The first phase of a project to design a prompting system to help semi-experienced end users to search Chemical Abstracts online, this study focused on the differences and similarities in the search approaches used by experienced users and those with less expertise. Four online searches on topics solicited from chemistry professors in small colleges—the target group for the prompting system—were conducted by each of the 12 participants, who were divided into three groups on the basis of their prior experience. Each participant received a packet of materials introducing the project, searching, and search aids, and SDC's chemistry manual, and a slide/tape presentation was shown at the time of the test. It was found that, for novice searchers, problems in interacting with the computer overshadowed all other concerns; semi-experienced searchers relied heavily on natural language searching; and experienced searchers focused on exploiting the structure of Chemical Abstracts within the capabilities of ORBIT. Problems with the search requests are discussed, as well as searching constraints and items peculiar to each searcher. Appendices include the pre-test handouts and narration for the slide/tape presentation, background on the searchers, search forms and search requests, online interaction, and searchers' comments. (RBF)
MEASUREMENT AND IMPROVEMENT OF SUBJECT SPECIALISTS PERFORMANCE SEARCHING CHEMICAL ABSTRACTS ONLINE AS AVAILABLE ON SDC SEARCH SYSTEM

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PHASE I

TESTING ONLINE SYSTEM USE

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As a result of an earlier study (NSF SIS75-12748), Dr. R.F. Copeland came to the conclusion that it was more cost-effective to access the literature of Chemical Abstracts via an online system instead of subscribing to the printed version. Six chemistry professors in six small private colleges in Florida found that they could meet virtually all of their needs for Chemical Abstracts with approximately $504,00 a year of online time while the printed version cost $3,700.00 a year (at the time of the study). It was also not merely a question of replacing the printed CA with the online version — most of the schools participating in this study had cancelled their subscription to CA many years earlier. The online option meant access to the literature not previously available locally.

However, using the online system created a new set of problems. One was obviously document delivery (discussed in the report). Another was the fact that all of the people participating in the previous study were full-time college professors. Dr. Copeland's next concern centered around how to get quality search results with a limited amount of search experience or time for proper training and keeping abreast of system changes. Even when search costs were covered by the grant, the amount of searching done was barely sufficient to maintain search expertise. It was decided to embark on a project aimed at designing a prompting system to help the semi-experienced end user (and subject specialist in this case, chemistry college professors) search Chemical Abstracts online. SDC, the most favored system in the earlier study, was chosen as the vendor system for the project.

The first phase of the study focused on trying to determine what distinguished an experienced searcher from a semi-experienced searcher as a basis for deciding what types of prompts might help semi-experienced searchers
become more proficient. An assumption was made that experienced searchers were also better at exploiting system capabilities. Novices were also tested to see what similarities and differences occurred between them and the two other groups but the focus of interest was on the experienced and semi-experienced searchers. The word novice was interpreted to mean literally no previous online experience. It was felt that one quickly left the novice category and therefore any prompting geared toward their needs would rapidly outlive its usefulness. Semi-experienced was defined as the basic ability to get on and off the system and perform a literature search online on one's own.

Twelve persons were tested on four searches. We were aware that twelve was hardly a representative sample but it was better than operating on our own assumptions of how people search. The problem of finding four experienced and four semi-experienced searchers with the background we were looking for within a reasonable radius of Daytona Beach (information capital of the world!) was a major reason for the sample size. Even as it was, we did go out of the state for some of the experienced level participants. We decided twelve additional opinions about searching, SDC, Chemical Abstracts, and prompting systems would give us that much more insight into how to proceed with the second phase of the project, designing the actual prompting system. The number of variables became so prohibitive that one can hardly call the results scientific but they have indeed provided us with insights into not only search behavior, but also the whole topic of testing system use. This report will discuss both of these issues at length.

The issue of system use and misuse is only in its infancy. When it became apparent early in the study that the "test" would be variable-ridden, it was decided to go ahead anyway and try to gather as much information as possible with more of a case study rather than statistical approach.
The goal of trying to decide what in the way of prompting might help a searcher perform a better search proved to be a most useful practical guideline. Deciding empirically what constitutes a good search or a good searcher is a slippery type of evaluation to make; however, trying to determine what aids might help someone search more effectively seemed to limit this rather large topic to a more manageable problem-solving scale. That is, in a study already missing many control features, the practical concern with what constitutes a search aid provided some grounding that the question what constitutes a good search or searcher would not have given us.

Precision and recall was to be used as the measurement for evaluating the results. However, it became quite evident as the test progressed that this would be a meaningless method of evaluation. This will be discussed again later in the report.

PHASE I

Our participants were to conduct four online searches, hopefully in one sitting. More than three hours was considered to be an imposition on the time of the test participants. Also, it would have been difficult to arrange to do it in small segments since some of the testees were at considerable geographic distances. A member of the project was present during the testing to set things up, answer questions, and note comments participants made about searching, search systems, or Chemical Abstracts. This resulted in observations that would have been quite difficult to gather any other way.

THE SEARCH REQUESTS

We felt that we should solicit real search requests from chemistry professors at small colleges throughout the State of Florida. These were, after all, the people we were interested in designing the prompting system for, so their information needs should be appropriate test searches.
Approximately 150 search requests were sent out to chemistry faculty and college chemistry departments in the state. The University of Florida and Florida State University were excluded as not being representative. Very few search requests were returned. Five eventually trickled in. We solicited a few more locally. This still did not give us much to choose from. Two of the requestors said they would also be willing to participate in the study. We were curious about what differences might show up if they were to run their own searches (Novice J initiated search #2, Semi-experienced Searcher E initiated Search #3). Four of the other searches seemed "reasonable". Two of these were chosen on the basis of clarity of writing and subject content to balance out the others. The choice was still somewhat arbitrary.

There were two major disadvantages with the solicited search requests. The first was that they did not necessarily elicit or suggest techniques or features of searching, ORBIT, or Chemical Abstracts database that one might like to test. They didn't have much "resonance". A "realistic" search request does not necessarily require a wide variety of system features. One might then conclude that perhaps we don't need a wide variety of system features for the majority of our searches. While this may be true, that could constitute another study in which search requests are collected and analyzed. Our meager six hardly constitute a sufficient pool. We would have preferred searches that strongly favored the use of standard abbreviations, for instance, and then we could see how many searchers used these—or, a search that suggested searching by section number as a good approach so we could see who thought of this. Neither of these are particularly intricate or sophisticated techniques but we were curious about how many people might have used them when appropriate.

Even as it was, our search requests were a bit odd. Someone from Chemical Abstracts Service mentioned that Search #1 and Search #3 represented exceptions.
in Chemical Abstracts indexing policy. In fact, several of the experienced searchers complained that CAS was not consistent in their indexing and that there were too many exceptions that only the people at Chemical Abstracts Service were aware of. Certainly this is an important issue to raise: are Chemical Abstract's indexing policies and practices appropriate to the user's needs. Once again however, this issue needs to be addressed in a more sophisticated study.

The two search requests written by test participants also proved to be unique in their own ways. No one found much if anything on Search #2. Search #3 proved to be so broad that one searcher would have given close to 1000 citations to fulfill the request and another refused to search it at all. This search raised a considerable number of subjective issues and certainly didn't enhance the value of precision and recall as an evaluative measure.

This leads into the second major problem with solicited search requests. Virtually everyone wanted to talk more to the requestors about their topics. I asked participants to try as much as possible to run the searches as they would "normally." Many said that they would not "normally" perform these searches without talking more to the requestors. Even under the testing conditions where they tried to proceed anyway many sooner or later said, "I just cannot go further without talking to the requestor."

If we had used prepared searches we could have tried to avoid this lack of clarity and ambiguity in the requests and concentrated on less subjective problems. It is doubtful however that even with planned searches the subjective element would have disappeared. In fact, there might have been more to compare if the issue of interpretation had been on a more refined level. In our study, counseling became more of an issue than system design. We will discuss the relationship between counseling the patron and search strategy in greater depth when we get to the sections on individual searchers and groups of searchers.
PREPARATION FOR THE TEST

Prior to testing we tried to come up with some hypotheses about problems users might have searching online. The more we looked at the structure of Chemical Abstracts, the more we came to the conclusion that it was a well designed tool. The indexes, appendices, teaching guides are of high quality. However, the more we studied them, the more we began to wonder if they were used the way they were designed to be used. Despite her background as a librarian in evaluating reference tools, our information scientist who had no background in chemistry was aware of the time it had taken her to even with familiarize herself with the structure of the excellent workbooks and the help from the people in user education at Chemical Abstracts Service. Instead of trying to think of ways to "improve" CA, we began to think more in terms of testing for proper use or possible misuse of a sophisticated retrieval tool. The structure of Chemical Abstracts and proper vocabulary development did seem a more formidable obstacle than the command structure of ORBIT. In both cases, the big question seemed to be: Are these systems being used the way they were designed to be used?

We tried to think of ways we could improve SDC's ORBIT with a prompting system. However, we felt the mechanics of the search system would be difficult to improve upon in any significant way with our minicomputer. While we could remind the searcher of correct form, we came to the conclusion that this could probably be done just as effectively with a cue card by the side of the terminal. Putting it online would just be a more expensive way of doing this and not necessarily any improvement in format.

We must also admit to ourselves that these systems are going to be used with or without proper training and that the end user may be completely unaware of his/her "misuse". If one uses the incorrect command, the system will either not respond or tell you you've erred. However, if you have not fully exploited
the structure of Chemical Abstracts—or developed proper pre-search habits, you may walk away with seven articles, thinking that is "everything" on the topic, when there are 700. In fact, many searchers face this education problem daily with their patrons but how many who actually use these systems also share that misconception because they aren't familiar with the database they are searching?

I have gone into this discussion of concern with proper system use because it became one of the underpinnings of the first phase. The decision was made to do as much as possible within the constraints of the test to assist optimum use of the system. Instead of testing to see if people were aware of search aids, anything that could help them search was made readily available. While the experienced and semi-experienced searchers were not told how to search, major currently available resources were provided. We felt we could afford to find out if there would be any use for our prompting system, even under the best of conditions (i.e. offline aids). The information scientist also assisted whenever it was requested and made notes about the type of assistance needed.

PRIOR TO TESTING

Everyone who participated was sent a packet of material prior to the tester's arrival. This included a handout that introduced the project, searching, and search aids (Appendix A) and SDC's Chemistry manual. When she arrived, the participant was also shown an AV slide tape presentation (Appendix B).

The handouts and the AV were considered a part of the test. Material was kept to a minimum to give added emphasis to what was covered. Our handout included the absolute basics of searching but the main focus was on aids to vocabulary development. We wanted to make sure participants were aware of what was available to help them search (see earlier discussion) so all major aids from the Index Guide to the CHEMDEX file online were mentioned (CA would probably object to the absence of the Subject Coverage Manual). The SDC Chemistry hand-
out was included for two reasons. One was because it was full of examples of what the online text would look like. The other was that SDC had reprinted all of the major CA appendices that could aid the online searcher in the back of the manual, such as the list of standard abbreviations. We wanted to make sure these tables would be readily available to see if they would be used. One major flaw in our introduction and in SDC's manual was that neither possessed an index. In fact, one of the experienced searchers actually made a rough index to the SDC manual which he said he would give to us only if we informed them that he was startled they had produced such a guide without one. Another change we would have made in the introductory handout for this project is that we would have made it more eye-catching, possibly have it printed up with color illustrations so it would be more "enticing" to read.

The AV (Appendix B) was designed for the novice. We were aware at the time that there seemed to be too much to cover to bring them up to a test-able level, but again we tried to keep the material to a minimum. It covers the basics of how the search system works, what the pre-search setting and a search look like. We introduced the terminal and followed a search through pre-search activity and what actually happens online. It was our hope that the AV would at least reinforce the handout in a flashy way and give the novice a rough idea of the process so they would at least feel psychologically prepared for the test. However, we must admit that no participants were particularly "computer shy." Maybe the AV helped or maybe this just wasn't a problem. The AV could have easily been broken down into two; one on the pre-search preparation, and another actually following a search through. However, we were supposedly testing and not training so we wanted to keep introductory efforts to a goal-oriented minimum.

At the time we designed these pre-test aids we felt they would be studied
closely and we would be able to draw all kinds of conclusions from their application. That is, we could expect all test participants to have absorbed the points covered and would be able to study their use. At the same time we did not require this type of familiarity. The handouts were sent in advance with thanks for participating in the study. When the tester got on location we set up the AV. We did not demand that we study what use was made of available resources, not how to manipulate people into using them. However, the results were somewhat discouraging. In the majority of semi-experienced and novice cases the handout was not read prior to testing. At this time the novices read or glanced over it (most tried to absorb as much as possible from it, some novices did genuinely study the handout but it was not a sufficient introduction without some experience online). But the semi-experienced class, with whom we were most concerned, paid little attention to the handouts.

The AV was designed for novices but it covered too much material for them to absorb. Several of the semi-experienced searchers picked up a few tips from it (one had not known that "$" would permit one to start a line over, some adopted a form for laying out vocabulary that was suggestive of the style in the AV, etc.). The group that paid the most attention to the handout and the AV was the experienced group who didn’t need the introduction. I believe this was because they are all interested in training and were curious about our work as colleagues with similar problems.

From the standpoint of the test, this only emphasized the lack of awareness about search aids. Only one person from the semi-experienced and novice groups combined knew the difference between the Index Guide and the General Subject Headings and he was dropped from the experienced searcher category: Searcher G. The others, chemistry college professors, were not aware of the difference, nor were they aware of having made use of them previously. In
fact, the only offline aid used by the other semi-experienced searchers prior to this test was the keyword frequency list on microfiche. There is a reason why they were all familiar with this but we prefer not to explain to preserve anonymity. Suffice it to say that we doubt this is representative of widespread familiarity with that search aid. We suspect Chemical Abstracts Service might be alarmed to find out the statistics on how many chemistry college professors are not aware of the function and use of the Index Guide and the difference between this and the General Subject Headings. Also, seeming verbal awareness does not necessarily reflect practical application awareness. While we have no suggestions for how to remedy this situation past massive bibliographic instruction, we do feel that an awareness that their users don't even understand the basics of their tools can affect other decisions to not unduly refine their system when only a small percentage of their clientele will appreciate the subtleties and to all others the information will be lost.

It is important to note here that we found the people we have dealt with at CAS to be very concerned with the proper use of CA. They seem to take very seriously their responsibility to help their clientele get access to the information they need. The tendency to assume our patrons and users know more than they do is probably fairly widespread in the information community which is part of the reason we sometimes have a difficult time helping the user while we continue to design systems for our own kind who will understand the complexities and challenges of organizing information.

Perhaps it is possible to get the information one needs out of the system without a proper understanding of how the system was designed to be used. Since one can assume that virtually all semi-experienced searchers and novices conducted these searches without much understanding of the search aids available to them, one should also be able to evaluate whether this made any difference in their ability to perform successful searches.
THE TESTING SITUATION

The testees were most agreeable about participating. No one turned us down. This is perhaps surprising since the test did take several hours minimum. We tried to be as accommodating as possible which meant that we went to visit them-terminal, AV equipment, and search aids-in hand. It was a bit much to ask them to conduct four searches in one sitting and each was asked to do as best as possible under the circumstances. It was agreed that we could hardly expect polished results. It would be basically "improvised" searching.

Certainly it was more impression gathering on how to conduct a test than an actual test. In all fairness to the participants it is important to emphasize that the searches were conducted as close to normal as possible under rather unusual and hasty circumstances and the test participants did their best "off the cuff." This seemed to be the way the semi-experienced searchers operated anyway. They viewed it as a chance to brush up and play around online. We encouraged this because we thought that was as good a way as any to find out how they used the system. The experienced searchers would hardly consider this test representative of their work. However, it does indicate their basic approaches and attitudes and their ability to manipulate the system under these circumstances.

We first discussed the project, saw the AV, then they were given the searches. Though the initial proposal called for doing the searches in a specific order and varying this for participants, the time factor was so limiting that the order of the searches became less important than getting the topics searched. The searchers preferred to pick their own order. However, everyone chose either Search #1 or #4 to begin.

Background information was collected on each searcher (Appendix C). This was usually collected after the test because the final question had to do with what they like to see on a prompting system or features they would like to see
incorporated into Chemical Abstracts. We told them it was their "wish list." By the end of the test we felt any problems, complaints, or concerns would be fresh in their minds. We had to disguise some of this background information to preserve anonymity but we will try to bring as much of it to bear on the discussion of their individual approaches to searching as we can.

We also saved all scraps of paper, the "official doodles," as we like to call them, that were used by the searchers to construct their strategies and vocabulary. Though they are interesting, we're not sure what to do with them. Many of them would not copy well and some would be impossible to transcribe. Suffice it to say that we have them and will make them available to anyone who wants to see them. Otherwise we will try to describe them in the discussion of each searcher. They range from three words to profoundly copious notes. But almost all of them have one thing in common: they were used for vocabulary development and almost never for strategy development unless that was inherent in the vocabulary "groupings".

Finally, should anyone be interested, the searchers were tested in the order listed in the appendices within their group. That is, I may have tested Novice J first, but among experienced searchers, A was tested first and D last. The order was mixed up between the three classes depending on when we could schedule them, but it was J, E, A, B, C, G, H, D, K, M for anyone who cares to trace it this way. The next part of the report will be a discussion of the actual searching. It will consist of three parts: a section on the searching in general, a section on the searching of each group: experienced, semi-experienced, and novice, and finally a discussion of items peculiar to each searcher.

**SEARCHING IN GENERAL**

There were several constraints placed on the searching. One was that all four searches were done without any prior knowledge of the topics to be covered so no advance preparation could be done. One reason for this was be-
cause the searchers had varying resources available but the most important reason was because we wanted a project person to be present for their comments as they evaluated the searches and to take notes on what was done in preparation for the searches.

A second constraint was that the searches were all to be performed on CAS7276 and CHEMDEX files on SDC. When searchers mentioned that they felt another file would be more appropriate, the tester made note of it. We did not include logging on or off as part of the test because we decided it is pretty obvious when you don't log on and incentive for correcting your behavior is fairly strong.

Another constraint was the inability to talk to the requestor. We had made no provisions for this. Our information scientist, who was present for all of the tests, lacked background in chemistry so she could not "read into" the search requests for them. This helped lessen the temptation to assist them.

