Chemical Reference Works

It was not that long ago that chemical handbooks of one kind or another were primary resources for data and descriptive information on elements and compounds. These books still survive but the information is increasingly available from on-line versions and other less traditional on-line resources.

For general student work perhaps the most useful handbooks are:

- *Handbook of Chemistry and Physics* (*CRC Handbook)* (*annual*)
- *Lange's Handbook of Chemistry* (revised every 4-5 years)
- *The Merck Index* (revised about every 10 years)

All three of these handbooks are available in the Science Resource Center adjacent to the Science Office. The *CRC* and *Lange's* contain most of the same information and generally in tabular format. Although there are tables of contents in each book, the indices are generally easier to use. These books are good places to look for numerical information (thermodynamics, equilibrium constants, densities, melting points, half-lives, vapor pressures, etc.). The *CRC* also has an interesting text section on each element.

The format of *The Merck Index* is very different from the other two handbooks. Compounds and elements are listed alphabetically and information (including some numerical data) is given in paragraph form. Included are literature references on preparation, properties and uses. The supplementary material in the *Index* is much less extensive than in the other two references (half-lives, indicator recipes, solubilities, etc.). However, the *Index* has a large section on organic reactions, classified by name.

By way of contrast, consider the following entries for the compound nickel(II) chloride. The first is copied from a recent edition of the *CRC* [Physical Constants of Inorganic Compounds]:

No.	Name	syn & form	Mol.wt	crys, refrac index	density	mp	bp	soluble, g/100cc water		
								cold	hot	other
n57	nickel chloride	$NiCl_2$	129.62	yel sc, deliq	3.55	1001	subl 973	64.2^{20}	87.6^{100}	s al

In *The Merck Index* this is the entry for the same compound:

Nickel Chloride, $NiCl_2 \cdot 6H_2O$; mol wt 237.70. Anhydrous salt 54.52%, H_2O 45.48%, Ni 24.69%, Cl 29.83%.

Green, deliquesc crystals or cryst powder. Soluble in about 1 part water, in alcohol. The anhydr salt is of golden-yellow color, sublimable in absence of air and readily absorbs NH_3. The aq soln is acid; pH about 4. *Keep well closed*. LD i.v. in dogs: 60 mg/kg.

USE: For nickel-plating cast zinc, manuf sympathetic ink. The anhydr salt as absorbent for NH_3 in gas masks.

In *The Merck Index* there is an empirical formula index at the end of the book which sometimes makes finding organic compounds easier since the nomenclature used can vary. The CRC has separate sections for inorganic (shown above) and organic compounds. The organic section has similar information and also an empirical formula index (as well as a boiling point index).

You should be using these works when writing conclusions or trying to make sense out of results--or when calculations require physical constants (e.g., the density of water at 23.4^{o}C). If at first you don't find what you want, try, try again. Even the indices in *CRC* and *Lange's* can be frustrating. But keep looking. The information is bound to be in one of the three handbooks.

Of course, the handbooks are not much good if you are at home. Fortunately there are some useful resources available on-line [for free]. The Internet being what it is, the URLs for these resources change from time to time. The **Chemical Data** section (under **WWW Links**) of the Chemtopics web site (http://www.chemtopics.com/) is a good place to find current links to helpful information. Of the resources listed there perhaps the most generally useful are:

- ChemFinder (information on physical properties of compounds)
- NIST Webbook of Data (mainly thermodynamics, some spectra)
- Integrated Spectrum Database (reference Mass, IR and NMR spectra)
- Selected tables of chemical data in the public domain from Oliver Seely at CSU, Dominguez Hills

ALWAYS cite your source for information obtained from one of these or other reference works (including your text book if that's what you use). Ordinary values that are used routinely (such as atomic masses) do not need to be cited. Anything you could not find on a plain periodic table should be.