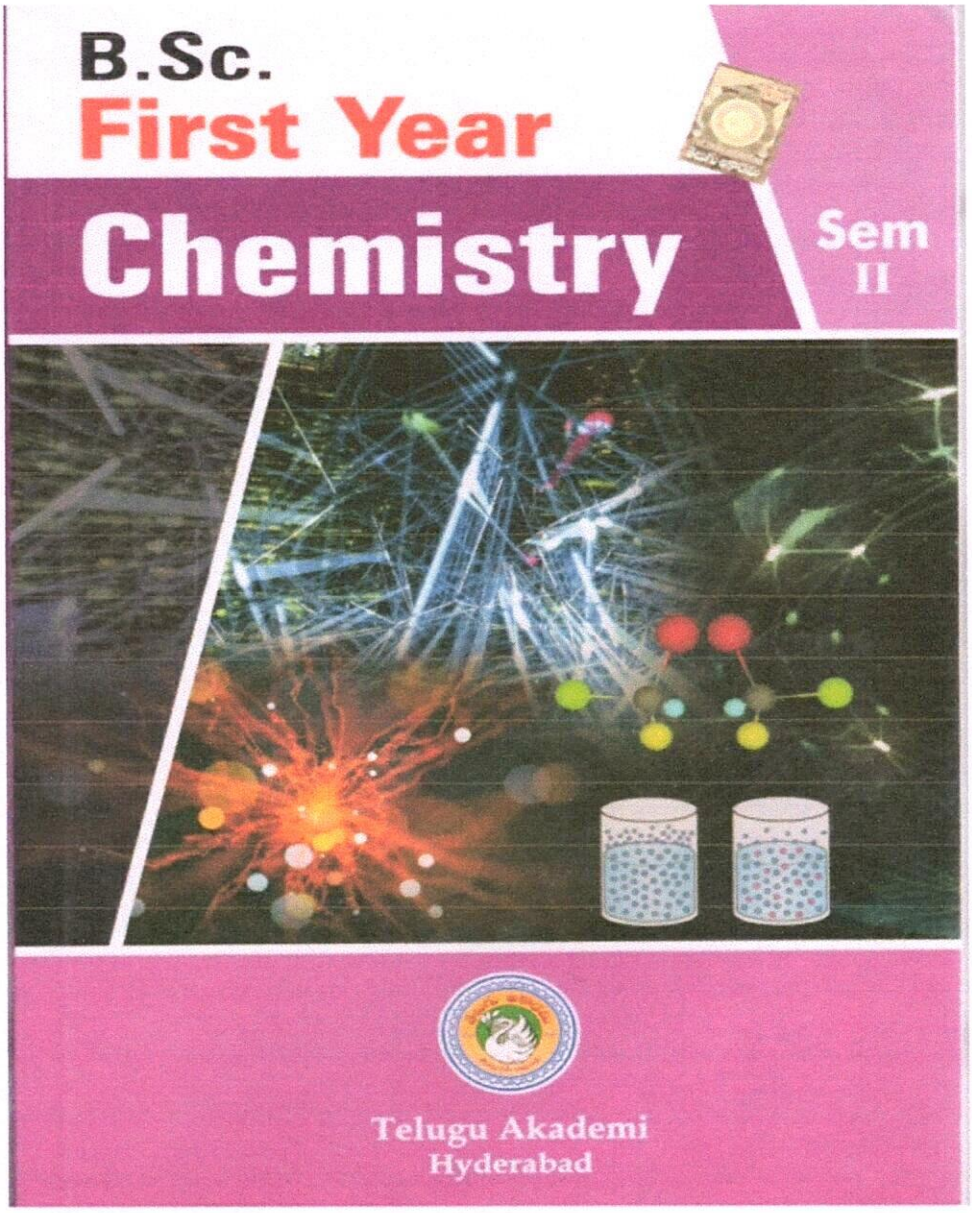

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Chapter 1

p - Block Elements - II

Oxides

The oxygen atom has the electronic configuration of $1s^2 2s^2 2p^4$. Oxygen forms compounds with all the elements except He, Ne and possibly Ar, and it combines directly with all the other elements except halogens, a few noble metals, and the noble gases either at room or at elevated temperatures.

1.1 Types of Oxides

Oxides are chemical compounds with one or more oxygen atoms combined with another element.

Oxides are classified in several ways based on their oxygen content and structure or on the basis of their chemical behaviour.