Another constraint was that those who had additional resources, with the exception of search aids, were not permitted to use them. Searcher B said he had a copy of one of the articles and would have looked it up manually to get a better feel for the topic (see notes, Appendix F): I might add here that there were some logistics problems with Searcher G and we were forced to end the session after he had the search requests but before he had run them online. I asked him to be sure to note anything he used to help him prepare the searches. During the later discussion he said he had looked up one of the articles. Since there were some major problems with his approach to searching in general, this did not seem to be a major influence on the results.

Probably the largest single variable affecting search results was our decision to tell searchers to "Do it as you would normally." Or at least as close as possible to "normal" as the test would permit. We wanted to encourage
searchers to use their own judgment. But "normally" not only includes personal judgment, it includes the institutional background of each searcher. This was especially true of the experienced searchers. Semi-experienced and novices were virtually all from the same background. We had thought that the emphasis on "normal" behavior would give us more honest results but that also meant considerably different levels of interpretation of what the patron really needed in the way of assistance with a search problem. We will discuss this in greater detail in the next section.

Before we move on to specific observations, we want to call attention to Appendix E. This appendix consists of what was actually typed in to the terminal by the searchers and the comments they made about searching. We have taken some liberties with the SDC responses but we're sure those of you who are familiar with SDC will be able to recognize the basics. This was done to keep the length of this appendix to a minimum. This appendix and the notes that go with it are actually the heart of this report. It is the reference for our comments on searching. For instance, it is obvious that if the results of three experienced archers' can fit on one page and the next semi-experienced searcher's results take two, then the experienced searchers use a certain economy of construction.

Our apologies if reading through the appendix constitutes the "drudgery and disappointment" of readership. We view this report as a way of making the record available. We are sceptical of the validity of quantifying what was done though we will try to draw it together for shorter articles that cannot contain the actual record. The liberties we (meaning us and the participants) took with this test to complete it, make us acutely aware of how subjective the results are.

This report includes fairly complete notes from the conversations the tester had with each searcher during the test (Appendix F). We have grouped them in this appendix because we thought this would facilitate the "case study" approach. It includes general and specific comments. The specific comments refer to comments
made during the actual online searching session. These have been marked in the earlier Appendix E. Reading them will call for some flipping back and forth between sections but we decided it would be easier to review the searches if we separated what the machine said from what the person said. We hope this is not too confusing.

These comments made while searching are one of the most interesting parts of the study. We had done nothing to insure that the same topics would be discussed by each searcher. This was because at the beginning of the study we had no idea of what to anticipate in the way of comments and observations. However, if we were to use this study for further research along these lines, it would include reviewing the list of the topics that were raised on this project. This list could then be used as a framework for discussion so some generalizations could be made about searcher's attitudes and approaches to online searching.

Arranging the comments into categories that reflect aspects of searching to be evaluated in a testing situation results in the following breakdown:

**OUTLINE OF TOPICS COVERED VERBALLY DURING TEST**

1. **An evaluation of search aids.** The searcher's use and opinion of the following:
   a) Index Guide
   b) General Subject Headings
   c) Subject Coverage Manual
   d) Word Frequency List
   e) Chemdex File Online
   f) SDC's Chemistry Manual
   g) Other

2. **Opinion of Chemical Abstracts indexing policies.**

3. **House aids.** That is, anything the searcher made himself to assist searching Chemical Abstracts or ORBIT.

4. **Analysis of the topic:**
   a) need for further clarification.
   b) usual way of preparing these topics for searching.
   c) possible use of non-online related reference works, articles, etc.
   d) other databases one would search and why.

5. **Search style:**
   a) relative use of controlled vocabulary vs. natural language - that is,
These all contribute to his approach. Has the searcher chosen a certain approach, or is there a lack of awareness of the options open to him? Is it his style or his lack of training and system familiarity that accounts for his preferences? Before we think of designing systems that will be more suited to the user's needs, we would have to determine what accounts for his present practices.

The concern over the issues outlined earlier varied from group to group. Since this was what we were initially interested in determining, these group variations are worth noting. We will discuss the major issues in the order of novice, semi-experienced, and experienced searchers since that seems to represent a natural progression in the learning process.

**NOVICES**

Not only was it difficult to try to cover all of the basics a novice should be aware of in the AV and written handout, but it was also too much material. We tried to just sit them down at the terminal and say "go to." This was followed by a blank stare. We don't think the motivation accompanying participation in this test was high enough for the novices to learn the system themselves. Also, the time limitations of the test made this impossible. Faced with early failure in the novice category, we decided it would be better to do some training and see how they responded than to give up completely.

After reviewing the handout and AV, and discussing issues like vocabulary development, all novices ran a quick preliminary search under the tester's guidance on a topic of their choice. This was done prior to handling the search requests so they would have some idea of what to do with the requests. This preliminary search was not planned for in the project but it became the quickest way to explain how the system worked, boolean operators, postings, etc.

Once the search proper began, we prompted whenever things came to a standstill to get them going again. Actually, the tester could have abandoned testing complete novices with a clear conscience. The only thing she felt she
was testing was how quickly they could absorb her perspective on searching. However, by the time the "test" was over, she felt they were as capable of handling searches on their own as the semi-experienced searchers.

There was, of course, difficulty with commands. There was also a lack of understanding of what postings were and how to use that information. It is obvious that at the beginning level these problems of how to interact with ORBIT overshadow all other concerns. However, they did accept and apply the emphasis on proper vocabulary development more readily than the semi-experienced searchers who felt they already knew what they were doing. As a result, some of the novices used more synonyms, although there was still a tendency to not anticipate variant word endings.

The major points emphasized with novices were:

1. the difference between controlled vocabulary and free text.
2. thinking of as many different words as possible to describe the same concept.
3. searching most specific concept first but not narrowing too early.
4. boolean operators.

After these points were covered, we could proceed on a question and answer basis.

As with the semi-experienced group, they assumed we could give them no help with the search request. The first time this happened the tester was quite surprised. It seemed that they felt chemistry was their field and that she couldn't possible provide them with any insight into how to interpret or break down the search request into concepts or vocabulary elements. While we preferred to not do this, it was interesting that both novice and semi-experienced searchers felt their knowledge of chemistry also extended to their ability to manipulate chemical information. (For instance, one tried to find the registry number for hydrogen bond and did not think to ask the tester why it wasn't listed).

To recapitulate: testing the novices proved to be too much of a training situation. Perhaps the most valuable observation gathered was that absorbing a few principles of searching can positively affect the quality of search results more than an emphasis on commands, that one cannot fall back on what the person
already should know about Chemical Abstracts but rather one has to introduce
the tool anew from an online perspective, and that training goes quicker if
discussion is interspersed with hands-on experience as early as possible,
rather than waiting until the entire process of searching is explained.
However, it is our understanding that these principles are well understood
by those who train and that was not to be the purpose of this study.

Their major concern was, understandably, with commands. While we hoped
we could possibly bring them up to a level where their observations would be
comparable with the other two groups, we decided they absorbed too much of
the tester's perspective in the process.

SEMI-EXPERIENCED SEARCHERS

The semi-experienced searchers were more comfortable with commands but
limited themselves to a working group. They were often unaware of even some
of the less sophisticated system features. For instance, one said he'd only
recently learned about the NEIGHBOR command, another mentioned that a $ sign
(allowing one to redo an entire line) was new to him. Also, they never seemed
to use the hash (#) mark for single letter truncation. It would have been
interesting to review the list of commands with them to find out more system-
atically which they were familiar with. We had assumed initially that they would
know of them but perhaps not use them. However, they not only just preferred a
few, they often weren't even familiar with all of them.

As an interesting sidelight, we did consistently introduce the HISTORY
command to semi-experienced and novice searchers. With the exception of one,
they seemed to find this quite useful. One preferred his old habit of reeling
in the paper to see what he had done. While the others quickly absorbed the
HISTORY command into their repertoire, they had not used it before. However,
this command seems especially well suited for the semi-experienced searchers
who often did not have tight, well constructed strategies and would therefore
often forget what they had already entered.
The use of truncation was not consistent. They often seemed to not anticipate possible variations in word endings. This was distinctly different from the experienced searchers who seemed to consider this for every word they might use. Also, the experienced searchers would use hash marks when they knew they would only be interested in one word and its plural. Hash marks were never used by semi-experienced searchers.

It also seemed that semi-experienced searchers consistently needed help with how to search an author and sometimes with print options. The problem of author searching was mostly a matter of form and of reminding them to not limit it, that is, to use a first name initial followed by the truncation symbol rather than a period or the whole name. Print options did not seem to be thought out in terms of objectives at that particular point in the search. That is, there seemed to be no preference for PRINT TRAIL or PRINT, and PRINT FULL was avoided after it was obvious it took too long. In other words, the main reason for printing citations online was to check if the topic was appropriate rather than for systematic restructuring of vocabulary development. Experienced searchers usually did this by just having the title, or title and author, printed out but that option did not occur to semi-experienced searchers who would have probably been satisfied with seeing that much of the record in most cases.

None of the semi-experienced searchers ever used section numbers. Even if the searches had been more conducive to this, we don't think is is an option that would have been pursued without prompting. It is our suspicion that this is more of an education problem than that the approach is not useful. Most of them did not know how to search by section number. However, we are not sure if it would be used since the semi-experienced searchers relied heavily on free text, natural language searching. Also, standard abbreviations were never used. Again, we suspect this is lack of knowledge of them rather than preference.
The reliance on natural language searching was "all-pervasive" among the semi-experienced searchers. This was the most pronounced characteristic of their searching. We were aware of this before we began testing them. We emphasized the discussion of controlled vocabulary vs. free text because we wanted to see what use would be made of the tools available. This meant that we waited for them to use the tools but when this was not forthcoming we made a mental note that the searcher would have proceeded with virtually no use of offline aids. We then discussed the offline aids. This generated perhaps mild curiosity. (At this point, the novices tended to respond more - actually trying to use the Index Guide). It seemed that while the discussion was interesting and perhaps new to them, we had also emphasized that they could take any approach to searching that they preferred. They generally proceeded with the free text, natural language approach that they were most familiar with.

Perhaps the one exception was regarding the registry numbers. Most preferred to try to search using these. Since the CHEMDEX file was relatively new, it is also understandable that this approach was new to the searchers and required some assistance. The tendency of these searchers appeared to be that they would try searching by registry number when possible. It seemed apparent that despite their background in chemistry, they might need more assistance understanding the CHEMDEX file, a better understanding of what substances are likely to have a registry number, and how to search for them.

So if one can say that the novices were primarily absorbed in stumbling through the commands, system mechanics, and basic approach to searching using postings as a guide, the semi-experienced searcher was characterized by acute dependence on natural language searching, lack of extensive vocabulary development, lack of awareness of how to effectively use search aids in general. They used the system but they did not exploit its capabilities. This resulted in a hit and miss approach to searching. Because vocabulary was not well developed,
the searcher would encounter repeated dead ends. It appears (see Appendix E),
that this often resulted from prematurely narrowing a search either by not
using enough terms for a concept or combining concepts that were already quite
specific. Perhaps this also indicates a lack of attention to postings as a
search guide. We all know they are the only clue the system gives us of how
we are doing or our probability of success with a given approach but to date
this aspect of searching has some of the characteristics of reading tea leaves.

The art of reading postings (à la Mark Twain reading the currents of
the Mississippi River) has not been given serious attention in training. It is
possible that probability guidelines could be established to give the novice and
semi-experienced searcher some clue regarding how to make effective use of
postings at various stages of search development.

EXPERIENCED SEARCHERS

Experienced searchers did not have problems manipulating the command structure
of ORBIT. Either they were aware of the specific commands, or they knew what
they should be able to do and had cue cards or notes to remind them of the proper
ORBIT form.

Knowledge and use of offline aids was extensive. In fact, one of the major
differences between the experienced searchers and the others was that the online
system was peripheral to the question of how to effectively meet the requestor's
needs. The structure of Chemical Abstracts, the possibility of exploiting this
structure within the capabilities of ORBIT were the primary issues. This focus
on the structure of CA accounts for the heavy use of offline aids since one gets
virtually no assistance online with this. This was also the central concern of
their "wish list" answers on the questionnaire - more help manipulating CA in
an online mode. They were not only aware of what they were retrieving from the
system, but they also seemed capable of evaluating what they suspected they
weren't retrieving from the system.

This leads into the issue of defining the parton's information needs.
The greatest differences amongst searchers of any one group appeared in the experienced group. This was due largely to their interpretation of how to counsel the patron in their information needs and the searcher's institutional background. In one case, Searcher D, it was also due to system capabilities. Our desire to encourage searchers to "do it as you would normally" resulted in incomparable variety. It is probable that a hypothetical search situation (in addition to structured search requests) would have been a better way to structure the test. However, the differences that the effect of institutional background and usual attitudes about the role of an online search in aiding a patron had on their search style and results just points very strongly to a subjective element in searching.

Let us review this case by case.

Experienced Searcher A works for the government. After reviewing the requests he decided this was definitely "exploratory" searching. Were he to be doing these searches for his organization he would make a quick search to help define the topic further. In short, the search was a "sketch" of the topic as available online. A more comprehensive search would be the second step.

The same was basically true for Searcher B although the fact that he works in an academic setting added some additional elements to his counseling technique. The first was extreme money consciousness. Even under test conditions, time spent online was viewed as most precious. His standard way of proceeding is to do as much as possible to prepare a search and counsel a patron at minimum expense. This might mean no online search until the topic was further clarified so the patron would not be out of money with no results. The second distinctive element is how much emphasis this searcher places on counseling the patron. He seems acutely aware that the patron may not know what it is he needs and wants. Since this searcher also teaches, I suspect he has a good understanding of his clientele in this regard. Others may not have liked the way a search request was written but this searcher was curious if the requestor had a clear idea in their own
mind of what they wanted. This is not to say that this searcher was overly suspicious of his patrons. If a search is clear enough so he, the searcher, understands it, and if it is an appropriate online search, he runs it. However, if it is not clear he tries to help the patron from the standpoint of their total information needs. This also might include running a quick exploratory search to help the patron define the topic with the understanding that the topic and search can be refined after preliminary evaluations have been made. So a quick inexpensive broad sampling is the way this searcher would "normally" proceed initially and that is what we walked away with in the form of test results.

Experienced Searchers C and D were perhaps the most precision-and-recall oriented. The approaches were still quite different.

Searcher C works for Chemical Abstracts Service. He accepted the search requests at face value, especially since we were hoping he would be a good control for precision and recall. It was his aim to find what he could in the database on those topics. He tried to overlook the ambiguity in the requests and to guess the patrons subject interests. The focus was definitely on the topics and the system since he accepted the fact that access to the requestor would not be possible. Time was only a factor within the limitations of the project and cost of citations was not part of his judgment since we had stipulated this.

Experienced Searcher D operates in a unique environment where he actually discusses the search strategy with his patrons. (See Appendix G). This indicates a whole new approach to searching facilitated by his ability to locally store his strategy. Obviously precision and recall cannot be applied comparatively when one has these kinds of system capabilities. Also, it indicates a trend towards educating the patron in the nature and structure of currently available information and information systems and using the system to enhance the counseling role rather than the searcher becoming a surrogate patron.
CONCLUSION

This report reviews the methods used to acquire information about the search process and searcher approach to online systems for the first phase of our project. The aim of the testing was more to gather opinions and thought provoking data than to run a strict, statistically reliable test. This approach was used because we found very little in the literature to give us insight into how people search to base the second phase of our study on (designing a prompting system), and because we hoped by taking a broader, issue-defining approach we might inspire others to pursue user testing in the areas of concern that emerged in our work. We hope others will do more work on system use and misuse and that our observations and data may help them decide what they are looking for and at.

It is obvious that there are only shades of grey between training and system design, but we all seem to agree that there is some optimum design for the online/user interface we should be striving for. All too often when we refer to the online/user interface we are speaking of system mechanics and forgetting the scope of the information in the database and the intent of the searcher. The mechanical system is supposed to bring these together. All three share some type of patterned approach to organizing information. Our ideas about what to do with a prompting system were altered as a result of this preliminary study. A prompting system should encourage the merging of patterns, or, you might say, the inherent logic of each. The idea of a machine recognizing an English sentence is not any more important than the searcher recognizing when he is dealing with a bonafide idea or concept. If the researcher cannot do this, how good will the work he is seeking information for be? We should be designing systems that not only compensate for searcher or database weaknesses, they should also encourage improvement in both.
APPENDIX A

PROJECT PRE-TEST HANDOUT
Handout by Maureen Corcoran, Research Associate in Information Science.
Project Director: Dr. Richard Copeland.
This material is based upon work supported by the National Science Foundation under Grant DSI 78-11407.
This handout is an introduction to the basics you will need to know to perform an online bibliographic search. It is not our intention to be sure you know everything there is to know about searching when you are done reading this handout and associated materials. If you think of something you would like to be able to do, be sure to ask if it is possible. It may already be a feature of the system but not covered in this material. Or it may be something that should be a system feature.

You will be searching the Chemical Abstracts database for the years 1972 through 1976 on a Texas Instruments terminal that will be hooked up to the System Development Corporation (SDC) computer in California via a telephone line. The master program for SDC's computer system is called ORBIT. One interacts with ORBIT when doing a search. The ideal searcher would be familiar with the capabilities of ORBIT, the structure of Chemical Abstracts, have a solid understanding of chemistry, and be able to integrate these three to exploit the bibliographic retrieval system. The ideal system would require none of these prerequisites to search it effectively. The purpose of this project is to bring the system closer to the ideal. Since the person with the background in chemistry is likely to be the primary user of the system, we want to design a prompting system to help compensate for a lack of familiarity with the mechanics of searching. We want to base its design on difficulties you, a chemist, may experience trying to use the system.

The purpose of this handout and complementary AV presentation is to give the novice a theoretical and practical introduction to online searching.
The semi-experienced searcher will see it as a review; the experienced searcher as an orientation to the project. It is not our wish to limit searching to the points covered but rather to provide a jumping off point.

The major steps involved in online searching are:

1. Clarifying the subject to be searched.
2. Identifying concepts.
3. Choosing appropriate search terms (vocabulary development).
4. Planning search strategies.
5. Translating your intentions into the command structure of ORBIT.
6. Evaluating the preliminary results.
7. Evaluating the final results.

