

a new  
**CONCISE INORGANIC  
CHEMISTRY**

third edition

by  
**J. D. LEE**

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CONCISE INORGANIC CHEMISTRY

## PREFACE

The aim of the first edition of this book was to provide a concise modern textbook of inorganic chemistry which was long enough to cover the essentials, yet short enough to be interesting. It provided a simple and logical theoretical framework into which the reader should be able to fit his factual knowledge. It was intended for those reading for Part I of the Grad.R.I.C. examinations, for first and second year students at universities and polytechnics, and for Higher National Certificate students at technical colleges. The aim of the third edition is still the same, and the layout of the book remains largely unchanged.

In the eleven years since the second edition of this book, chemical knowledge and understanding have advanced significantly. The molecular orbital theory of bonding has gained in popularity, and its coverage is extended, though the valence bond theory and electron pair repulsion (Sidgwick-Powell) concepts of bonding are still used extensively. The controversy over the extent to which *d* orbitals participate in  $\sigma$  bonding remains unresolved, and for simple compounds of the main groups the Gillespie-Nyholm concept of *d* orbitals participating in hybridization is retained.

About two thirds of the elements are metals, yet many chemistry books omit or give scant coverage to a discussion of bonding in metals and alloys. A new section has been included to rectify this.

Though there is a trend for chemistry teaching to become more theoretical most students eventually earn their living in an industrial environment, so an attempt has been made to indicate which chemicals are produced commercially on a large scale. Tonnage production figures inevitably vary from year to year, but still indicate the general scale of use.

There has been considerable interest in organometallic compounds, some of which are manufactured on a large scale (silicones, lead tetraethyl, Ziegler-Natta catalysts, etc.). These and the use of organolithium and Grignard reagents in syntheses are described in the appropriate groups. There has also been great interest in the role of inorganic materials in biological systems (chlorophyll, haemoglobin, vitamin B<sub>12</sub> and nitrogen fixation) and a public awareness of the toxicity of various materials, most notably lead and mercury. These are discussed in the appropriate sections.

An enormous amount of effort has gone into the preparation and characterization of transition metal compounds and complexes, particularly using magnetic properties and visible and uv spectra. The discovery that a significant number of compounds of Cr, Mo, Tc, Re, Ru and Rh contain metal-metal bonds, and the discovery of metal atom cluster compounds for Nb, Ta, Mo, W

and Re have extended our concepts of chemical bonding. The crystal field theory provides a simple explanation of bonding in complexes, and the chapters on the *d* block elements and complexes have been greatly extended and largely rewritten.

The heavier elements in the periodic table were first studied because of their nuclear chemistry. A good deal more of their normal chemical behaviour is now known, and this section has been rewritten.

Over the past twenty years spectroscopy has become an increasingly important technique. Some understanding of uv and visible spectra is essential to the understanding of the energy levels, stability and bonding of transition metal complexes. The last chapter has been added to explain this rather difficult subject as simply as possible, explaining the origin of the spectra and the number of bands observed, without explaining the difficult spectroscopic nomenclature, or involving group theory and symmetry.

A large amount of chemistry is quite easy, but some is enormously difficult. I can find no better way to conclude than that by the late Professor Silvanus P. Thompson in his book *Calculus Made Easy*, 'I beg to present my fellow fools the parts that are not hard. Master these thoroughly, and the rest will follow. What one fool can do, another can'.

J.D.L.

## SI UNITS

SI units for energy have been used throughout the third edition, thus making a comparison of thermodynamic properties easier. Ionization energies are now quoted in  $\text{kJ mol}^{-1}$ , rather than ionization potentials in eV. Older data from other sources may be converted to these units ( $1 \text{ kcal} = 4.184 \text{ kJ}$  and  $1 \text{ eV} = 23.06 \times 4.184 \text{ kJ mol}^{-1}$ ).

Metres, or nanometres, are strictly the SI units for distance. However, angstrom units  $\text{\AA}$  are a permitted unit of length and are widely used by crystallographers because they give convenient numbers for bondlengths, so their use is continued. The positions of peaks in spectra are normally quoted as wave numbers in  $\text{cm}^{-1}$ . These should strictly be multiplied by 100 to give SI units of  $\text{m}^{-1}$ , or multiplied by 11.96 to give  $\text{J mol}^{-1}$ .

The SI units for density are  $\text{kg m}^{-3}$ , making the density of water  $1000 \text{ kg m}^{-3}$ . This convention is not yet widely accepted, so the older units of  $\text{g/cc}$  are retained.

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