Problems

Q 1. Discuss the thermodynamic stability of a complex and correlate stepwise constant with overall stability constant.


Q 3. Discuss the determination of formation constant by pH-metry.

Q 4. What is log β? How is it related to the stability of complexes?

Q 5. Illustrate with suitable example the trends in stepwise formation constant.

Q 6. Discuss a spectrophotometric method for the determination of stability constants of complexes.

Q 7. How does the nature of the central metal ion affect the stability of the complexes?
Home: https://www.dalalinstitute.com/
Classes: https://www.dalalinstitute.com/classes/
Books: https://www.dalalinstitute.com/books/
Videos: https://www.dalalinstitute.com/videos/
Location: https://www.dalalinstitute.com/location/
Contact Us: https://www.dalalinstitute.com/contact-us/
About Us: https://www.dalalinstitute.com/about-us/

**Postgraduate Level Classes**
*(NET-JRF & IIT-GATE)*

<table>
<thead>
<tr>
<th>Admission</th>
<th>Distance Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular Program</td>
<td>Result</td>
</tr>
<tr>
<td>Test Series</td>
<td></td>
</tr>
</tbody>
</table>

**Undergraduate Level Classes**
*(M.Sc Entrance & IIT-JAM)*

<table>
<thead>
<tr>
<th>Admission</th>
<th>Distance Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular Program</td>
<td>Result</td>
</tr>
<tr>
<td>Test Series</td>
<td></td>
</tr>
</tbody>
</table>

**A Textbook of Inorganic Chemistry – Volume 1**

“A Textbook of Inorganic Chemistry – Volume 1 by Mandeep Dalal” is now available globally; including India, America and most of the European continent. Please ask at your local bookshop or get it online here.

READ MORE

Join the revolution by becoming a part of our community and get all of the member benefits like downloading any PDF document for your personal preview.

Sign Up
Table of Contents

CHAPTER 1 ..................................................................................................................................... 11

Stereochemistry and Bonding in Main Group Compounds: ........................................................ 11
  ❖ VSEPR Theory .......................................................................................................................... 11
  ❖ $d\pi-p\pi$ Bonds ....................................................................................................................... 23
  ❖ Bent Rule and Energetic of Hybridization ............................................................................. 28
  ❖ Problems .................................................................................................................................. 42
  ❖ Bibliography ............................................................................................................................ 43

CHAPTER 2 ..................................................................................................................................... 44

Metal-Ligand Equilibria in Solution: ................................................................................................. 44
  ❖ Stepwise and Overall Formation Constants and Their Interactions ...................................... 44
  ❖ Trends in Stepwise Constants .................................................................................................. 46
  ❖ Factors Affecting Stability of Metal Complexes with Reference to the Nature of Metal Ion and Ligand .................................................................................................................. 49
  ❖ Chelate Effect and Its Thermodynamic Origin ...................................................................... 56
  ❖ Determination of Binary Formation Constants by pH-metry and Spectrophotometry ........ 63
  ❖ Problems .................................................................................................................................. 68
  ❖ Bibliography ............................................................................................................................ 69

CHAPTER 3 ..................................................................................................................................... 70

Reaction Mechanism of Transition Metal Complexes – I: ............................................................ 70
  ❖ Inert and Labile Complexes ...................................................................................................... 70
  ❖ Mechanisms for Ligand Replacement Reactions ...................................................................... 77
  ❖ Formation of Complexes from Aquo Ions .............................................................................. 82
  ❖ Ligand Displacement Reactions in Octahedral Complexes- Acid Hydrolysis, Base Hydrolysis .... 86
  ❖ Racemization of Tris Chelate Complexes ............................................................................... 89
  ❖ Electrophilic Attack on Ligands ............................................................................................... 92
  ❖ Problems .................................................................................................................................. 94
  ❖ Bibliography ............................................................................................................................ 95
# Electronic Spectra of Transition Metal Complexes:

- Spectroscopic Ground States ................................................................. 214
- Correlation and Spin-Orbit Coupling in Free Ions for 1st Series of Transition Metals ........... 243
- Orgel and Tanabe-Sugano Diagrams for Transition Metal Complexes ($d^1$ – $d^9$ States) ... 248
- Calculation of Dq, B and $\beta$ Parameters .................................................... 280
- Effect of Distortion on the $d$-Orbital Energy Levels ........................................... 300
- Structural Evidence from Electronic Spectrum ................................................. 307
- Jahn-Tellor Effect .......................................................................................... 312
- Spectrochemical and Nephelauxetic Series ...................................................... 324
- Charge Transfer Spectra .................................................................................. 328
- Electronic Spectra of Molecular Addition Compounds ...................................... 336
- Problems ....................................................................................................... 340
- Bibliography ................................................................................................. 341

# Magnetic Properties of Transition Metal Complexes:

- Elementary Theory of Magneto-Chemistry .................................................... 342
- Guoy’s Method for Determination of Magnetic Susceptibility ......................... 351
- Calculation of Magnetic Moments ................................................................. 354
- Magnetic Properties of Free Ions .................................................................... 359
- Orbital Contribution: Effect of Ligand-Field .................................................... 362
- Application of Magneto-Chemistry in Structure Determination ...................... 370
- Magnetic Exchange Coupling and Spin State Cross Over ............................... 375
- Problems ....................................................................................................... 384
- Bibliography ................................................................................................. 385

# Metal Clusters:

- Structure and Bonding in Higher Boranes ...................................................... 386
- Wade’s Rules ................................................................................................. 401
Mandeep Dalal is an Indian research scholar who is primarily working in the field of Science and Philosophy. He received his Ph.D in Chemistry from Maharshi Dayanand University, Rohtak, in 2018. He is also the Founder and Director of "Dalal Institute", an India-based educational organization which is trying to revolutionize the mode of higher education in Chemistry across the globe. He has published more than 40 research papers in various international scientific journals, including mostly from Elsevier (USA), IOP (UK) and Springer (Netherlands).

**Other Books by the Author**

- A Textbook of Inorganic Chemistry - Volume I, II, III, IV
- A Textbook of Physical Chemistry - Volume I, II, III, IV