As the searcher in this project, you will be concerned with 2 through 6. The person who wrote the search request will be responsible for the first and last steps.

The three major problems you may encounter in searching are:

1. search strategy
2. developing vocabulary to define your concepts
3. the formal command language

This handout will focus on how to approach these problematic areas of searching.

BASIC STRUCTURE OF COMPUTERIZED RETRIEVAL SYSTEMS.

One of the major advantages to doing a search online is being able to combine ideas to form a unique topic and then generate a bibliography on that topic. While there are several ways one could set up a database for bibliographic retrieval, there is one predominant way. This involves
the basic principles of set theory. You type a term into the system, it picks out the articles associated with that term. You then form subsets by combining terms. This is done using the logical operators:

1. OR which creates a set of all terms mentioned.

2. AND which creates a set of articles having terms in common.

3. AND NOT which excludes any articles associated with that term.

Terms combined with OR serve the same function in the topic. When terms are combined with AND, the topic narrows and becomes more defined. AND NOT is used less frequently since it is generally easier to tell the system what you do want than to tell it what you don't want.

SEARCH STRATEGY

Developing a search strategy consists of figuring out which terms you want to combine with each other using the logical operators and in what order. When you read over your search request, you will
want to be analysing it for terms you feel are significant to that
topic. Group them together whenever you feel they serve the same
function. Each group will represent a concept. A concept consists
of words that describe something functionally synonymous from the
standpoint of the searcher. For instance, if you were interested in
the analysis of powder burn from gunshot, you might use the terms
"powder burn" and "wounds" in the same concept group since you would
be interested in linking both of them to other terms with AND.

1. GUNSHOT AND ANALYSIS AND POWDER BURN

2. GUNSHOT AND ANALYSIS AND WOUNDS

3. 1 or 2

can also be expressed as:

1. POWDER BURN OR WOUNDS

2. GUNSHOT AND ANALYSIS AND 1

A simple search usually consists of two concepts, a complex one
is rarely more than four so you may not use all of the concept groups
you have established or you may use them in a variety of combinations
instead of lumping them all together in one approach. Ranking their
importance may help you make these search strategy decisions. It
usually helps if you search

1. the most specific terms first.

2. the most important concepts first.

While you may want to map out a plan before sitting down at the
terminal to search, how you decide to approach your search once you
are online will depend on the number of postings you get while searching.
The number of postings indicates the number of articles associated
with a given term or combination of terms. It is one of your guides to when you may want to expand or refine your search vocabulary or strategy.

There are two major approaches to searching:

1. Type all of your terms in first, making sure no search statement (a search statement is a separate message sent to the computer) contains a term you might want to separate out later. Combine them after you have established your search terminology. Example:

   1. POWDER BURN OR WOUNDS OR RESIDUE
   2. GUNSHOT OR GUNS OR FIREARMS
   3. ANALYSIS OR DETERMINATION OR TRACE ELEMENTS
   4. 1 AND 2
   5. 3 AND 4

   Some searchers prefer to set up two concepts first, then combine them, then set up additional concepts as a part of their continuing search strategy, but the basic approach is still the same.

2. Combine your major terms and print out some of the articles. Find one that seems relevant and use the way it has been indexed as a basis for developing your own search vocabulary. Many searchers use this technique when they have run into problems with the first approach:

SEARCH AIDS

The search aids are printed guides to how to search on the SDC system, how Chemical Abstracts is organized, and any other reference works that can help you decide on vocabulary for your search.
Included with this handout is a copy of Chemistry, a search aid compiled by SDC. It contains an explanation of the actual computerized file with tips on how to search various elements in a record (e.g., to search by author, see p. 28). There are also some valuable vocabulary aids in the appendices. Aids published by Chemical Abstracts Service include: 1) The Index Guide reflects the formal indexing policy of Chemical Abstracts. It lists cross references from one form of a term to another and includes some notes on how to approach specific subjects. 2) The General Subject Index contains the actual formal indexing terms. We are interested in your opinion of these printed search aids. Are they useful or do you feel they're too confusing and why? Is their content and coverage the type you need or do you feel they're fine but not really necessary for searching, etc.? Take as much time as you like prior to or after searching to evaluate them.

VOCABULARY DEVELOPMENT

The words you decide to use to describe each concept constitute the vocabulary of your search. The list of words you think of without referring to the Chemical Abstracts indexes is called free text. That is, no attempt has been made to see if the database indexes used the form of word you have listed to identify articles on that topic. Unless it is also the form used by the indexers, you will only retrieve articles where the author has used that term. If you can also identify the form used by Chemical Abstracts for indexing, you may be able to retrieve even more articles on the subject. The terminology used
by the indexer is called the controlled vocabulary. You may have noticed in the gunshot example that the terms powder burn and trace elements were not connected with AND or OR. This can only be done with controlled terms. That is, trace elements would have to be listed in the General Subject Index to be used like this. Otherwise, the multi-word expression would have to be searched as trace AND elements.

CHEMDEX (an online chemical dictionary)

The CHEMDEX file is another vocabulary aid. It is a dictionary database of the various names and forms of names associated with specific chemical substances. The major use of the file is to obtain the registry number for a substance. The advantage to using the registry number when searching is that you don't have to anticipate all of the possible ways a substance could be named in the literature. However, it is Chemical Abstracts' policy to list the registry numbers of every substance mentioned in an article regardless of how tangential it may be to the main topic so you may end up with a lot of citations that have very little to do with your search topic. Chemical Abstracts recommends that you search a substance by its familiar names and registry number if you want to be truly comprehensive or if you are dissatisfied with the postings. However, if you just want a few good articles, you may want to skip using the registry number. If you decide to search by it, you must identify it by typing 'RN' after it (eg. 12345/RN).
THE NEIGHBOR COMMAND

The neighbor command is a way of looking at a section of the list of searchable terms in a database. It is an alphabetical listing and therefore called the dictionary. When you use the neighbor command, you will get a display of five terms - the two preceding and the two following the one you typed in - and the postings for each. If you want to see more on either side, you can type UP 4 or DOWN 7 (or any number up to 10). Using the neighbor command can be a source of suggestions for variant spellings of a term. It is especially helpful with authors when you don't know how their name is listed in Chemical Abstracts or the literature in general. It is also useful when you don't know why you got a limited number of postings (or none at all) for a term you feel should be pulling up more. After you have used the neighbor command, you will have to re-enter any terms you are interested in for your next search statement. This gives you a display; it is not a search command.

TRUNCATION

The truncation feature is another way of accessing similar terms with variant spellings. Truncation means you want to see all of the words that have the same spelling up to a certain point. You indicate that point with a colon. Example: COCO: could describe coco, cococos, cocoa, cocoanut, coconut, and cocoon (example not taken from Chemical Abstracts). ORBIT would list all of these terms for you. You would then have to specify which you were interested in. Or, if you want to bypass the display, you could type in ALL COCO.
The system would assume you wanted to search all of these terms. It would give you postings for the total set instead of a display.

LIMITATIONS

You may limit your search by any field in a record. For instance, if you wanted to search by author, you would type in the name of the author followed by /AU. If you are not sure of an author's name as it is listed in the database, it is wise to truncate it, eg. Copeland, R:/AU. ORBIT will then give you a display of all names beginning that way and you can select any that you think might be the person you are interested in. Again, ALL COPELAND,R:/AU would bypass the display.

There are two major non-subject limitations you may want to place on your topic at the end of the search. They are limiting your topic by language or date. There is no reason to get citations in other languages if you are only interested in Japanese!

To limit by language, type:

AND ENG/LA

for English (see Appendix F in SDC's Chemistry guide for other languages).

To limit by date, type:

AND FROM 76-76

This would limit your search to articles published during 1976. Substitute whatever years you are interested in.

PRINTING CITATIONS

When you want to print out articles online you have three options
available to you. They are:

PRINT
PRINT TRIAL
PRINT FULL

PRINT will give you the bibliographic information on the article.
PRINT TRIAL will give you the fields that will help you select terms for subject development such as the title, keywords, and index terms.
PRINT FULL will give you the full citation (not including the abstract).

For the purposes of this project, PRINT TRIAL will probably be adequate since you will most likely print out articles to see if they represent the subject you are searching.

PRINT TRIAL 5 means you want to see the five most recent citations associated with the last search statement. ORBIT will automatically assume you want citations from the preceding search statement unless you specify otherwise.

PRINT TRIAL 5 2 5 means print out the five most recent citations associated with search statement 2. If you don't specify how many citations you want to see, ORBIT will automatically print out two. If you want to see more than that, you must indicate how many.

CONCLUDING REMARKS

The last resource you have to draw upon is the project person. We know we are expecting a lot from you due to time considerations of the project. There is a limit to the amount of technique anyone can absorb without a little experience online. The resource person will refresh your memory or acquaint you with any search mechanics you may be seeking as you go along.
APPENDIX B

NARRATION FOR SLIDE TAPE PRESENTATION
The following is an introduction to searching computerized Chemical Abstracts.

Welcome to computerized literature searching. You will be helping us figure out what aids would make it easier to search the Chemical Abstracts database.

This slide tape presentation is aimed at familiarizing you with the basics of the system you will be using. The important points we will be covering are also referred to in the written handout since we are not interested in testing your memory but rather the system.

Let's say you want articles about the relation between Nicotine & Vitamin C depletion. Doing a literature search online can save you hours of time. By typing in your terms and building logical
relationships between them, you can produce a tailor-made bibliography on your research topic. The procedures are mildly complicated right now, but with your help we hope we can make it easier to do.

First let's take a look at the physical setting and some of the instruments. The books you see are generally referred to as search aids. They can be helpful for vocabulary development prior to, during, your search. They are the Chemical Abstracts Index Guide, the General Headings Index, a thesaurus, a chemical dictionary, and a general dictionary.

This is the terminal you will be using to do your searches. The keyboard is similar to a typewriter in most ways. However, there are a few functional differences.

First there is the carriage return. Your message is sent to the computer when you press the carriage return key. That's the signal for it to read and respond to your message.

If you are typing a long list of search terms and you want to use the carriage return as you normally would on a typewriter to get to the next line, just make sure the last word on the line is 'AND' or 'OR' before hitting the carriage return. ORBIT will give you more space to finish your message before
responding to it.

There are also some fudge factors built into the system for those of us who are not the world's greatest typists.

If you have a typo and want to backspace, depress the control key located on the left side of the keyboard then hit the H key.

If you want to redo an entire line, hit the dollar sign and then the carriage return. The computer will start the line over again - none of the information in that line will be sent.

One more thing, if the computer is giving you a lengthy reply to one of your requests and you want to stop it, hit the break key.

Those are the major terminal controls that differ from a typewriter. Let's go over them.

To have the computer read your message, press the Carriage Return.

To backspace, hold the control key down and hit the "H" key.

To continue typing on the next line, end the line with the word OR or AND.

To start a line over, type the dollar sign, then carriage return.

To interrupt the computer output, hit the break key.

Now let's review the preparation done before
sitting down at the terminal.

Let's say a student wants a search done for review articles on the toxicology of cannabind, the active ingredient in marijuana.

Identify the major concepts of your search topic.

Begin to develop a vocabulary to express each concept.

Think of different ways to express the same concept, use the chemical abstracts indexes or any general thesaurus or dictionary to stimulate your thinking.

Make a special note about any terms you may want to check online using the CHEMDDEX file for specific chemical substances, the NEIGHBOR command or TRUNCATION. Refer to the written handout about when to use these online vocabulary aids.

Next you will want to develop a preliminary search strategy. Decide which concepts are the most important. Then think of ways to combine the concepts so you can capture the essence of your topic while you vary your approach. By doing this, if one approach is unsuccessful, or only partially successful, you will have a back-up plan.

Think of any limitations you may want to add at the end of your search. These are things that don't directly relate to the subject such as date or language.

Finally, set overall goals for the search.

Ask yourself what is the requestor going to use the information for?
P ONLINE
P AT TERMINAL
P USE NUMBER SCOPE
P USE NUMBER SCOPE
P FRANK IN CLASSROOM
P DEVELOP STRATEGY
P IDENTIFY CONCEPTS
P DEVELOP VOCABULARY
P SET GOALS
P IMPROMPTU
P VARIATIONS

Identify concepts, developing vocabulary, identifying the concepts, developing a search strategy, specifying limitations, setting goals. If you attend to these five pieces of business before you take to the terminal, you will be well prepared to search and it will probably cut down on the time you spend on the system. However, we also realise that many people prefer a more improvised approach, using the system with a minimal amount of preparation. If this is your preference, feel free to use it. If that’s the way you would approach it on your own, then by all means, we’d like to know that is how you would do it. If you have any specific chemical substances that you want to search by registry number, you will want to enter the CHEMDX file first. When you sit down at the terminal, you will be ready to interact with ORBIT, the master program. If you have gotten your registry numbers, you will need to switch files. The procedure is the same.

Should I try to find everything in the database on the subject or just a solid sample? To review, preparing for a search consists of:

- Approximately how many citations do I want to retrieve?
- Should I try to find everything in the database on the subject or just a solid sample?
Just type in the word "file" and the abbreviation for the Chemical Abstracts file we are using for this project.

You are now ready to begin your search.

At this point the order of the steps is up to you, the searcher.

You are trying to solve a problem.

The problem is "How can I enter and combine terms to form a subset of the database on my topic?"

You may not want to use all of your concepts if you are having satisfactory results with a few of them.

However, you may want to approach the same search two ways to make sure you have been thorough.

Two maxims to remember are:

"Be practical" and

"All complications are necessary evils."

With that in mind, let's move on to the basic techniques of searching.

The steps online resemble those offline.

So, you enter search terms.

You may want to do some more vocabulary development online using the neighbor command and truncation.

To use the neighbor command, just type the word NEIGHBOR and your word.

The computer will give you a display of its dictionary. You can then select the variant forms of words listed or truncate your term.
TRUNCATION

To get both "review" and "reviews", you can truncate by saying all review.

ORBIT will retrieve all words beginning R-E-V-I-E-W, including review and reviews.

You specify how much you want them to have in common.

Typing in terms is followed by combining them using the logical operators OR, AND, AND NOT.

- OR means you want any documents with either term.
- AND means you want only documents with both terms in common.
- AND NOT means you do not want any documents with the term following AND NOT associated with it.

Remember, the ORBIT program performs AND operators first so be careful that your operators express what you intended when you use both in the same search statement.

When in doubt, don't use OR and AND in the same search statement.

You will want to evaluate your search statements as they get more involved.

- Are they defining the subject you are looking for?
- Are there other combinations that could also represent your topic?

As you approach the end of your search, you will also want to consider limiting the search by date or language.
To limit by date, just add AND FROM 75-76 (or whatever years you want) to your search.

To limit by language, add AND ENG-ENG-IA.

Now that you have more or less exhausted your original ideas of how to search your topic, are you satisfied with your strategy, and with the postings?

If you are not sure and want to check some of the articles, print out a few of them online.

You can do this by typing print trial or print full.

If you are not satisfied because the postings are too few, you may want to see the index terms in these articles to give some fresh ideas about how to call up more documents on your topic.

If you have too many postings, perhaps you can think of another concept to add to narrow the topic more.

That is, if you are not satisfied:

1. Pursue an alternate search strategy.
2. Expand the vocabulary using a thesaurus or index terms of relevant articles.
3. Refine your search by adding another concept.

If you are satisfied, great!

Tell the project person you have finished and he or she will finish the record keeping on the system.

Feel free to ask the resource person for reminders of procedures when you get bogged down.

We want to know where a prompting system would be of assistance to you so we are very interested in your questions and observations as you use the system.
SEARCH REQUEST FORM

Name: __________________________________________ Date: ____________________________

Position or title: __________________________________________ Work Phone: ______________

Address: ____________________________________________ Home phone: __________________

Status: _____ faculty _____ grad. _____ undergrad. (yr. ___) _____ other (specify) _______

1. Which indexes, including Chemical Abstracts, if applicable, do you use routinely for research? (Please list in order of use.)

____________________________________________________________________________________

2. Are any of the Chemical Abstracts printed tools available locally? _____ yes _____ no
   If yes, which?
   _____ CA Sections, weekly (_____ printed _____ microform)
   _____ CA Volume Indexes (_____ printed _____ microform)
   _____ CA Collective Indexes (_____ printed _____ microform)
   _____ CA Index Guide
   _____ Don't recall names, but it is available
   _____ Other (please specify) __________________________
   If no, how do you access it?
   _____ Go to another school (please specify) 
   _____ Use the online service.
   _____ Use the online service and sections with abstracts.
   _____ Don't have occasion to use it.
   _____ Other (please specify) ________________________

3. Have you ever had an online bibliographic search done before?
   _____ No, this is the first time.
   _____ Yes, once or twice.
   _____ Yes, several times.
   _____ Yes, regularly.

4. Have you ever conducted your own searches?
   _____ No, never.
   _____ Yes, once or twice.
   Vendor: ______________________
   Data base: __________________
   Preferred vendor: 
   Databases: ___________________
   Yes, I do my own searching.

5. How do you get information in your field? (Please rank in order of importance.)
   _____ Colleagues
   _____ Teachers
   _____ Journal subscriptions
   _____ My college library
   _____ Other libraries (specify)
   __________________________________________
   Conferences
   Online searching
   ______ Other (please specify) __________________
   __________________________________________
SEARCH DESCRIPTION

Since several people from differing online backgrounds will be performing your search, your description of the subject should be as complete as possible. Assume your searcher is unfamiliar with your field and knows nothing of your research objectives.

1. Please write a full description, in sentence form, of the subject to be searched. Be specific; define terms which have special meaning. Include names, or descriptive terms for specific items, ideas, processes, methods, or techniques if relevant to your topic. Append a list to your narrative of any synonyms, closely related terms, or alternate spellings.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

2. If you were to write a paper on this topic, what would you entitle it?

________________________________________________________________________

3. Are there any authors you know of whose work is of special interest to you in this field? Complete names, if known, are helpful.

________________________________________________________________________

________________________________________________________________________

4. Please list the complete citations of two or three of the most useful articles, books, etc., on your topic, if known.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
5. Which of the following statements best characterizes the type of search you want done?

___ A few good articles (around 10).
___ A working bibliography of 25 to 35 citations.
___ A comprehensive search which could run between 75 to 100 citations.

