CHEMISTRY REFERENCE PRIMER

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SCIFINDER SCHOLAR (CHEMICAL ABSTRACTS/MEDLINE)

The **first place to turn** to and, many times, the only place to turn to for journal articles, patents, conference papers even remotely related to chemistry

Good for:
1) Verifying citations back to 1907.
2) Finding at least some good citations on almost any sci/tech topic.

Agricultural Sciences
Biochemistry
Biology – Molecular, Cell Level
Biomedical
Crystallography
Environmental Sciences
Food Sciences
Geochemistry including hydrology, fossil fuels, minerals
Materials Applications, e.g. coatings, inks, explosives, textiles
Materials Science including alloys, cement, ceramics, extractive metallurgy, colloids
Plastics & Polymers
Physics, especially atomic, condensed phase, thermodynamics, and thermal, nuclear, & magnetic phenomena.
Surface Chemistry
Toxicology
Waste Treatment

Key Points:

1) Research by Topic is NOT Google, but natural language query. **Query should be a phrase using prepositions** to separate search concepts. Search for "superconductivity of carbon nanotubes", not "superconductivity carbon nanotubes…".

2) It's fine to create a very large set in the first pass. Become familiar with very easy to use Analyze/Refine options. **Refine is the limit function**: by publication date, document type, language, author, company name, or database (C.A. or Medline). There is also a Refine by Topic that allows you to "AND in" an additional concept. **Analyze creates a pick list of all field values** for the hit set: by author, company name, publication year, index terms, language, journal name, document type, CAS Registry Number, and CA Section Title (very broad subject classification). Note that picking some of these options will limit your search to 1967+ and/or to Chemical Abstracts citations.

Prefer using:

Biological Abstracts for organism level biology.

Compendex, IEEE Xplore, or another specific engineering database for engineering topics not closely related to characteristics and use of chemicals and synthetic (human-made) materials.

Inspec for computer science, electrical and electronics, and additional coverage of physics topics.

Web of Science – always a good choice for topics that cross disciplines. But remember the indexing is shallow, can not compare to *INSPEC, SciFinder, or Medline.*

As always, to go further in any discipline, consult the Resources by Subject guide, soon to be greatly improved (see New Form Guide draft).

SciFinder Practice Problems:

1) Find A. Flemming's first publication of penicillin. It's pre-1935.

2) What journals should I publish in/subscribe to if I am interested in carbon nanotubes? What organizations are doing most of the current research in this area?

3) Has anyone used pig fat to treat skin diseases?

4) Marion Jones and other athletes have allegedly used EPO, a performance enhancing drug. What is EPO and what are its adverse effects?

NIST Chemistry WebBook Practice Problem: I need an IR spectra of phenol.

Knovel Practice Problem: What is the viscosity of phenol?

A FEW BASIC CHEMISTRY TERMS

Chromatography – separation of mixtures by selective absorption on media (like paper or a column of coated beads).

Molecular Formula – a count of every element in a molecule. H_2O is 2 hydrogen and 1 oxygen. Many different compounds can have the same molecular formula since the same number of atoms can be connected in various ways in 3D space.

Molecular Weight – the total weight of the molecule. The more atoms, the more weight.

Reaction – transforms a compound(s) into a different compound(s).

> **Reactant/Raw Material/Starting Material –** compounds on the left side of a reaction. For example, in C (carbon) + O_2 (oxygen) ➔ CO_2 (Carbon Dioxide), carbon and oxygen are the reactants.
> **Reagent/Catalyst –** Reagents and catalysts help make a reaction happen by providing key functional groups or lower energy pathways. The difference between a reagent/catalyst and a reactant can be fuzzy.
> **Product/Target Compound** – compounds on the right side of a reaction. In the sample reaction above, carbon dioxide is the product.
> **Preparation/Synthesis/Production/Manufacture** – all synonyms for preparing a compound from other substances.

Registry Number/CAS (Registry) Number – Unique identification number widely used in print and electronic resources to identify a specific substance. Pattern is nnnnnn-nn-n, always ending with '–nn-n'. The first sequence of digits can be 2 to 6 digits. Use registry number indexes where possible instead of chemical name indexes since the same compound can have dozens of names. The registry number has no inherent meaning.

Spectroscopy/Spectrometry/Spectra – A beam of energy/radiation is directed at a substance. The absorption, transmission, or transformation of that energy is measured producing a table or a graph known as a spectra.

