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### ❖ Bibliography

- [1] R. J. Gillespie, *Electron Densities and the VSEPR Model of Molecular Geometry*, E. Can. J. Chem., 70, 1992, 742.
- [2] I. Hargittai and B. Chamberland, *The VSEPR Model of Molecular Geometry*, Comp. & Maths. with Appls., 12B, 1986, 1021.
- [3] R. J. Gillespie and R. S. Nyholm, *Inorganic Stereochemistry*, Q. Rev. Chem. Soc., 11, 1957, 339.
- [4] J. D. Lee, *Concise Inorganic Chemistry*, Chapman & Hall, New York, USA, 1994.
- [5] B. R. Puri, L. R. Sharma, K. C. Kalia, *Principals of Inorganic Chemistry*, Milestone Publishers, Delhi, India, 2012.
- [6] J. E. Huheey, E. A. Keiter, R. L. Keiter, *Inorganic Chemistry: Principals of Structure and Reactivity*, HarperCollins College Publishers, New York, USA, 1993.
- [7] A. F. Wells, *Structural Inorganic Chemistry*, Oxford University Press, London, UK, 1975.
- [8] F. A. Cotton, G. Wilkinson, C. A. Murillo, M. Bochmann, *Advanced Inorganic Chemistry*, John Wiley & Sons, New Jersey, USA, 1999.
- [9] W. U. Malik, G. D. Tuli, R. D. Madan, *Selected Topics in Inorganic Chemistry*, S. Chand Publishers, New Delhi, India, 2014.

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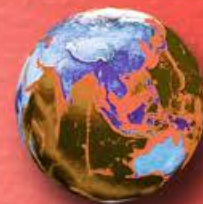
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# A TEXTBOOK OF INORGANIC CHEMISTRY

**Volume I**

**MANDEEP DALAL**



*First Edition*

**DALAL INSTITUTE**

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