RESTRICTIONS OR LIMITATIONS (optional)

6. Language: ___ English only ___ any language ___ other (specify): __________________

7. Dates (i.e. nothing before 1975): __________________

8. Geographic (i.e. only interested in research done in the United States): __________________

9. Other restrictions or limitations (these may be used to narrow the search if too many citations are found in the data base): __________________

INFORMATION NEED

10. Check all applicable blanks which most accurately describe the ultimate purpose of the search results:

___ Research project
___ Grant proposal
___ Seminar
___ Class project
___ Term paper
___ Thesis (Master's)
___ Dissertation (Doctoral)
___ Bibliography for publication
___ Personal bibliography
___ Patent search
___ Instruction or teaching
___ Other: __________________

11. Do you want to participate in the searching phase of our project?

___ Yes  ___ No

I will be undertaking a manual search through the CA indexes.

Please return completed search request form to:

Maureen Corcoran
Dept. of Chemistry
Bethune-Cookman College
Daytona Beach, Florida 32015
Title:

Induced Electron Transfer in the Reaction of Ferricyanide with (Methyl Pyridinium) pentaamminecobalt(III) Complexes.

Search Description:

We are interested in studying the type of reactions known as induced electron transfer reactions. In this type of reaction, an oxidizable ligand is coordinated to a transition metal cation such as Cobalt(III). An external oxidizing agent such as Cerium(IV) or Ferricyanide acts to oxidize the coordinated ligand by a one electron transfer process. The metal to which the ligand is coordinated accepts the second electron in the overall two electron process. Hence, the action of the external oxidizing agent results in the reduction of the transition metal cation. We are interested in utilizing substituted methyl pyridinium salts as the oxidizable ligand, coordinating it to the pentaamminecobalt(III) moiety, and oxidizing the ligand to an N-methylpyridone with concomitant reduction of the cobalt.

Known Authors:

Henry Taube

Known Citations:


Type of Search:

A working bibliography. Any language.

Information Need:

Research project; grant proposal; bibliography for publication.
SEARCH #2

Title:
Equilibrium and Mass Transfer of CO in salt water media and Associated Chemical Reactions.

Search Description:

I would like to have done a search done on the determination of equilibrium constants of CO for its oxidation to CO2 in salt water media and any biological algae, bacteria etc that might also be involved. I would like to know how pH, temperature, ionic strength of the water, pressure affect the equilibrium constant for the above. I would also like to get any data on concentrations of CO in terms of mass transfer overtones in salt water.

Type of Search:

- A comprehensive search.
- Any language.
- Nothing before 1910.

Information Need:

- Research project; grant proposal; personal bibliography; instruction or teaching.
SEARCH #3

Title:
Polymeric Reagents (Polymer-bound Biochemical Reagents).

Search Description:
Research involves the synthesis and reactions of polymer-bound reagents, coenzymes, and substrates. Polymers generally involve copolymers of styrene and divinyl benzene (1-2%). Attachment of pendent groups via displacement reactions on chloro-methyl polystyrene (or copolymer). Possible groups to be attached are coenzymes or closely related model compounds: thiamine or thiazole, pyridoxal. Reactions to be studied by use of such polymeric reagents include: aldol-type condensations, decarboxylations, and transaminations.

Known Authors:
Nechers, D. C.; Lenzhoff, A.; Patchornik, A.; Wroebel, H.

Known Citations:

Type of Search:
A comprehensive search.
Any language.
1972 to present.

Information Need:
Grant proposal; personal bibliography.
SEARCH #4

Title:

Hydrogen Bonding in (Highly Hindered) Alcohols.

Search Description:

Interested in the strength of bonding, the species formed (monomer, dimer, higher polymers), and the equilibrium constants when hydrogen bond interactions occur between alcohol molecules (R-O-H type interactions). Experimental techniques commonly used include proton and carbon-13 nuclear magnetic resonance (chemical shifts, linewidths, and relaxation times), infrared absorption spectrophotometry, dielectric constant measurements (dipole moments), and heats of solution and/or dilution. Most often, alcohols are dissolved in inert solvents such as CCl4, C6H14, etc.

Known Authors:


Known Citations:

Pimentel and McClellan, Hydrogen Bond, Freeman (1960).
Dodd and Stephenson, Hydrogen Bonding, Pergamon (1959).

Type of Search:

A comprehensive search.
Any language.
1970 to present.

Information Need:

Research project, thesis (Master's), instruction or teaching.
APPENDIX D: BACKGROUND INFORMATION ON PHASE I SEARCHERS

Some of this information has been generalized to protect anonymity (Section C is verbatim however). The background does not necessarily reflect the participant's current occupation. However, all participants are currently teaching, researching, or practicing in the field of chemistry or are information professionals who focus on access to the chemical literature.

The first page is a copy of the form used to collect this information. This is followed by a breakdown by question.
BACKGROUND INFORMATION ON PHASE I SEARCHERS

The following information will be eliminated from the NSF report:

Name:  
Address:  
Position:  
Social Security Number:  
Phone Number:  

A. The following information will be a part of our report:

1. What is your subject background? For example, undergraduate degree in physics, graduate degree in organic chemistry, etc. Informal background welcome too.

2. Which subject areas of chemistry do you feel most comfortable with?

3. Which subject areas of chemistry do you feel least comfortable with?

4. How often do you use the printed version of Chemical Abstracts?

5. How often do you use the online version of Chemical Abstracts?

6. Have you had any formal bibliographic instruction? For example, a course in how to access chemical literature, a Master's in Library Science, etc.

7. Have you had any informal bibliographic instruction? For example, worked in a library as a reference assistant, did library work for a professor. (No need to answer this if your current position indicates ample library experience!)
B. This section applies only to those who have searched online prior to this project:

1. How long have you been conducting online bibliographic searches?

2. Which vendor are you most comfortable with? Which system did you first learn to search on? Do you search other systems? Which?

3. Have you attended any vendor training courses? Which vendor(s)? Beginning or advanced level, or both?

4. Have you attended Chemical Abstracts Service training courses?

5. When you search, is the information for your own use? If so, how often is this the case?

6. Do you conduct searches for other people? If so, how often? Are they present while you search?

C. This section applies to everyone! If you could have any three things on a prompting system to help you search Chemical Abstracts online, what would they be? (in order of desirability)
A. Analysis of background information on Phase I searchers

1. What is your subject background?

**Experienced**

Searcher A: Advanced degree in Physics
Teacher of Applied Physics (not current occupation)
Editor of physics journal

Searcher B: Undergraduate degree in Chemistry
Advanced degree in Library Science

Searcher C: Advanced degree in Physical Chemistry
Years at Chemical Abstracts Service

Searcher D: Undergraduate degree in Chemical Engineering
Courses in Library Science

Searcher E: Undergraduate degree in Chemistry
Advanced degrees in Chemistry and Organic Chemistry

Searcher F: Undergraduate degree in Chemistry
Advanced degree in Inorganic Chemistry

Searcher G: Advanced degrees in Chemistry and Library Science

Searcher H: Advanced degree in Organic Chemistry

Searcher J: Undergraduate degree in Chemical Engineering
Advanced degree in Physical Chemistry

Searcher K: Undergraduate degree in Chemistry and Physics
Years as analytical chemist

Searcher L: Undergraduate degree in Chemistry and Biology
Advanced degree in Chemistry and Clinical Chemistry

**Semi-experienced**

Searcher M: Undergraduate degree in Chemistry and Biology
Advanced degree in Chemistry and Clinical Chemistry

**Novice**

Searcher N: Undergraduate degree in Chemistry and Physics
Years as analytical chemist
2. Which subject areas of chemistry do you feel most comfortable with?

<table>
<thead>
<tr>
<th>Level</th>
<th>Searcher</th>
<th>Subject Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experienced</td>
<td>Searcher A</td>
<td>Inorganic, physical, nuclear</td>
</tr>
<tr>
<td></td>
<td>Searcher B</td>
<td>Organic, polymers</td>
</tr>
<tr>
<td></td>
<td>Searcher C</td>
<td>Inorganic and coordination</td>
</tr>
<tr>
<td></td>
<td>Searcher D</td>
<td>Organic and hi-polymer</td>
</tr>
<tr>
<td></td>
<td>Searcher E</td>
<td>Organic and biochemistry</td>
</tr>
<tr>
<td>Semi-experienced</td>
<td>Searcher F</td>
<td>Analytical; inorganic</td>
</tr>
<tr>
<td></td>
<td>Searcher G</td>
<td>Physical</td>
</tr>
<tr>
<td></td>
<td>Searcher H</td>
<td>Organic; biochemistry</td>
</tr>
<tr>
<td>Novice</td>
<td>Searcher J</td>
<td>Physical</td>
</tr>
<tr>
<td></td>
<td>Searcher K</td>
<td>Qualitative and quantitative analytical chemistry</td>
</tr>
<tr>
<td></td>
<td>Searcher L</td>
<td>Analytical; physical; biochemistry</td>
</tr>
<tr>
<td></td>
<td>Searcher M</td>
<td>Analytical; physical; biochemistry</td>
</tr>
</tbody>
</table>

3. Which subject area of chemistry do you feel least comfortable with?

<table>
<thead>
<tr>
<th>Level</th>
<th>Searcher</th>
<th>Subject Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experienced</td>
<td>Searcher A</td>
<td>Organic; biochemical</td>
</tr>
<tr>
<td></td>
<td>Searcher B</td>
<td>Physical, quantum</td>
</tr>
<tr>
<td></td>
<td>Searcher C</td>
<td>Biochemistry</td>
</tr>
<tr>
<td></td>
<td>Searcher D</td>
<td>Inorganic; biochemical</td>
</tr>
<tr>
<td></td>
<td>Searcher E</td>
<td>Inorganic</td>
</tr>
<tr>
<td>Semi-experienced</td>
<td>Searcher F</td>
<td>Physical; organic</td>
</tr>
<tr>
<td></td>
<td>Searcher G</td>
<td>Inorganic</td>
</tr>
<tr>
<td></td>
<td>Searcher H</td>
<td>Inorganic; physical</td>
</tr>
<tr>
<td>Novice</td>
<td>Searcher J</td>
<td>Nomenclature; qualitative analysis</td>
</tr>
<tr>
<td></td>
<td>Searcher K</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Searcher L</td>
<td>Organic</td>
</tr>
<tr>
<td></td>
<td>Searcher M</td>
<td>Organic</td>
</tr>
</tbody>
</table>
A. 4. How often do you use the printed version of Chemical Abstracts?

Experienced

Searcher A . . . . Backup for online searches. Use for word usage, abbreviations, registry, numbers, frequency of usage, etc.

Searcher B . . . . Heavily

Searcher C . . . . Weekly

Searcher D . . . . I use the index, otherwise monthly or less.

Searcher E . . . . Once a week.

Searcher F . . . . Once or twice a year.

Searcher G . . . . At least twice a month.

Searcher H . . . . Maybe once a year.

Searcher J . . . . Used to use it quite a bit; now isolated from a copy.

Semi-experienced

Searcher K . . . .

Searcher L . . . . Perhaps 15-20 times a year.

Searcher M . . . . Seldom.

Novice

Searcher E . . . .
A. How often do you use the online version of Chemical Abstracts?

Experienced

Searcher A
Several times a week.

Searcher B
Moderately.

Searcher C
Weekly.

Searcher D
Daily.

Searcher E
Once every six months.

Searcher F
Once or twice a year.

Semi-experienced

Searcher G
Frequently, very limited access; previously daily exposure.

Searcher H
About a dozen times a year.

Searcher J
Never.

Searcher K

Novice

Searcher L
Never used.

Searcher M
Never.

6. Have you had any formal bibliographic instruction? For example, a course in how to access chemical literature, a Master's in Library Science, etc.

Experienced

Searcher A
None

Searcher B
Teach access to chemistry literature.

Searcher C
Teach access to chemistry literature.

Searcher D
Courses in library science.

Searcher E
No

Searcher F
No

Semi-experienced

Searcher G
Teach access to chemistry literature.

Searcher H
None

Searcher J
Survey courses in chemical literature.

Searcher K

Novice

Searcher L
No

Searcher M
No
A.

7. Have you had any informal bibliographic instruction? For example, worked in a library as a reference assistant, did library work for a professor. (No need to answer this if your current position indicates ample library experience!)

Experienced

Searcher A . . . . Completely self-taught.

Searcher B . . . . Works in information profession.

Searcher C . . . . Works in information profession.

Searcher D . . . . Works in information profession.

Searcher E . . . . No

Semi-experienced

Searcher F . . . . Only hand experiences.

Searcher G . . . . Works in information profession.

Searcher H . . . . Many literature searches.

Searcher J . . . . Advanced degree

Novice

Searcher K . . . .

Searcher L . . . . No

Searcher M . . . . No
B. This section applies only to those who have searched online prior to this project.

1. How long have you been conducting online bibliographic searches?

   - **Experienced**
     - Searcher E . . . . 1 hour over one year.

   - **Semi-experienced**
     - Searcher F . . . . Since 1975.

2. (a) Which vendor are you most comfortable with?

   - **Experienced**
     - Searcher A . . . . Lockheed's Dialog
     - Searcher B . . . . Lockheed is the only vendor I use and C.A. the only files.
     - Searcher C . . . . No preference
     - Searcher D . . . . SDC
     - Searcher E . . . . SDC

   - **Semi-experienced**
     - Searcher F . . . . SDC
     - Searcher G . . . . SDC
     - Searcher H . . . . SDC
B. Continued

(b) Which system did you first learn to search on?

Experienced

Searcher A. . . . DOE's Recon, which began as Dialog
Searcher B . . . . Lockheed
Searcher C . . . . Dialog
Searcher D . . . . SDC

Searcher E . . . . SDC

Semi-experienced

Searcher F . . . . SDC
Searcher G . . . . Battelle
Searcher H . . . . I have used SDC only.

(c) Do you search other systems? Which?

Experienced

Searcher A . . . . Yes, SDC's "Orbit"; BRS; Informatics' "Recon IV"; NY Times' "Ballots"; NASA's "Recon"; RLIN's "Ballots"; NLM's "Elhill"; the local batch system on many of the same databases.
Searcher B . . . . Lockheed
Searcher C . . . . Yes, BRS, SDC, LRS
Searcher D. . . . Yes, LRS
Searcher E . . . . No

Semi-experienced

Searcher F . . . . Lockheed is used by our library and works well.
Searcher G . . . . Lexis
Searcher H . . . . SDC only.
B. Have you attended any vendor training courses? Which vendor(s)?
Beginning or advanced level, or both?

Searcher A
- DOE's Recon - Advanced
- Lockheed's Dialog - beginning
- BRS - beginner
- Biosis (on bio abstracts)

Searcher B
- Beginning and advanced Dialog workshops
- Advanced in chemical files

Searcher C
- LRS, SPC - beginning and advanced
- BRS - beginning

Searcher D
- SDC, CAS, DERWENT-WPI, TITUS
- LRS, PREDICAST FILES

Searcher E
- No

Searcher F
- None

Searcher G
- SDC

Searcher H
- SDC - one beginning workshop

C. Have you attended Chemical Abstracts Service training courses?

Searcher A
- No

Searcher B
- Yes

Searcher C
- Yes

Searcher D
- Yes

Searcher E
- No

Searcher F
- No

Searcher G
- No

Searcher H
- No
B. When you search, is the information for your own use? If so, how often is this the case?

Experienced
- Searcher A: Only occasionally, say 5%.
- Searcher B: No
- Searcher C: No
- Searcher D: Very seldom.
- Searcher E: Yes, usually.
- Searcher F: Yes—always. Well, done some online searches for faculty members, but not many.

Semi-experienced
- Searcher G: Both
- Searcher H: About half the time.

6. Do you conduct searches for other people? If so, how often? Are they present while you search?

Experienced
- Searcher A: Half the time, the requestor is present, either because they await the print or because they are needed to refine the search question in the light of some test output. I average two searches for others each day.
- Searcher B: Yes and they are not present when I search due mostly to their own choice. I search whenever asked and it varies but I would say I use computer files moderately.
- Searcher C: Yes, usually patron not present.
- Searcher D: Normally for others; 2 or 3 times daily. Requestor present less than 20% of the time.
- Searcher E: Sometimes for students.

Semi-experienced
- Searcher F: Not often. I prefer that they be present.
- Searcher G: Used to do.
- Searcher H: Yes. About once every two months. Sometimes they are present.
C. This section applies to everyone! If you could have any three things on a prompting system to help you search Chemical Abstracts online, what would they be? (In order of desirability)

Experienced Searcher A
I would prefer that Chemical Abstracts add multiple subject classification assignments, and that they use group names in indexing (e.g. polyaromatic hydrocarbons; heterocyclic nitrogen cpds (ed. note: not sure if that's the correct spelling, cannot read the handwriting); how to do that with prompting, I don't know. As for prompting, I don't know what a prompter can do that a handy manual alongside the terminal can't do. Perhaps abbrev. need reminders; perhaps the relation of section codes and index words (e.g. Section 4 is Toxicology). But too many editorial practices are not codified by CAS and so can't be entered into a prompter.
Sorry, I am a novice in prompting and can't guess what you think could go in.

Experienced Searcher B
1. Prompt for nomenclature.
2. Prompt for substructure searching.
3. Prompt for new features of the system.

Experienced Searcher C
1. Automatic transfer of dictionary retrieval to document file as search statement.
2. Automatic broader-narrower terms.

Experienced Searcher D
1. Subject tie-in reminder.
   For example: Terms used show direct link to volume index headings.
2. Process synonyms and abbreviations.
   For example: Terms production, manufacture, synthesis would cue in other synonyms and abbreviations used in CA data bases.
3. Word frequency by CA Section Number.

Semi-experienced Searcher E
No comments.

Semi-experienced Searcher F
1. How to use OR commands, i.e., the effect of an OR command in a particular database.
2. Related to the above, a general statement on how a computer gives priorities to commands.
3. Ways to discover misspelled index terms or title terms without looking through the whole list of search terms.

Semi-experienced Searcher G
1. Better subject analysis of current issues on condensates.
2. More consistency in indexing.
3. Use of WLN as a tool in searching CA.

Semi-experienced Searcher H
1. My own notes.
Section C - Continued

Novice J
Superimpose more of CA structure, search procedures appropriate to CA.