MEMORIZE THESE ELEMENT SYMBOLS

C – Carbon	O – Oxygen
H – Hydrogen	P – Phosphorus
N – Nitrogen	S – Sulfur

Consult the Periodic Table for other elements. Found in any chemistry handbook, textbook, and the inside front & back covers of the Merck Index (RS356.M524 Ref).

If I am going to look at a couple of sources in _____, I would use:

Registry Number
hundreds of print and electronic sources can be searched or are indexed by the CAS Registry Number.

Merck Index (RS356 .M524 Ref)
Registry numbers for the 10,000 most common substances

SciFinder Scholar (Client access program must be installed)
First icon on main menu, "Chemical Substances or Reactions". The master file of all 65 million plus registry numbers, searchable by common/trade name or molecular formula (not unique).

Analytical Chemistry *[QD 71-142]*
determination of the presence of a particular compound (qualitative analysis) or the presence and quantity of a particular compound (quantitative analysis). Includes separation techniques such as chromatography and spectroscopy/spectrometry techniques like IR and NMR.

Encyclopedia of Analytical Chemistry (QD71.5 Ref)
Extensive review chapters. Vol. 1-10 by type of substance (i.e. pesticides) and Vol. 11-15 by analytical technique (such as NMR)

Chemical Engineering/Industrial Chemistry/Chemical Technology *[TP]*
large scale or commercial production of chemicals. Mostly LC Class TP.

Kirk-Othmer Encyclopedia of Chemical Technology. (TP9 .K54 2004)
The classic, better U.S. coverage.

Ullmann's Encyclopedia of Industrial Chemistry
http://ublib.buffalo.edu/libraries/units/sel/e-resources/ullmanns.html
Older edition in print: TP9 .U57 1985
Better worldwide coverage.

Electrochemistry *[QD551-571, QD261, TP250-261, QD273]*
chemical reactions/transformations caused by electrical energy.

Encyclopedia of Electrochemistry (QD552.5 .E53 2001 Ref)

German, as in “Eeek! it is in …”

Patterson's German-English Dictionary for Chemists (QD5 .P3 1992 Ref)
THE place to go for translating Beilstein, Gmelin, Landolt-Bornstein, and old journal articles and abbreviations.

Industrial Chemistry *[TP]*

See **Chemical Engineering/Industrial Chemistry/Chemical Technology**

Inorganic Chemistry *[QD 146-197]*

usually compounds with 0-1 carbon (C), often containing metal atoms.

Comprehensive inorganic chemistry (QD151.2 .C62)
Arranged by key element, well indexed, logically arranged.

Encyclopedia of Chemical Reactions (QD155.J3 Ref)
Cites classic, basic inorganic and organometallic reactions.

Dictionary of Inorganic Compounds (QD148 .D53 1992)
Brief, but informative entries with key references.

Journal Abbreviations

Chemical Abstracts Service Source Index [CASSI]
(Z5523 .C436a Ref or CD-ROM Z5523 .C436)
Arranged by abbreviation. Terrific title histories and cross references. All science, not just chemical, journals.

Patterson's German-English Dictionary for Chemists (QD5 .P3 1992 Ref)
Mystified by a one letter journal abbreviation like ‘B.’? Try here.

Medicinal Chemistry/Pharmaceuticals *[QV & RS]*

much of this material is at HSL under QV. SEL often uses the RS class.

Merck Index (RS356.M524 Ref)
Concise, information rich overview of laboratory chemicals, drugs, and biologicals.

Burger's Medicinal Chemistry and Drug Discovery
http://ublib.buffalo.edu/libraries/e-resources/bmcdd.html
6-volume online reference work

Natural Products Chemistry *[QD416-436]*

organic compounds, often complex, synthesized and used by living organisms in biological processes. Many can be used as drugs, pesticides, enzymes, etc.

Comprehensive Natural Products Chemistry (QD415.C63 1999 Ref)
Extensive review chapters organized by major classes.

Odd stuff (like canary seed or neatsfoot oil)

Materials Handbook (TA403.B75)
Everything from *A-286 superalloy* to *Zytel 6/6* – alloys, natural products, chemicals, textiles, wood, herbs, you name it.

Organic Chemistry *[QD 241-441]*

the chemistry of life. Compounds with a) carbon (C) and hydrogen (H) or b) more than one carbon are nearly always organic.

Encyclopedia of reagents for organic synthesis (QD77 .E53 1995)
Reagents help make a reaction happen by providing key functional groups or lower energy pathways.