1. Classification based on their oxygen content

Based on the oxygen content or geometric structure, oxides are classified into normal oxides, polyoxides, suboxides and mixed oxides.

(i) Normal oxides: These are having as much oxygen as allowed by the normal oxidation number of its metal / non-metal or hydrogen. Oxidation number of oxygen in these oxides is -2. These oxides contain only M–O bonds.

Eg: H_2O, MgO, Al_2O_3

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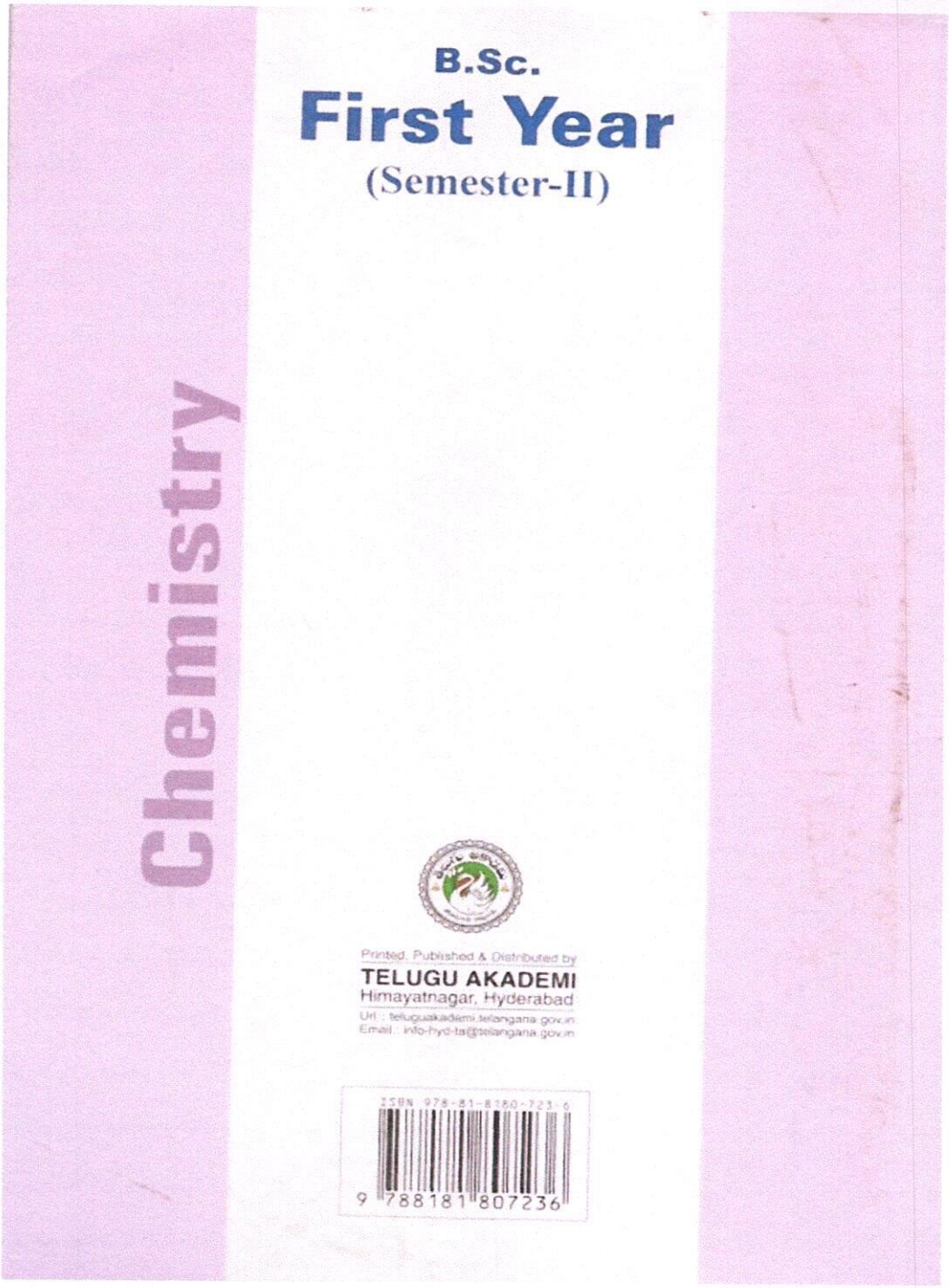

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