Novice K

Novice L
1. Command language, use of and/or, colons, etc.
2. Vocabulary aids, such as use of registry numbers and use of Chemdex, truncation, etc.
3. Interpretation of output symbols and abbreviations.

Novice M
1. A person to help searching.
2. A machine prompt to lead you through the steps.
3. A complete handbook that describes as much as possible about the system.
APPENDIX E

ONLINE INTERACTION
Experienced Searcher A

SS 1  FERRICYANIDE AND ELECTRON; FD FERRICYANIDE AND TRANSFER; FD 1 OR 2
SS 1  pstg 64
SS 2  pstg 57
SS 3  pstg 101
SS 4  PRT TI SS 1
SS 4  PRT TI SS 2
SS 4  PYRIDINIUM AND 3
   no match
SS 4  PYRIDINIUM
   pstg 1255
SS 5  3 AND 4
   no match
SS 5  4 AND FERRICYANIDE
   pstg 4
SS 6  PRT OFFLINE

Experienced Searcher B

SS 1  ELECTRON AND TRANSFER; FD FERRICYANIDE; FD COBALT; FD ALL COMPLEX:
SS 1  pstg 2916
SS 2  pstg 559
SS 3  pstg 24757
SS 4  pstg 65929
SS 5  1 AND 2 AND 3 AND 4 AND 5
   pstg 3
SS 6  PRINT TRIAL
SS 6  PRT OFFLINE

Experienced Searcher C

SS 1  ELECTRON EXCHANGE REACTIONS AND COBALT AND AMMINE#  comment (note 2)
   no-pstg (electron-exchange reactions)
   mm (ammine#) (2)
   1 ammine
   2-ammines
   specify numbers, all, or none
   ELECTRON EXCHANGE REACTION
   no pstg (ammine#)
   no match
SS 1  ELECTRON EXCHANGE REACTION
   pstg 1534
SS 2  1 AND COBALT-AND ALL AMMINE#  backspacing
  pstg 6
SS 3  PRT FUS
SS 3  (1.OR ELECTRON EXCHANGE REACTION CATALYSTS OR KINETICS OR ELECTRON EXCHANGE REACTION) AND COBALT AND ALL AMMINE#
   pstg 13
SS 4  3 AND NOT 2
   pstg 7
SS 5  PRT AN TI AU IT
SS 5  ELECTRON AND (EXCHANGE.OR TRANSFER) AND COBALT AND ALL AMMINE#  comment (note 3)
   pstg 52
SS 6  5 AND NOT 3
   pstg 39
SS 7  PRT AN TI AU IT
SS 7  PRT OFFLINE SS 5

Comment

Note 1

Comment (note 1)

Note 2

Comment (note 2)

Note 3

Comment (note 3)
SEARCH #1

Semi-experienced Searcher E

SS 1 FILE CHEMDEX
SS 1 C5H22N6O1CO
np
SS 1 C5H22N6O1CO/MF
np
SS 1 METHYL PYRIDINE PENTAAMIN COBALT (3+)
np
SS 1 METHYL PYRIDINE:
np
SS 1 METHYL PYRIDINE:
pstg 1
SS 2 PENTAAMINCOBALT (3+) COMPLEXES:
np
SS 2 PENTAAMIN COBALT:
np
SS 2 FILE CAS7276
SS 1 ELECTRON EXCHANGE
np
SS 1 REDOX REACTION:

1 redox reaction/it
2 redox reaction. catalysts/it
ALL
pstg 1148

SS 2 LIGAND:

1' OR 9 OR 11
pstg 6919

SS 3 COBALT (3+)
np
SS 3 METHYL PYRIDINE
pstg 336
SS 4 COBALT (III)
np
SS 4 COBALT
pstg 24757
SS 5 TAUBE, H.:/AU
np
SS 5 TAUBE, H.:/AU
mm 5
1' OR 4
pstg 45
SS 6 ABRAMOVITCH, R.:/AU
mm 3
ALL
pstg 70

(Continued next page.)
SEARCH #1

Semi-experienced Searcher E - Continued

SS 7 HIS
SS 7 1 AND 2 AND 3 AND 4
   none
SS 7 2 AND 3 AND 4
   pstg 1
SS 8 1 AND 3 AND 4
   none
SS 8 PRT FULL SS 7
SS 8 3 AND 5
   none
SS 3 4 AND 5
   pstg 4
SS 9 PRT TRIAL SS 8 4
SS 9 PENTAAMMINE COBALT
   np
SS 9 COBALT PENTAAMMINE:
   np
SS 9 COBALT AMMINE:
   np
SS 9 4 AND 6
   none
SS 9 HIS
SS 9 1 AND 6
   none
SS 9 OXIDATION
   pstg 25635
SS 10 1 AND 2 AND 4 AND 9
   pstg 2
SS 11 PRT TRIAL
SS 11 LIGAND OR LIGANDPENTAAMMINECOBALT OR LIGANDS
   pstg 6918
SS 12 11 AND 3 AND 4
   pstg 1
SS 13 1 AND 11 AND 4 AND 9
   pstg 2
SS 14 7 OR 8 OR 10
   pstg 7
SS 15 7 OR 8 OR 10 OR 11 OR13 OR 7
   np(11 OR13)
   pstg 7
SS 16 15 OR 11 OR 13
   pstg 6922
SS 17 7 OR 8 OR 19 OR 12 OR 13 OR 14
   pstg 7
SS 18 PRT OFFLINE
Semi-experienced Searcher-F

SS 1 ELECTRON
   pstg 67217
SS 2 1 AND TRANSFER
   pstg 2916
SS 3 2 AND TRANSFER
   pstg 2916
SS 4 2 AND INDUCED
   pstg 72
SS 5 PENTAMMIN3
   no pstg
SS 5 PENTAMMIN#
   pstg 8
SS 6 COBALT: AND 5
   pstg 6
SS 7 PRINT TRIAL
SS 7 HIS
SS 7 6 AND 4
   no pstg.
SS 7 TAUBE, H:AU
   mm 5
   1,4
SS 7 pstg 45
SS 8 7 AND 4
   no pstg
SS 8 7 AND 4
   no match
SS 8 PRT OFFLINE SS 4

Semi-experienced Searcher G

SS 1 ELECTRON TRANSFER
   no pstg
SS 1 ELECTRON EXCHANGE
   no pstg
SS 1 ELECTRON EXCHANGE
   no pstg
SS 1 ELECTRON:
   mm 84
   ALL
SS 1 pstg 79861
SS 2 ELECTRON
   pstg 2
SS 3 ELECTRON: AND ECH
SS 3 E1
   pstg 856
SS 4 1 AND EXCHANGE
   pstg 3668
SS 5 13408-62-3/RN AND 4
   pstg 22
SS 6 31011-67-3/RN AND 5
   no match

(Continued next page)
Semi-experienced Searcher G - Continued

SS 6 31011-67-3/RN AND 4
    no match
SS 6 33248-49-6/RN AND 4
    no match
SS 6 44236-77-3/RN AND 4
    pstg 1
SS 7 PRINT
SS 7 ABRAMOVITCH, S
    ALL ABRAMOVITCH, R:
    no pstg
SS 7 ABRAMOVITCH, R:/AU
    mm 3
    ALL
SS 7 pstg 70
SS 8 7 AND 4
    no match
SS 8 7 AND ELECTRON
    no match
SS 8 VINUTHA, A:/AU
    no pstg
SS 8 VINUTHA, A:/AU
    no pstg
SS 8 TAUBE, HENRY/AU
    pstg 27
SS 9 9 AND ELECTRON
    pstg 263
SS 10 8 AND ELECTRON
    no pstg (38) line garbage
SS 10 METHYL PYRIDINIUM SALTS.
    METHYL AND PYRIDINIUM AND SALT:
    mm (salt) 47
    ALL
SS 11 10 AND ELECTRON
    error reenter input
    10 AND ELECTRON
    pstg 1
SS 12 PRINT
SS 12 ERASEALL

Semi-experienced Searcher H

SS 1 OXIDATION
    pstg 25635
SS 2 COBALT
    pstg 24757
SS 3 COMPLEX:
    mm 77
    ALL
SS 3 pstg 65929

(Continued next page)
SEARCH #1

Semi-experienced Searcher H - Continued

SS 4 1 AND 2 AND 3
  pstg 226
SS 5 PENTAMMINECOBALT
  pstg 1
SS 6 PENTAMMINE:
  mm 6
SS 6 pstg 1
SS 7 PRINT 1 SS'6
SS 7 14.
  pstg 6708
SS 8 PYRIDINUM
  pstg 1255
SS 9 1 AND 2 AND 3 AND 8
  no match
SS 9 2 AND 3 AND 8
  pstg 5
SS 10 PRINT 5 SS 9
SS 10 FERRICYANIDE
  pstg 559
SS 11 1 AND 2 AND 3 AND 10
  pstg 4
SS 12 PRINT 4 SS 11
SS 12 INDUCED
  pstg 28372
SS 13 ELECTRON
  pstg 67217
SS 14 TRANSFER
  pstg 27369
SS 15 12 AND 13 AND 14.
  pstg 72
SS 16 15 AND 2
  pstg 4
SS 17 PRINT 4 SS 16
SS 17 TAUBE, HENRY/AU.
  pstg 27
SS 18 17 AND 2
  pstg 1
SS 19 PRINT 1 SS 18
SS 19 17 AND 15
  no match
SS 19 17 AND 1 AND 3
  pstg 3
SS 20 PRINT 3 SS 19
SS 20 7 OR 12 OR 17 OR 19
  pstg 34951
SS 21 6 OR 11 OR 16 OR 18 OR 19
  pstg 13
SS 22 PRT OFFLINE~

comment (note 15)

comment (note 16)

comment (note 17)

comment (note 18)

comment (note 19)

backspacing
Novice J

SS 1 ELECTRON TRANSFER
np
SS 1 ELECTRON AND TRANSFER
pstg 2916
SS 2 COORDINATION CHEMISTRY
np
SS 2 COORDINATION AND LIGANDS
pstg 461
SS 3 OXIDIZABLE LIGAND
np
SS 3 METHYL PYRIDINIUM
np
SS 3 OXIDIZABLE AND LIGAND
none
SS 3 TRANSITION AND LIGAND
pstg 693
SS 4 1 AND 2 AND 3
pstg 2
SS 5 PRINT TRIAL
SS 5 PRT OFFLINE

Novice K

SS 1 FILE CHEMDEX
SS 1 FERRICYANIDE
pstg 1
SS 2 PRINT FULL
SS 2 N-METHYLPERIDONE
no pstg
SS 2 METHYLPERIDONE OR N-METHYLPERIDONE
no pstg
SS 2 PENTAMINE COBALT:
no pstg
SS 2 COBALT
pstg 1
SS 3 PRINT
SS 3 COBALT OR OR COBALT(III)
search syntax error. search aborted
SS 3 FILE CAS7276
SS 1 ELECTRON AND TRANSFER AND (FERRICYANIDE OR 13408-62-3/RN)
backspacing
SS 3 PRINT TRIAL .5
SS 2 PENTAMINE COBALT
no pstg
SS 2 PENTAMINE AND COBALT
pstg 4
SS 3 PRINT 4
SS 3 PENTAMINE AND COBALT(3+)
search syntax error. search aborted.

(Continued on next page)
Novice K - Continued

SS 3 PENTAMINE
   pstg 8
   prompt (note 23)
SS 4 COBALT(3+)
   search syntax error. search aborted
   backspacing
SS 4 COBALT (3+)
   search syntax error. search aborted
SS 4. COBALT#3+#
   no pstg
SS 4 COBALT#3+#
   no pstg
SS 4 HIS
SS 4 1 AND 2
   no match
SS 4 NBR PENTAMINE
   5 DOWN
SS 4 METHYL PYRIDINE
   pstg 336
SS 5 1 AND 2 AND 4
   no match
SS 5 306-53-6/RN
   pstg 17
SS 6 COBALT
   pstg 24757
SS 7 1 AND 5 AND 6
   no match
SS 7 1 AND 6
   pstg 4
SS 8 PRINT 4
SS 8 PENTAMINE OR PENTAMINE OR PENTAMINE
   backspacing
   pstg 34
SS 9 16 AND 8
   no match
SEARCH #1

Novice L
prompt (note 24)

SS 1  INDUCED ELECTRON TRANSFER REACTIONS AND OXIDIZABLE LIGANDS prompt (note 25)
no pstg (induced electron transfer reactions).
no pstg (oxidizable ligands).

SS 1  INDUCED AND ELECTRON AND TRANSFER AND REACTIONS AND OXIDIZABLE LIGANDS
no pstg (oxidizable ligands).
no match

SS 1  ELECTRON TRANSFER AND ELECTRON EXCHANGE REACTIONS prompt (note 26)
no pstg (electron transfer).
no pstg (electron exchange reactions).

SS 1  ELECTRON AND TRANSFER prompt (note 27)
ss 1 pstg 2916

SS 2  ELECTRON AND EXCHANGE prompt (note 28)
ss 2 pstg 3134

SS 3 ONE OR TWO$
SS 3 1 OR 2
pstg 5010

SS 4 LIGAND OR LIGANDS
pstg 6918

SS 5 3 AND 4
pstg 101

SS 6 OXIDIZ:
mm 22
ALL
ss 6 pstg 5147

SS 7 OXIDAT
no pstg (oxidat).

SS 7 ALL OXIDAT:
pstg 30355

SS 8 6 OR 7
pstg 30376

SS 9 HIS

SS 9 5 AND '8
pstg 3

SS 10 PRINT 3

SS 10 PRINT TRIAL 3

SS 10 35$ no pstg (35$).

SS 10 5 AND COMPLEX:
mm 77
all or none
ALL
pstg 70

SS 11 PRINT TRIAL

SS 11 PRT OFFLINE
Novice

SS 1 CHELATE AND LIGANDS
pstg 134

SS 2 ELECTRON EXCHANGE AND 1
no pstg (electron exchange).
no match

SS 2 ELECTRON AND EXCHANGE AND 1
pstg 2

SS 3 PRINT TRIAL
prompt (note 30)

SS 3 FERRICYANIDE AND PENTAAMINE COBALT 1.1 ELECTRON AND TRANSFER
no pstg (pentaamine cobalt 111 electron).
no match

SS 3 FERRICYANIDE AND PENTAAMINE COBALT 111 AND ELECTRON TRANSFER
no pstg (pentaamine cobalt 111).
no pstg (electron transfer)
no match

SS 3 FERRICYANIDE
pstg 559

SS 4 PENTAAMINE AND COBALT
no pstg (cobalt).
no match

SS 4 PENTAAMINE AND COBALT
pstg 4

SS 5 ELECTRON AND TRANSFER
pstg 2916

SS 6 3 AND 5
pstg 20

SS 7 HIS
SS 7 6 AND 4
no match

SS 7 4 AND 5
pstg 2

SS 8 7 ANS
SS 8 7 OR 6
pstg 22

SS 9 PRINT TI.22
backspacing

SS 9 TÄUBE, H:/AU
mm 5
1 OR 4
pstg 45

SS 10 HIS
9 AND 5
pstg 4

SS 11 8 OR 10
pstg 26

SS 12 HIS
SS 12 PRT OFFLINE
Experienced Searcher A

SS 1. CARBON AND MONOXIDE; FD-7732-18-5/RN; EQUILIBRIUM; FD-EQUILIBRIUM; FD MASS AND TRANSFER; FD SALT AND WATER; FD BRINE

ss 1. pstg 7256
ss 2. pstg 18780
ss 3. 'equilibrium' is not a recognized command name.
ss 3. FD EQUILIBRIUM; FD MASS AND TRANSFER; FD SALT AND WATER; FD BRINE
ss 3. pstg 7230
ss 4. pstg 4073
ss 5. no pstg (salt and water).
ss 5. pstg 1708
ss 6. SALT AND WATER; FD BRINE
ss 6. pstg 2858
ss 7. pstg 1708
ss 8. HISTORY

SS 8. 1 OR 2; FD 5 OR 6
ss 9. pstg 25656
ss 10. pstg 4490
SS 10. 8 AND 9
   pstg 402
SS 11. 10 AND 4 OR 10 AND 3
ss 11. pstg 4
SS 12. PRT TI
ss 12. 1 AND (3 OR 4) AND 9
   comment (note 33)
   no match

SS 12. 1 AND 3-OR 1 AND 4
ss 12. pstg 96
SS 13. PRT OFFLINE SS 11

Experienced Searcher B

SS 1. FILE CHEMDEX
SS 1. CARBON AND MONOXIDE
   no pstg (monoxide).
   no match
SS 1. CO

ss 1. pstg 49
SS 2. CARBON MONOXIDE
   pstg 1
SS 3. PRINT PULL
SS 3. FILE CAS7276
   ERROR, REENTER INPUT
   FILE CAS7276
SS 1. 630-08-0/RN
   pstg 8260.
SS 2. WATERS, OCEAN, AND BRINE
   pstg 2589
SS 3. BRINE
   pstg 1708
SS 4. 3 OR 2
   pstg 4265
SS 5. 4 AND 1
   pstg 9
SS 6. PRT OFFLINE

backspace
Experienced Searcher C

**SEARCH #2**

**SS 1** 124-38-9/RN AND 630-08-0/RN
  pstg 1518

**SS 2** 1 AND SALT OR SALINE$
  do match

**SS 2** 1 AND (ALL SALT# OR ALL SALINE)
  backspace
  pstg 9

**SS 3** PRT AN TI IT

**SS 3** 1 AND (EQUILIBRIUM OR FORMATION OR STABILITY) AND (CONSTANT OR ALL CONSt# comment unbalanced parentheses in search statement, search aborted.
  (note, 35)