March's Advanced Organic Chemistry (QD251.2M37 2001 Ref)
First place to go for background. Includes appendix on searching chemical literature.

Organometallic Chemistry/Coordination Compounds/Metal Complexes *[QD410-412]*

each term nearly synonymous, compounds with one or more metal atom and an organic component.

Dictionary of Organometallic Compounds (QD411 .D53 1995)
Arranged by the metal element, i.e. all organotitanium compounds in one place. Name, molecular formula, and CAS registry number indexes.

Comprehensive Coordination Chemistry I & II (QD474 .C65 1987 & 2004)
The 'II' set is an update, not a replacement for the 'I' set.

Physical Chemistry/Chemical Physics *[QC & QD 450-801]*

concepts and law of physics used to describe chemical processes. Tends to be theoretical and mathematical, discussing processes and reactions at an atomic or even quantum (sub-atomic) level.

Encyclopedia of chemical physics and physical chemistry (QD451 .E539 2001)

Physical properties of specific compounds *[Scattered all over QC, QD & T's]*

[See also: **Terminology/Unit Conversions**]

NIST Chemistry WebBook (http://webbook.nist.gov/chemistry/)
Most extensive physical property/spectra site on free Web. Infra-red spectroscopy (IR), mass spectrometry (MS), and Ultra-violet/visible [light] (UV/VIS) only.

CRC Handbook of Chemistry and Physics (QD65 .C4 Ref)
(http://libweb.lib.buffalo.edu/sel/searchSelMaterials.html)

Knovel E-books: Science and Technology
(http://ublib.buffalo.edu/libraries/e-resources/knovel.html)
Online collection of over 450 science and engineering reference books.

UB Materials Properties Locator Database
(http://libweb.lib.buffalo.edu/sel/searchSelMaterials.html)
Home grown search of individual print reference books by type of property or type of substance.

If feeling a bit brave:
Comprehensive Index 1996: Landolt-Bornstein Numerical Data (QC61.L332 Index Ref)
Easy access to the finest print compilation of physical, chemical, atomic, and earth/space data available on the reference shelves. Look for "Comprehensive Index 1996" on spine.

A couple of terminology hints:

1) Heat of… and Enthalpy of… are synonymous.

2) Specific …, e.g. specific gravity, is comparative (ratio) measurement of a compound to a standard material, often water. By definition, the specific gravity (density) of water is set to 1. Compounds with higher densities than water have a specific gravity proportionally greater than 1. "Specific" properties have no units because they are a ratio, i.e. the units divide out.]

Spectra of specific compounds *[Scattered all over QC & QD]*

[For general discussion on analyzing classes of compounds or specific techniques, see **Analytical Chemistry**.]

A beam of energy/radiation is directed at a substance. The absorption, transmission, or transformation of that energy is measured producing a table or a graph known as a spectra.

NIST Chemistry WebBook (http://webbook.nist.gov/chemistry/)
Most extensive physical property/spectra site on free Web

Spectra of specific compounds (cont.) *[Scattered all over QC & QD]*

*Sadtler standard spectra (*QC453 .S28 Ref)
Check alphabetical name or molecular formula master indexes at the very end of the run. Old, but very extensive. Two type of infra-red (prism and grating IR), nuclear magnetic resonance (NMR), and mass spectrometry (MS).

UB Spectra Subject Guide (http://ublib.buffalo.edu/libraries/asl/guides/spectra.html)
Lists many sets of spectra on the reference shelves plus prime web sites by technique (NMR, IR, X-ray, etc.)

Terminology/Unit Conversions & Definitions

McGraw-Hill Dictionary of Scientific and Technical Terms (Q123 .M15 2003 Ref)
Brief entries, but comprehensive.

Scientific Unit Conversion (QC94.C295 1997 Ref)
Includes definition, symbol, and what it measures (volume, pressure, force, etc.). Includes ancient units such as the Egyptian thebs.

Dictionary of Scientific Units (QC82.J4 1992 Ref)
Clear, but detailed and technical, definitions.

OnlineConversion.com (http://www.onlineconversion.com/)
Over 5,000 units covered.

Trade Names *[TP]*

Gardner's Chemical Synonyms and Trade Names (TP9.G286 Ref)

SciFinder Scholar (Client access program must be installed)
First icon on main menu, "Chemical Substances or Reactions". The master file of all 65 million+ substances.

July 2004
URL: http://ublib.buffalo.edu/libraries/asl/staff/documents/chemistry-ref-primer.pdf