**SS 3** 1 AND EQUILIBRIUM OR FORMATION OR STABILITY) AND (ALL CONSTANT OR ALL CONSt#)
  pstg 2

**SS 4** PRT AN TI IT

**SS 4** 124-38-9/RN
  pstg 11056

**SS 5** 630-08-0/RN
  pstg 8260$

**SS 6** EQUILIBRIUM OR FORMATION
  pstg 130453

**SS 7** 4 AND 6
  pstg 1637

**SS 8** 7 AND (SALT OR SALINE)
  pstg 19$

**SS 9** PRT AN TI IT

**SS 9** 630-08-0$

**SS 9** 5 AND (ALL OXIDAT: OR OXIDN)
  pstg 943

**SS 10** 9 AND ALL SALT$
  pstg 7$

**SS 11** PRT AN TI IT

**SS 11** 124-38-9/RN AND (PREPN OR FORMATION) AND EQUILIBRIUM too many pstgs in this ss, revise search strategy.

**SS 11** 124-38-9/RN AND EQUILIBRIUM
  backspace
  pstg 260$

**SS 12** 11 AND (PREPN OR FORMATION)

**SS 12** NBR 124-38-9/RN

**SS 12** 124-38-9, PREPN/RN
  pstg 489$

**SS 13** 124-38-9, PROP/RN
  pstg 3064$

**SS 14** 13 AND EQUILIBRIUM
  pstg 120$

**SS 15** 14 AND SALT
  pstg 1$

**SS 16** PRT FU

**SS 16** ERASE ALL
SEARCH #2

Semi-Experienced Searcher E

SS 1 EQUILIBRIUM
  pttg 7230

SS 2 EQUILIBRIUM CONSTANT
  np (equilibrium constant)

SS 2 CARBON MONOXIDE
  np (carbon monoxide)

SS 2 CARBON AND MONOXIDE
  pttg 7256

SS 3 EQUILIBRIUM AND CONSTANT
  pttg 272

SS 4 CARBON AND DIOXIDE
  pttg 11143

SS 5 SAVEHOLD
  np (savehold)

SS 5 SAVEOLD
  saveold completed

SS 5 FILE CHEMDEX
  SS 1 C101/MF
    np (C101/MF

SS 1 CARBON MONOXIDE
  pttg 1

SS 2 PRT

SS 2 CARBON DIOXIDE
  pttg 1

SS 3 PRT

SS 3 FILE CAS7276

SS 1 RECALL
  SS 1 equilibrium (7230)

SS 2 carbon and monoxide (7256)

SS 3 equilibrium and constant (272)

SS 4 carbon and dioxide

SS 5 630-08-0/RN
  pttg 8260

SS 6 124-38-9/RN
  pttg 11056

SS 7 OXIDATION
  pttg 25635

SS 8 WATERS, OCEAN
  np (waters, ocean)

SS 8 WATERS, OCEAN
  pttg 2589

SS 9 3 AND 5 AND 6.
  none

SS 9 3 AND 5
  pttg 2

SS 10 9. AND 7
  none
## SEARCH #2

**Semi-Experienced Searcher E - Continued**

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Semi-Experienced Searcher F

SS 1 FILE CHEMDex
SS 1 CO
pstg 49
SS 2 CO/MF
pstg 49
SS 3 CARBOPN
SS 3 CARBON MONOXIDE
pstg 1
SS 4 PRINT
SS 4 CARBON DIOXIDE
pstg 1
SS 5 PRINT
SS 5 FILE CAS7276
SS 5 630-08-0/RN AND 124-39-9
no pstg (124-39-9)
no match
SS 1 630-08-0/RN AND 124-39-9/RN
no pstg (124-39-9/RN)
no match
SS 1 630-08-0/RN AND 124-39-9/RN
pstg 1518
SS 2 1 AND EQUILIBRIUM
pstg 29
SS 3 PRINT 3
SS 3 2 AND ALGA;
m (alga) (27)
9 (ALGAE)
no match
SS 3 2-2 AND $
SS 3 2-2 AND SALT AND WATER
no match
SS 3 2 AND IONIC AND STRENGTH
no match
SS 3 2 AND IONIC STRENGTH
no pstg (ionic strength)
no match
SS 3 2 AND PH
no match
SS 3 PH
pstg 7447
SS 4 3 AND 2
no match
SS 4 2 AND PRESSURE
no match
SS 4 2 AND TEMPERATURE
pstg 2

prompt (note 41)
prompt (note 42)

comment prompt (note 43)
prompt (note 44)
comment (note 45)
### SEARCH #2

**Semi-Experienced Searcher F - Continued**

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**Semi-Experienced Searcher G**

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<th>ERASE ALL</th>
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prompt (note 46)
SEARCH #2

Semi-Experienced Searcher H

SS 1 EQUILIBRIUM
  pstg 7230

SS 2 CONSTANT
  pstg 18861

SS 3 CARBON MONOXIDE
  no pstg (carbon monoxide).

SS 4 CO
  pstg 2157

SS 5 CARBON DIOXIDE
  no pstg (carbon dioxide).

SS 5 CO2
  pstg 169

SS 6 CARBON
  pstg 57080

SS 7 MONOXIDE
  pstg 8390

SS 8 DIOXIDE
  pstg 27438

SS 9 1 AND 2 AND 6 AND 7 AND 8
  pstg 1

SS 10 PRINT 1 SS 9

SS 11 SALT
  pstg 25507

SS 12 SALT AND WATER
  pstg 2858

SS 12 6 AND 7 AND 8 AND 11
  no match

SS 13 MARINE
  pstg 3449

SS 13 6 AND 7 AND 8 AND 12
  no match

SS 13 OCEAN

SS 13 ALL OCEAN:
  pstg 4017

SS 15 PRINT 4 SS 14

SS 15 PH
  pstg 7347

SS 15 15 AND 13
  pstg 43

SS 17 TEMPERATURE
  pstg 31587

SS 18 16 AND 17
  pstg 1

SS 19 PRINT 1 SS 18

(Continued next page.)
SEARCH #2

Semi-Experienced Searcher H - Continued

SS 20 13 AND 19
    no match
SS 20 6 AND 7 AND 8 AND 15
    pstg 3.
SS 21 PRINT 3 SS 20
SS 21 6 AND 7 AND 8 AND 17
    pstg 39
SS 22 20 AND 21
    no match
SS 22 ALL ALGA:
    pstg 3564
SS 23 6 AND 7 AND 8 AND 22
    pstg 14
SS 24 PRINT 1 SS 23
SS 24 BACTERIA
    pstg 10170
SS 25 6 AND 7 AND 8 AND 24
    no match
SS 25 1 AND 6 AND 7 AND 8
    pstg 20 comment (note 51)
SS 26 PRINT 20 SS 25
SS 26 ERASEALL

Novice J

SS 1 ALL REVIEW
    pstg 138565
SS 2 CARBON MONOXIDE OR CO
np (carbon monoxide).
    pstg 2157
SS 3 CARBON DIOXIDE OR CO2
np (carbon dioxide).
    pstg 169
SS 4 EQUILIBRIUM CONSTANTS
np (equilibrium constants)
SS 4 EQUILIBRIUM AND CONSTANTS
    none
SS 4 EQUILIBRIUM
    pstg 7230.
SS 5 SALT WATER SALINE
np (salt water saline)
SS 5 SALINE
    pstg 1050
SS 6 1 AND 2 AND 3 AND
    none
SS 6 .2 AND 3 AND 4 AND 5
np (5and)
    none
SS 6 2 AND 3 AND 4 AND 5
    none
SS 6 ERASEALL

prompt (note 52)
comment prompt (note 53)
backspacing (illegible) prompt (note 54)
backspacing
Novice K

SS 1  CARBON MONOXIDE
      no pstg (carbon monoxide).
      comment (note 55)

SS 1  CARBON AND MONOXIDE
      pstg 2256

SS 2  OXIDATION
      pstg 25635

SS 2  1 AND 2
      pstg 696

SS 4  SALT WATERS
      pstg 2856

SS 5  3 AND 4
      no match

SS 5  IONIC STRENGTH
      no pstg (ionic strength).

SS 5  IONIC AND STRENGTH
      pstg 615

SS 6  3 AND 5
      no match

SS 6  SEA AND WATER
      pstg 3553

SS 7  3 AND 6
      no match

SS 7  CARBON AND DIOXIDE
      pstg 11143

SS 8  3 AND 7
      pstg 133

SS 9  BRINE
      pstg 1708

SS 10  HIS
      prompt (note 58)

SS 10  8 AND 9
      no match

SS 10  ERASEALL

Novice L

SS 1  EQUILIBRIUM CONSTANT
      no pstg (equilibrium constant).

SS 1  EQUILIBRIUM AND ALL CONSTANT
      comment prompt backspacing (note 62)

SS 2  CARBON-MONOXIDE
      no pstg (carbon monoxide).

SS 2  CARBON-MONOXIDE $ 

SS 2  CARBON-MONOXYDE OR CO
      pstg 9322

SS 3  1 OR 2
      no pstg (1 or 2).
Novice L - Continued

SS 3 1 AND 2
patt 5
comment (note 63)

SS 4 PRINT TRIAL 5

SS 4 H15

SS 4 1 AND 2 AND PROTON TRANSFER$...

SS 4 1 AND 2 AND PROTON AND TRANSFER...

SS 5 FILE CHEMDEX

SS 1 CARBON MONOXIDE

patt 1

SS 2 PRINT

SS 2 FILE CAS7276

SS 1 630-08-0/RN
patt 8260

SS 2 1 AND ALL EQUIL:
patt 122

SS 3 SEA AND WATER, OR SALT AND WATER

patt 6244

SS 4 2 AND 3

no match

SS 4 2 AND MASS AND TRANSFER

patt 1

backspacing

SS 5 PRINT

SS 5 ERASE ALL

Novice M

SS 1 7732-18-5/RN

patt 18780

SS 2 EQUILIBRIUM CONSTANTS

no patt (equilibrium constants)

SS 2 EQUILIBRIUM CONSYANT

no Patt (equilibrium consyant)

SS 2 EQUILIBRIUM CONSTANT

no patt (equilibrium constant)

SS 2 EQUILIBRIUM AND CONSTANT

patt 272

SS 3 1 ANS

no patt (1 ans)

SS 3 1 AND 2

patt 4

SS 4 EQUILIBRIUM

patt 7230

SS 5 CARBON MONOXIDE

no patt (carbon monoxide)

SS 5 CARBON AND MONOXIDE

patt 7256

SS 6 HIS

SS 6 3 AND 5

patt 67
**Novice W - Continued**

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<td>SS 7, 1</td>
<td>AND 6</td>
<td>pstg 3</td>
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</tr>
<tr>
<td>SS 8</td>
<td>CARBON AND DIOXIDE</td>
<td>pstg 11143</td>
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</tr>
<tr>
<td>SS 9</td>
<td>5 AND 8</td>
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<td>SS 10</td>
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<td>SS 10-1</td>
<td>AND 5 AND 8</td>
<td>pstg 65</td>
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<td>4 AND 10</td>
<td>pstg 1</td>
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<td>SS 12</td>
<td>PRT, AN TI</td>
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<tr>
<td>SS 12</td>
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<td></td>
</tr>
<tr>
<td>SS 12</td>
<td>ERASEALL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Experienced Searcher A

SS 1 ALL NECHERS:/AU;$
SS 1 ALL NECHERS, D:/AU; FD ALL WROEBEL, H:/AU
ss' 1 no pstg (nechers, d:/au).
ss 1 no pstg, (wrobel, h:/au).
SS 1 NBR NECHERS/AU
   NBR WROEBEL/AU
   NBR LENZHOFF/AU
   NBR PATCHORNIK/AU
SS 1 PATCHORNIK:/AU
   mm (patchornik:) (4)
   ALL; PRT.TI
   PSTG 54
   PRT TI TRIAL SKIP 3
   PRT; TRIAL SKIP 3
   (POLYMER OR POLYMERS; FD REAGENTS; FD COENZYMES OR THIAMINE OR THIOZOLE OR
   no pstg ()polymer).
   PSTG 3951
   continue entering ss 3
   PYRIDOXAL
   no pstg (thiozole).
   PSTG 2244
   SS 3 PSTG 2244
   SS 4 OR THIAZOLE
   PSTG 3078
   SS 5 4 OR POLYMER OR 4 AND POLYMERS
   PSTG 24
   SS 6 2 AND POLYMER OR 2 AND POLYMERS
   PSTG 124
   SS 7 6 OR 2 AND POLYMERIC
   PSTG 127
   SS 8 4 AND POLYMERIC OR 5
   PSTG 24
   SS 9 7 OR 8
   PSTG 151
   SS 10 PRT TI SS 7; PRT TI SS 8
   SS 10 7 AND BIOCHEMICAL
   no match.
   SS 10 BIOCHEMICAL AND (POLYMER OR POLYMER$ backspacing
   SS 10 BIOCHEMICAL AND (POLYMER OR POLYMERS OR POLYMERIC)
   PSTG 18
   SS 11 PRT TI
   SS 11.8 OR 10
   PSTG 42
   SS 12 PRT OFFLINE
SEARCH #3

Experienced Searcher B

SS 1 POLYMERS; FD STYRENE; FD DIVINYL AND BENZENE
ss 1 pstg 58930
ss 2 pstg 15837
ss 3 pstg 52
SS 4 2 AND 3
pstg 28
SS 5 4 OR 1
pstg 58944
SS 6 COENZYMES OR SUBSTRATES OR REAGENTS
pstg 8407
SS 7 6 AND 5
pstg 490
SS 8 SYNTHESIS OR REACTIONS
SS 8 BACKUP
SS 7 6 AND 5
pstg 490
SS 8 SYNTHESIS
pstg 52427
SS 9 REACTIONS
pstg 165651
SS 10 9 OR 8
SS 10 BACKUP
SS 9 REACTIONS
pstg 165651
SS 10 7 AND 8
pstg 28
SS 11 7 AND 9
pstg 43
SS 12 11 OR 10
pstg 60
SS 13 PRINT AU, TI SKIP. 57
SS 13 PRINT FULL SKIP 57
SS 13 PRINT FULL SS 12 2
SS 13 HIS
SS 13 PRT OFFLINE

Experienced Searcher C

SS 1 NECHERS, D:/AU
no pstg (nechers, d:/au).
SS 1 NECHER, D:/AU
no pstg (nechers, d:/au).
SS 1 NBR NECHERS/AU
LENZHOFF, A:/AU
no pstg (lenzhoff, a:/au).
SS 1  PATCH$
SS 1  NBR PATCH/AU
   NBR PATCHNINIK/AU
   PATCHORNINIK, A:/AU
   mm (patchornik, a:) (4)
   ALL
   pstg 54
SS 2  1 AND POLYMER## AND (SUBSTRATE# OR ALL REAGENT#)
   mm (polymer##) (18)
   ALL
   mm (substrate# (4)
   pstg 11
SS 3  PRT AN TI IT
   pstg 974
SS 4  BENZENE AND ETHENYL
   pstg 3123
SS 5  3 AND 4
   pstg 68
SS 6  PRT AN TI IT
   PRT CC
SS 6  5 AND SEC14/CC
   pstg 10
SS 7  2 AND NOT 6
   pstg 9
SS 8  PRT AN TI CC
SS 8  PRT IT 4* SKIP 1
   3 AND (ALL PEPTIDE: OR ORGANIC)
   pstg 79
SS 9  PRT TI IT
SS 9  PRT OFFLINE
SEARCH #3

Semi-Experienced Searcher E

SS 1 POLYMER:
  mm (polymer: (86)
  ALL
  pstg 101952
SS 2 BOUND
  pstg 4614
SS 3 SUPPORT:
  mm (support:) (9)
  SUPPORT:
  np (support:)
SS 3 SUPPORT:
  mm (support:) (9)
  1 or 2
  1 OR 2 OR 7 OR 8
  pstg 4844
SS 4 REAGENT:
  mm (reagent:) (10)
  1 OR 8
  pstg 8232
SS 5 IMMOBILIZED
  pstg 1469
SS 6 HIS
SS 6 2 OR 3 OR 4 OR 5
  pstg 18863
SS 7 1 AND' 6
  pstg 1390
SS 8 POLYSTYRENE
  pstg 7351
SS 9 6 AND 8
  pstg 149
SS 10 COENZYME
  pstg 1529
SS 11 9 AND 10
  none
SS 11 7 AND 10
  pstg 3
SS 12 PRF FULL 3
  PRF TRIAL 3
SS 12 HIS
SS 12 THIAZOLE:
  mm (thiazole:) (79)
  all or none
  ALL
  pstg 1068
SS 13 7 AND 12
  none
SEARCH #3

Semi-Experienced Searcher E - Continued

SS 13-6 AND 12
pstg 15
SS 14 THIAMINE:
mm (thiamine:) (10)
1 OR 2 OR 5 OR 7 OR 8
pstg 1339
SS 15 7 AND 14
none
SS 15 9 AND 14
none
SS 15 1 AND 14
pstg 1
SS 16 PRT TRIAL
SS 16 1 AND 12
pstg 21
SS 17 8 AND 12
none
SS 17 PYRIDOXAL:
mm (pyridoxal:) (11)
ALL
pstg 630
SS 18 7 AND 17
none
SS 18 1 AND 17
pstg 6
SS 19 HIS
SS 19 1 AND 2
pstg 388
SS 20 10 AND 19
pstg 1
SS 21 PRT TRIAL
SS 21 MODEL
pstg 32223
SS 22 7 AND 22
pstg 263
SS 23 2 AND 23
pstg 12
SS 24 HIS
SS 24 9 OR 11 OR 13 OR 15 OR 16 OR 18 OR 20 OR 23
pstg 206
SS 25 PRT OFFLINE

Semi-Experienced Searcher F

SS 1 POLYMER-BOUND
no pstg (polymer-bound) prompt (note 71)
SS 1 POLYMER AND 'BOUND
pstg 279
SS 2 BIOLOGICAL OR BIOCHEMICAL
pstg 58324
SEARCH #3

Semi-Experienced Searcher F - Continued

SS 3 1 AND 2
  pstg 5

SS 4 3 AND REAGENT#
  mm (reagent#) (3)
  1,2
  no match

SS 4 PRINT SS 3 5

'SS3' is not a valid print parameter. command ignored.

SS 4 PRINT SS 3 5

SS 4 2 AND REAGENT#
  mm (reagent#) (3)
  1,2
  pstg 180

SS 5 THIAMINE OR THIAZOLE
  pstg 2173

SS 6 5 AND 4
  pstg 1

SS 7 PRINT

SS 7 "NECHERES"

SS 7 NECHERS, D:AU AND 4
  search syntax error. search aborted

SS 7 NECHERS, D:AU :AUAU AND 4
  search syntax error. search aborted

SS 7 NECHERS, D:AU AND 4
  no pstg (nechers, d:/au).
  no match

SS 7 LEUZHOFF,A:AUAU AND 4
  no pstg (leuzhoff,a:/au).
  no match

SS 7 LENZOFF A:AUAU AND 4
  no pstg (lenzoff,a:/au).
  no match

SS 7 LENZHOF A:AUAU AND 4
  no pstg (lenzhoff,a:/au).
  no match

SS 7 PATCHORNIK,A:AUAU AND 4
  no pstg (patchornik,a:/au).
  no match

SS 7 WROEBEL,H:AUAU AND 4
  no pstg (wrebel,h:/au).
  no match

SS 7 PRT SS 3 5 OFFLINE
SEARCH #3

Semi-Experienced Searcher G

SS 1 POLYMER AND REAGENT
   no pstg (polymer)
   mm (reagent:) (10)
   ALL
   no match

SS 1 POLYMERIZATION
   pstg 25514

SS 2 ALL-REAGENT
   pstg 8232

SS 3 1 AND 22
   no match

SS 3 1 AND 2
   pstg 36

SS 4 STYRENE
   no pstg (styrene)

SS 4 100-42-5/RN
   pstg 3495

SS 4 4 AND .3
   pstg 1

SS 6 PRINT

SS 6 POLYSTYRENE
   pstg 7351

SS 7 ADDITION REACTION
   pstg 2837

SS 8 6 AND 7
   pstg 3

SS 9 PRINT

SS 9 BENZENE, ETHENYI
   no pstg (benzene, ethenyl)

SS 9 100-42-5/RN
   no pstg (100-42-5/RN)

SS 9 HIAT

SS 9 DIVINYLBENZENE
   pstg 1094

SS 10 DERIVATIVES
   pstg 41268

SS 11 16 AND 4
   pstg 148

SS 12 THIAMINE PYROPHOSPHATE
   no pstg (thiamine pyrophosphate)

SS 12 THIAMINE AND PYROPHOSPHATE
   pstg 79

SS 13 12 OR TP2
   pstg 91
SEARCH #3

Semi-Experienced Searcher G - Continued

SS 14 11 AND 14
error reenter input
11 AND 13
no match
SS 14 THIAMINE
pstg 139
SS 15 PYRIDOKAL
pstg 626
SS 16 14 AND 15
pstg 5
SS 17 11 AND 14
no match
SS 17 11 OR 14
no pstg (11 or 14).
SS 17 11 OR 14
pstg 1487
SS 18 11 AND 14
no match
SS 18 PYRIDOXAL PHOSPHATE
no pstg (pyridoxal phosphate).
SS 18 11 AND REACTION
pstg 58
SS 19 PRINT TRIAL
SS 19 PRINT TITLE
SS 19 DECARBOXYLATION
pstg 1912
SS 20 HIS
CARBOXYLATION
pstg 722
SS 21 HIS
SS 21 11 AND 19
no match
SS 21 TRANSAMINATION
pstg 212
SS 22 11 AND 21
no match
SS 22 9 AND REACTION
no pstg ("9).
no match
SS 22 6 AND 13
no match
SS 22 11 AND 13
no match
SS 22 ERASEALL

comment (note 76)

line garbage
Semi-Experienced Searcher G - Continued

SS.21 15 AND 20
  pstg 1
SS 22 PRINT 1 SS 21
SS 22 LENZHOFF,:/AU
  no pstg (lenzhoff,:/au).
SS 22 PATCHORNIK,:/AU
  mm (patchornik,:) (4)
    ALL
    pstg 54
SS 23 14 AND 22
  pstg 4
SS 24 PRINT 4 SS.23
SS 24 WROEBEL,:/AU
  no pstg (wroebel,:/au).
SS 24 15 AND NOT ALL PROTEIN:
  pstg 40
SS 24 15 $
SS 25 AMINO AND ACID
  pstg 23506
SS 26 15 AND NOT 25
  pstg 32
SS 27 PEPTIDE
  pstg 8458
SS 28 15 AND NOT 27
  pstg 17
SS 29 PRIM$..1
SS 29 PRINT 17 SS 28
SS 29 13 OR 23 OR 28
SS 30 PRT OFFLINE

Novice J

SS 2 I ALL REVIEWS:
  np (lall reviews:)
SS 2 POLYMER SYNTHESIS
  np (polymer.synthesis):
SS 2 POLYMER AND SYNTHESIS
  pstg 1360
SS 3 POLYMER AND REACTIONS
  pstg 3304
SS 4 1 AND 6 AND 7
  pstg 8
SS 5 PRINT 'TRIAL
SS-5' PRT OFFLINE
SEARCH #3

Semi Experienced Searcher H

SS 1 ALL 'POLYSTYRENE'
search term may not begin with 'f' character. term deleted.
no pstg ('polystyrene').
SS 1 POLYSTYRENE
pstg 7351
SS 2 SYNTHESIS
pstg 52427
SS 3 SOLID AND STATE
pstg 4801
SS 4 1 AND 2 AND 3
no match
SS 4 CHLOROMRS
SS 4 CHLOROMETHYL POLYSTYRENE
pstg 2
SS 5 PRINT 2 SS 4
SS 5 2 AND 3
pstg 57
SS 6 5 AND NOT PROTEIN
pstg 56
SS 7 5 AND NOT PROTEINS
pstg 56
SS 8 POLYMER AND BOUND
pstg 279
SS 9 THIAMINE
pstg 1339
SS 10 8 AND 9
no match
SS 10 ALL PYRIDOX:
pstg.1158
SS 11 8 AND 10
no match
SS 11 BIOCHEMICAL
pstg 7246
SS 12 8 AND 11
no match
SS 12 3 AND 11
no match
SS 12 1 AND 11
no match
SS 12 1 AND 9
pstg 1
SS 13 PRINT 1 SS 12
SS 13 1 AND 10
no match
SS 13 NECKERS, D.C./AU
no pstg (neckers, d.c./au).
Search #3

Semi-Experienced Searcher H - Continued

SS 13 NECKERS/AU
   no pstg (neckers/au).
SS 13 LENZHOF/AU
   no pstg (lenzhoff/au).
SS 13 PATCHORNIK/AU
   no pstg (patchornik/au).
SS 13 WROEBEL/AU
   no pstg (wroebel/au).
SS 13 WOODWARD/AU
   no pstg (woodward/au).
SS 13 NECKERS/AU
   mm (neckers:) (6)
   1 AND 2
   pstg 11
SS 14 1 OR S
SS 14 PRINT 11 SS 13
SS 14 SOLID AND PHASE
   pstg 3826
SS 15 14 AND 9
   no match
SS 15 14 AND 10
   no match
SS 15 4 AND 14
   no match
SS 15 1 AND 14
   pstg 41
SS 16 ALDOL
   pstg 297
SS 17 15 AND 16
   no match
SS 17 DECARBOXYLATION
   pstg 1912
SS 18 15 AND 17
   no match
SS 18 TRANSAMINATION
   pstg 212
SS 19 15 AND 18
   no match
SS 19 15 AND 11
   no match
SS 19 ALL COENZYME:
   pstg 1625
SS 20 15 AND 19
   no match
SS 20 ALL REACTION:
SS 20 REAGENT
   pstg 8232
Novice K

SS 1 POLYMERS
  pstg 58930

SS 2 REAGENTS
  pstg 3951

SS 3 1 AND 2
  pstg 96

SS 4 COENZYME
  pstg 1529

SS 5 3 AND 4
  no match

SS 5 ALDOL AND CONденSATION
  pstg 254

SS 6 3 AND 5
  no match

SS 6 DECARBOXYLATIONS
  no pstg (decarboxilations)

SS 6 TRANSMAMINATION
  pstg 212

SS 7 3 AND 7
  pstg 1

SS 8 3 AND 6
  no match

SS 8 THIAMINE
  pstg 1338

SS 9 3 AND 8
  no match

SS 9 NECHERS, D:/AU
  no pstg (nechers, d:/au)

SS 9 LENZHOFF, A:/AU
  no pstg (lenzhoff, a:/au)

SS 9 PATCHORN, A:/AU
  mm (patchornik, a:) (4)

ALL
  pstg 54

SS 10 HIS
  pstg 20

SS 11 PRT TRL
  pstg 1

SS 11 PRT TRIAL
  pstg 1

SS 11 PRT TRIAL SKIP 2 3

SS 11 BIOCHEM:
  mm (biochem:) (31)
  all or none?
  ALL
  pstg 12329

SS 12 11 AND ALL POLYMER: AND ALL REAGENT:
  pstg 1

(Continued next page)
SEARCH #3

Novice K – Continued

SS 13 PRINT
SS 13 11 AND ALL POLYMER:
pstg 79
SS 14 PRINT TI.6
SS 14 PRT OFFLINE

Novice L

SS 1 POLYMERABOUN$S
SS 1 POLYMER AND BOUND AND REAGENTS
pстg 8
SS 2 1 AND COENZYMES AND BIOCHEMICALS
no match
SS 2 1 AND THIAMINE AND THIZOLE
no match
SS 2 THIAMINE AND THIAZOLE
пстg 24
SS 3 2 AND ALL POLYMER:
no match
SS 3 THIAMINE OR THIAZOLE
пстg 2173
SS 4 3 AND ALL POLYMER
пстg 12
SS 5 PRINT TRIAL
SS 5 HIS
SS 5 1 AND ALL ENZYMES:
no match
SS 5 PRT OFFLINE SS 4
Novice M

SS 1 100-42-5/RN
    pstg 3495
SS 2 2039-93-2/RN
    pstg 29
SS 3 HIS
SS 3 1 AND 2
    pstg 10
SS 4 BENZENE
    pstg 15999
SS 5 DIVINYLYL
    pstg 325
SS 6 4 AND 4
    pstg 52
SS 7 HIS
SS 7 3 AND 6
    no match
SS 7 1 AND 6
    pstg 1
SS 8 2 AND 6
    no match
SS 8 BIOCHEMICAL
    pstg 7246
SS 9 REAGENTS
    pstg 3951
SS 10 8 AND 9
    pstg 7
SS 11 HIS
SS 11 6 AND 10
    no match
SS 11 POLYMER
    pstg 52853
SS 12 BOUND
    pstg 4614
SS 13 11 AND 12
    pstg 279
SS 14 8 AND 13
    no match
SS 14 9 AND 13
    pstg 8
SS 15 HIS
SS 15 6 AND 13
    pstg 2-
SS 16 PATCHORNIK, A/AU
    no pstg (patchornik, a/au).

(Continued next page)
SEARCH #3

Novice M - Continued

SS 16 LENZHOFF, :/AU
  no pstg (lenzhooff, :/au).

SS 16 PATCHORNIK, A:/AU
  mm (patchornik, a/) (4)
  all or none
  ALL
  pstg 54

SS 17 HIS

SS 17 13 AND 16
  pstg 8

SS 18 ALL POLYMER: AND ALL REAGENT:
  no match

SS 18 ALL POLYMER: AND ALL REAGENT:; FD 12 AND 18; FD 16 AND 18 ] prompt (note 88)

ss 18 pstg 259

ss 19 pstg 11

ss 20 pstg 11

SS 21 ALL POLYMER: AND 16
  pstg 23

SS 22 HIS

SS 22 16 AND 18
  pstg 11

SS 23 6 AND 13
  pstg 2

SS 24 22 OR 23
  pstg 13

SS 25 HIS

SS 25 6 OR,13, OR 17

SS 26 PRT OFFLINE
Experienced Searcher A

SS 1 HYDROGEN AND BONDING AND ALL ALCOHOL# comment (note 90)
pstg 167
SS 2 PRT TI
SS 2 PRT OFFLINE

Experienced Searcher B

SS 1 ALL ALCOHOL#; FD HYDROGEN AND ALL BOND; comment (note 91)
pstg 16844
  time ovflw: cont? (y/n)
  N
SS 2 HYDROGEN AND ALL BOND:
pstg 5575
SS 3 1 AND 2
  pstg 284
SS 4 EQUILIBRIUM AND ALL CONSTANT#; FD BOND AND STRENGTH
  pstg 568
  pstg 518
SS 6 4 OR 5
  pstg 1086.
SS 7 6-AND3
  no pstg (6 and 3)
SS 7 6 AND 3
  pstg 14
SS 8 PRINT TRIAL
SS 8 HIS
SS 8 PRT OFFLINE

Experienced Searcher C

SS 1 HYDROGEN BOND OR HEAT OF HYDROGEN BONDING
  pstg 4147
SS 2 1 AND (ALL ALCOHOL# OR ALL ALC#)
  pstg 331
SS 3 PRT TI IT
SS 3 PRT TI IT CC 5 SKIP 5
SS 3 2 AND NOT AMINE
  pstg 303
SS 4 3 AND NOT 2
  no match
SS 4 2 AND NOT 3
  pstg 28.
SS 5 PRT TI
SS 5 PRT TI CC SS 2 SKI
SS 5 PRT TI CC SS 3 SKIP 5
SS 5 PRT OFFLINE SS 3

109
Semi-Experienced Searcher E

SS 1  ALCOHOL
      pstg 7469
SS 2  HYDROGEN BOND
      pstg 4041
SS 3  EQUILIBRIUM
      pstg 7230
SS 4  EQUILIBRIUM
      pstg 7230
SS 5  EQUILIBRIUM AND CONSTANT
      pstg 272
SS 6  1 AND 2 AND 6
      none
SS 6  1 AND 2 AND 5
      none
SS 6  1 AND 2 AND 3
      none
SS 6  NMR
      pstg 19680
SS 7  1 AND 2 AND 6
      pstg 9
SS 8  POLYMER: OR OLIGOMER
      mm (polymer:) (86)
      all or none
      ALL
      np (oligomer)
      time ovflw: cont? (y/n)
SS 9  POLYMER: AND OLIGOMER
      pstg 101952
SS 9  HIS
SS 9  7 AND 8
      none
SS 9  INFRARED SPECTROSCOPY
      np (infrared spectroscopy)
SS 9  IR
      pstg 21114
SS 10  2 AND 3 AND 10
       pstg 20
SS 11  DIPOLE MOMENT
       pstg 2625
SS 12  2 AND 3 AND 12
       pstg 3
SS 13  ENTHALPY SOLUTION
       np (enthalpy-solution)
SS 13  ENTHALPY
       pstg 4114

(Continued next page)
SEARCH #4

Semi-Experienced Searcher F - Continued

SS 14 2 AND 3 AND 14
  pstg 4
SS 15 HIS
SS 15 7 OR 10 OR 11 OR 14
  pstg 34
SS 16 PRINT TRIAL
SS 16 15 AND EQUILIBRIUM
  none
SS 16 PRT OFFLINE SS 14

Semi-Experienced Searcher F

SS 1 HYDROGEN AND BONDING
  pstg 2663
SS 2 ALCOHOL#
  mm (alcohol#) (2)
  all or none
  ALL
  pstg 15313
SS 3 1 AND 2
  pstg 167
SS 4 POLYMER AND 3
  pstg 1
  zrint
  zrint is not a recognized explainable item
  comment (note 94)
SS 5 PRINT
SS 5 NUCLEAR AND MAGNETIC AND RESONANCE AND 3
  no pstg (resonance and 3).
  no match
SS 5 NUCLEAR AND MAGNETIC AND RESONANCE AND 3
  pstg 13
SS 6 3 AND INFRARED AND ALL SPECTR
  pstg 31
SS 7 5 AND PROTON
  pstg 1
SS 8 PRINT
SS 8 5 AND CARBON-13
  no match
SS 8 (HEAT OR ENTHALPY) AND 3
  pstg 47
SS 9 5 OR 6 OR 8
  pstg 74
SS 10 PRT OFFLINE

comment (note 95)

comment (note 96)

comment (note 97)
Semi-Experienced Searcher G

SS 1 HYDROGEN BONDING
pstg 1

SS 2 HYDROGEN BONDING
pstg 1

SS 3 HYDROGEN BOND
pstg 4041

SS 4 ALCOHOL:
mm (alcohol:) (31)

ALL
pstg 16844

SS 5 3 AND 4
pstg 240

SS 6 TERTIARY
pstg 2614

SS 7 5 AND 6
pstg 8

SS 8 PRINT 8

SS 8 597-49-9/RN
pstg 26

SS 9 1 AND 8

SS 9 3 AND 8
pstg 2

SS 10 PRINT TRIAL

SS 10 CARBOTETRACHLORIDE
no pstg (carbotetrachloride).

SS 10 HIST

SS 10 9 AND 10
no match

SS 10 597-93-3
no pstg (597-93-3).

SS 10 597-49-3/RN
no pstg (597-49-3/rn).

SS 10 597-93-3/RN
no pstg (597-93-3/rn).

SS 10 597-93-3/RN
pstg 10

SS 11 HIST

SS 11 5 AND 10
no match

SS 11 MONOXYDRIC AND ALIPHATIC
no pstg (monodydric).

no match

SS 11 ALIPHATIC
pstg 3857

SS 12 11 AND 6 AND 4
pstg 23

SS 13 13 AND 3
pstg 34

SS 14 PRINT TRIAL

(Continued next page)
Semi-Experienced Searcher G - Continued

PRINT TI
SS 14 9 OR 13
   pstg 36
SS 15 PRT OFFLINE

Semi-Experienced Searcher H

SS 1 HYDROGEN
   pstg 43767
SS 2 BONDING,
   pstg 8134
SS 3 ALL BON:
   pstg 28274
SS 4 ALL BOND:
   pstg 21826
SS 5 1 AND 4
   pstg 5575
SS 6 ALCOHOL
   pstg 7469
SS 7 5 AND 6
   pstg 101
SS 8 BOND
   pstg 14979
SS 9 STRENGTH
   pstg 19883
SS 10 7 AND 8 AND 9
   pstg 4
SS 11 PRINT 4 SS 10
SS 11 EQUILIBRIUM
   pstg 7230
SS 12 ALL CONSTANT:
   pstg 23576
SS 13 5 AND 6 AND 11 AND A$$
   no match
SS 13 5 AND 6 AND 11
   pstg 2
SS 14 PRINT 2 SS 13
SS 14 HINDERED
   pstg 729
SS 15 5 AND 6 AND 14
   no match
SS 15 STERIC
   pstg 1800
SS 16 5 AND 6 AND 15
   pstg 2
SS 17 PRINT
SS 17 DIMER
   pstg 2325

(Continued next page)
Semi-Experienced Searcher H - Continued

SS 18 D$ALL DIMER:
   no pstg (D$all dimer):
SS 18 ALL DIMER:
   pstg 5868
SS 19 5 AND 6 AND 18
   pstg 3
SS 20 PRINT 3 SS 19
SS 20 BECKER, E. D./AU
   no pstg (becker, e. d./au).
SS 20 BECKER, E. D./AU
   pstg 1
SS 21 PRINT 1 SS 20.
SS 21 RAO, C. N. R./AU
   pstg 98
SS 22 5 AND 21
   pstg 6
SS 23 PRINT, 6 SS 22
SS 23 BERNAL, J. D./AU
   no pstg (bernal, j. d./au).
SS 23 LIPPINCOTT, E. R./AU
   pstg 12
SS 24 5 AND 23
   pstg 1
SS 25 PRINT 1 SS 24
SS 25 POOLE, J. A./AU
   pstg 37
SS 26 5 AND 25
   pstg 4
SS 27 PRINT 4 SS 26
SS 27 HANNA, M./AU
   pstg 1
SS 28 PRINT 1 SS 27
SS 28 MCCLELLAN, A. L./AU
   pstg 2
SS 29 PRINT 2 SS 28
SS 29 MURTHY, A. S. N./AU
   pstg 8
SS 30 5 AND 29
   pstg 6
   too many ss. use keep or backup to continue searching.
   (10 OR 13 OR 19 OR 22 OR 24 OR 26 OR 28) explanation (note 102)

ERASE ALL

(Continued next page)
Semi-Experienced Searcher H - Continued

SS 1 HYDROGEN
    pstg 43767
SS 2 ALL BOND4
    pstg 21826
SS 3 ALCOHOL
    pstg 7469
SS 4 ALL ALCOHOL:
    pstg 16844
SS 5 1 AND 2 AND 4
    pstg 284
SS 6 ENERGY
    pstg 824
SS 7 1 AND 2 AND 6
    pstg 827
SS 8 1 AND 2 AND 4 AND 6
    pstg 37
SS 9 BOND
    pstg 14979
SS 10 8 AND 9
    pstg 35
SS 11 MURTHY, A. S. N./AU
    pstg 8
SS 12 1 AND 2 AND 11
    pstg 6
SS 13 PRINT 6 SS 12
SS 13 PRT OFFLINE SS 10

Novice J

SS 1 HYDROGEN BONDING
    pstg 1
SS 2 HYDROGEN BOND
    pstg 4041
SS 3 ALCOHOLS
    pstg 8601
SS 4 EXPERIMENTAL PROCEDURES PERTAINING TO HYDROGEN BOND
    no pstg (experimental procedures pertaining to hydrogen bond).
SS 4 1 AND 2
    no match
SS 4 2 AND 3
    pstg 185
SS 5 TECHNIQUES OR PROCEDURES
    pstg 5725
SS 6 4 AND 5
    no match
SS 6 2 AND 3 AND 5
    no match
SS 6 PRINT TRIAL
    comment (note 104)
SS 6 PRT OFFLINE

comment (note 103)
comment (note 104)
comment (note 105)
comment (note 106)
SEARCH #4

Novice K

SS 1 HYDROGEN BOND
   pstat 4041

SS 2 ENERGY
   pstat 85241

SS 3 ALCOHOL
   pstat 7469

SS 4 ALCOHOLS OR 3
   pstat 15313

SS 5 1 AND 2 AND 4
   pstat 28

SS 6 EQUILIBRIUM
   pstat 7230

SS 7 6 AND CONSTANT
   pstat 272

SS 8 5 AND 7
   pstat 1

SS 9 PRINT TRIAL

SS 9 HIS

SS 9 PRINT TRIAL

SS 9 HIS

SS 9 PRT OFFLINE

Novice L

SS 1 HYDROGEN AND BONDING AND ALCOHOLS
   pstat 136

SS 2 1 AND INTER ACTIONS
   no pstat (inter actions).
   no match

SS 2 1 AND INTERACTION
   pstat 7

SS 3 PRINT TRIAL

SS 3 1 AND 2 AND SPECIES FORMED
   no pstat (species formed).
   no match

SS 3 1 AND 2 AND SPECIES AND FORMED
   no match

SS 3 NMR OR NUCLEAR MAGNETIC RESONANCE AND ALL ALCOHOL:
   pstat 19697

SS 4 HYDROGEN BOND AND 3
   pstat 478

SS 5 NMR OR

SS 5 (NMR OR NUCLEAR MAGNETIC RESONANCE) AND ALL ALCOHOL:
   pstat 296

SS 6 5B$

SS 6 5 AND HYDROGEN BOND
   pstat 28

SS 7 PRINT TRIAL

SS 7 PRT OFFLINE

116
Novice M

SS 1 BECKER, E./AU
specify numbers, all, or none
2 15
pstg 21

SS 2 ALCOHOL
pstg 7469

SS 3 1 AND 2
pstg 2.

SS 4 HYDROGEN
pstg 43767

SS 5 BONDING
pstg 8134

SS 6 HIS

SS 6 2 AND 3, ANND
no pstg (3 and),
no match

SS 6 2 AND 3 AND 4
pstg 2

SS 7 2, AND 4 AND 5
pstg 53

SS 8 1 AND 7
pstg 2

SS 9 HINDERED
pstg 729

SS 10 HIGHLY
pstg 3675

SS 11 9 AND 10.
pstg 27

SS 12 7 AND 11
no match

SS 12 HIS

SS 12 PRI$ 3 OR 7
pstg 53

SS 13 PRT OFFLINE

prompt (note: 114)

prompt (note 115)
EXPERIENCED SEARCHER A

GENERAL COMMENTS

Search #1. Looks easy. Used Index Guide to get Registry Numbers.

Search #2. Has not yet solved the problem of how to search "in-water" topics. Since he was unsure of "salt water," tried it without salt.

Search #3. This topic is biochemistry which he knows nothing about. With good citations, he would go through Science Citation Index. Also, he would use an author approach since it is dealing with polymers. Did some offline preparation.

Search #4. Said he would not normally perform this search without the patron present. Requires too much guesswork about what the person wants. Thought of limiting this search by methods but since requestor indicated a comprehensive search, he decided to give him all of them.

Had asked what command cleared the system but before I could answer "ERASE ALL," he had looked it up in his notes.

Does not like the multimeanings message.

SPECIFIC COMMENTS (see Appendix E)

Search #1
Note 1 Was sure the requestor wanted SS 5. Not so sure about SS 3.

Search #2
Note 33 These are the hot ones. Doesn't know if he should limit it to that. If requestor were here he would not have restricted it to salt water media since he doesn't know how to search it effectively. That is, he would not have limited it to that unsatisfactory approach. Pursues it without salt but it doesn't help.

Search #3
Note 68 "That's dirty pool." Apparently someone has written an encyclopedia article on just this topic and it's not properly indexed so the searcher can't build on it. "That's why CA does not have adequate indexing."

Note 69 Knows these 24 are good citations. Wonders how to get the rest.

Search #4
Note 90 Was thinking of limiting the search by methods but since the person wanted a comprehensive search, he decided to give him all of these citations.
EXPERIENCED SEARCHER B

GENERAL COMMENTS

Prefers to do a partial search, then get feedback from the requestor and define the search further rather than trying to anticipate a final search without requestor input. Does as much work as possible on a search prior to going online. Very money conscious, even for this test. The most concerned about time online of all participants.

Search #1. Does not like this topic - way out of anything he knows about. Would have looked up Abramovich article to help her develop the topic. Used Index Guide to look up Registry Numbers.

Search #2. Does not like to use Chemdex online. Would have looked up CO registry number manually under normal circumstances.

Search #3. Felt this to be a very broad search. In a normal situation, he would want to talk more with the patron, to get more of a definition of what he's talking about, does he expect to find a lot.is he using correct terminology; etc.

Would tell the person to plan on spending a lot of money or possibly approach by author.

Used Index Guide to help formulate the search.

At the end of the search, he said he would give those results to the patron as a starting point for more search development.

Search #4. Patron does not specify types of alcohol - would ask him about this. Says he prefers to do a broad search initially so the patron can throw out or narrow from them. Would give him the 14 postings, then tell him over 200 others available. Would have wanted further clarification.

SPECIFIC COMMENTS

Search #2
Note 34 Does not like to use CHEMDEX or CHEMNAME files online. Prefers to do this kind of preparation offline.

Search #3
Note 70 Needed help with how to print citations since he does not normally search SDC.

Search #4
Note 91 Discusses search procedure, preferring a broad approach to cover everything, then let the patron weed out irrelevant items of narrow topic more.
- Experienced Searcher B 
Specific Comments - Continued

Note 92 Would let requestor look at first 50-100, then see how he might want to narrow topic. Proceeded to narrow because of project limitations.

Note 93 Would give him these 14 postings then tell him over 200 others available.
This searcher works for Chemical Abstract's Service. Like the others, he was free to use as much time as the others within the limits of an afternoon. Interested in having him "exploit" the database and SDC capabilities rather than be cost effective. While this was the same situation with others, he had less qualms about finding exactly what was in CA on that topic, even if topic poor. His ability to use the offline search aids was keen and he relied heavily on these for reference. He also knew the file so well that he could track down exceptions that even other experienced searchers would miss.

He said searches 1 and 3 were rough because he knew CA indexing policy on these was exceptional.

Search #1. Would probably go to the printed tool first because he suspects the substances are not listed in Chemdex yet. Would look for coordination compound for ligand entry, get registry number, then search online.

Used Index Guide extensively for preparation.

Went to General Subject Headings for electron exchange reactions and electron exchangers. Wanted to see what kinds of things are indexed under that heading. Suspects an online search will yield the same results.

Uses General Subject Headings too - open as reference while searching online. Gave up on controlled vocabulary - used natural language to get electron transfer which he said would pick up controlled vocabulary too.

Says CA searchers often fall back on natural language searching.

Search #2. Used Index Guide to find registry number for CO and CO₂. Said he knew it would be listed in the cross reference under carbon oxide.

In evaluating citations, concluded they have nothing to do with what patron wants.

"Once I throw salt in, I'm in trouble." Many irrelevant citations, didn't like any of them repeatedly tries new strategies.

"Do you know if the emphasis is biological?" (I don't know.) I think he was considering searching by bio section.

Search #3. Doesn't just refer to his notes while searching, also makes use of search request on SS4 where he got 900 postings. He asked for the Subject Coverage Manual - I should have had one for him to use - would like to get rid of material on inorganic polymers - can't do that without the subject coverage manual or reviewing all 900, if that's too many, would look at the last 79.

Says it is a difficult area - knows CA has a strange indexing policy on substrates.
EXPERIENCED SEARCHER C

General Comments - Continued

Search #4. Both Index Guide and General Subject Headings open and extensively used.

Not sure if he'll need methods indicated (by search requestor) but he might so he's looking them up in the Index Guide: In IG under infrared structure, he sees bond headings so he checks General Subject Headings under hydrogen bond. Would look for everything connected with pentamine cobalt in dictionary, legends, and combine with electron transfer to be really comprehensive.

Wanted to try author approach but not working.

Can't get rid of alcohol amine - anything to cut it would also get rid of relevant citations. Tried to take out amine term but reluctant.

"Thiazole has me puzzled - not sure what they mean."

SPECIFIC COMMENTS

Search #1.
Note 2. "That I don't understand." Used Index Guide to see where he made a mistake and corrected.

Search #2.
Note 35. Says he always forgets last parenthesis.
Note 36. Searched registry number with a qualifier.
SEMI-EXPERIENCED SEARCHER E

GENERAL COMMENTS

Said it was hard to keep up with changes in searching services. Usually uses the key-word list to formulate search terms. Did not know how to search by author. Had not used Chemdex file before. Was not clear on the difference between the Index Guide and General Subject Headings. Used IG as if it were GSH until I explained the difference.

Search #1. Did not feel search #1 was well written.

Search #3. This searcher also wrote search #3. He said he was most definitely interested in "everything there is."

SPECIFIC COMMENTS

Search #1.
Note 4. Prompted all on SS 1.

Note 5. Needed help with number form on SS 2.

Note 6. Searching form of cobalt (3+) was a problem. When we found citations with it, he felt it confusing that the same citation listed it as both cobalt (3+) and cobalt (III).

Note 7. Having problems keeping track of search so I told him about the HISTORY command. He liked it a lot (new to him).


Search #2.
Note 37. Told him to try searching with AND.

Note 38.

Note 39. Suggested he restructure this since he used OR and AND in the same search statement.

Note 40. Reminded him to check the search request for the number of articles desired.
SEMI-EXPERIENCED SEARCHER F

GENERAL COMMENTS

Always wanted to learn about string search. Hoped I would show him when we were done. Never used Index Guide before to prepare a search. Hasn't searched in years (he helps students design searches [presearch]). Librarian then runs them for them.

Learned about the neighbor command a couple of days ago. Liked SDC display at truncation. Likes seeing terms. Uses word frequency microfiche.

I reviewed Index Guide and General Subject Headings with him - he does not emphasize when teaching his class online searching. However, the students must first search through the printed tool so they are familiar with the General Subject Headings.

Normally makes use of the microfiche list of terms but because of time, he'll do it online. He did not know that control vocabulary can be two words not linked with Boolean operators.

Search #1. Tried to look up pentammine in IG. Could not find the term. Says it should be spelled with two m's. His guess is that the researcher doesn't want articles on just the substance he mentions, but related substances as well, so he doesn't want to restrict the search to pentammine cobalt group.

Search #4. Wanted to look up carbon 13 in the microfiche but not enough time. Decided to do it online.

SPECIFIC COMMENTS

Search #1.
Note 9. "Distrubing." - only 8 postings for SS 5.

Note 10. As he struggled to reconstruct search, I suggested HISTORY command.

Note 11. I helped him properly structure author search statements.

Search #2.
Note 41. He asked how to start a line over. I prompted $.

Note 42. Needed some assistance getting registry numbers.

Note 43. With only 29 postings his temptation would be to give them all to the patron.

I suggested he print a few to see if they were on the topic.

Note 44. Helped again with $.

Note 45. "That blows the whole thing away - unbelievable there's no match."
Semi-experienced Searcher F
Specific Comments - Continued

Search #3.
Note 71. Needed some assistance restructuring polymer-bound.

Note 72. "That's everthing." Decided to play around a bit more.

Note 73. "Let's try another tack here. This is a place where I could have used clusters (explicit nesting)."

Note 74. Prompted him on use of colon in author searching.

Note 75. "I'm not sure I've got that name spelled right." Was also forgetting space after comma in author form but I was not watching to prompt him about it and he just assumed there were no hits anyway.

Search #4.
Note 94. "How about that, that's not going to get me anything. Back to square 1."

Note 95. That's better (13 postings)."

Note 96. "I just can't resist that. If I only get one posting, I've just got to see it!"

Note 97. Since the patron wanted a comprehensive search, he would give him these 74.
SEMI-EXPERIENCED SEARCHER G

GENERAL COMMENTS

This searcher had done some searching many years ago. Now if he needs a search done, he gives it to someone else to run. I assumed his background was stronger than it is and therefore may have not given him the appropriate introduction to the project. Also, there were some line problems and ORBIT often received messages with squiggles. It appears the testee did not try to key these terms in again; did not realize his messages were being read incorrectly.

Basically, this searcher took a manual approach to searching which resulted in too narrow a search strategy. He does not seem to start with a broad enough base to perform subject searches. He used the General Subject Headings, Index Guide, and even looked up some of the material listed on the search forms. His pretest notes were extensive, if too specific for affective online searching.

Search #1. He emphasized the importance of doing a manual search. When done, said he would need to rethink approach and try again later.

Search #2. Considered this a fairly straightforward search. Requestor does not specify whether he wants salt water or sea water. None of his approaches yielded relevant articles. (Happened several times with other participants on search #2.)

Search #3. Said that since the requestor wanted polymer reagents, he would approach the topic from Engineering Index first. Would also suggest Index to Encyclopedia of Polymers. He had looked in CA under "polystyrene" but there were at least three pages.

Search #4. Identified some highly hindered alcohols from memory and tried to track down their registry numbers before going online. Also meant to search by online section number 22 but forgot.

Again, I would like to emphasize that the poor results of this searcher were due primarily to my improper assessment of his familiarity with online systems prior to testing. This was compounded by line problems that I did not notice until looking over the results after the test was over. However, I must also say that a manual approach is not appropriate to online searching as this set of searches clearly illustrates.

SPECIFIC COMMENTS

Search #1.
Note 12. He reemphasized preference for doing a manual search first.

Note 13. Helped him set up this statement.

Note 14. Would give him that article, then talk about topic.
Semi-experienced Search G
Specific Comments - Continued

Search #2.
Note 46. I suggested he double check registry number. Noticed later he had
forgotten /RN.

Note 47. Used "water" because he didn't expect many postings. Said the pro-
cess was not well developed yet.

Search #3.
Note 76. Wonders if he should use styrene or polystyrene.

Search #4.
Note 99. Did not believe the postings for "hydrogen bonding." I suggested he
check Index Guide. He said he would have prepared better under
different circumstances.

Note 100. "I could have just printed the title.

Note 101. Would give the patron these two and then talk with the patron about
the topic.
SEMI-EXPERIENCED SEARCHER, H

GENERAL COMMENTS

This searcher does a small amount of searching for himself and others. He has a cue card of commands and the word frequency list on fische. Said the use of the $ to start a line over was a new and useful piece of information (picked up from AV presentation). I told him to do this and other searches as he would normally. The only major difference was probably that since it was for this project, he knew he needn't be as concerned about money. In fact, he and Semi-experienced Searchers E and F took the approach that the test was a chance for them to gain more experience online. Quite a strong tendency to print citations online.

Search #1. Doubted seriously if he would find 25-35 articles on this topic.

Search #2. No feel for this topic at all. Could get 2 or 200 postings. Does not like SDC prompt that asks if he wants to continue printing out citations.

Search #3. Looked up "pyridoxal" in the Merck Index. Never uses history command but reals in the paper often to check.

At conclusion of search said that he would tell requestor #3 that the literature on peptides is voluminous, that he should start with some books on it which he should be familiar with and if he isn't, he, searcher H, would recommend some. In short, he felt the search too broad. This was the first time he'd ever used exclusion (AND NOT peptides).

SPECIFIC COMMENTS

Search #1.
Note 15. "Oh dear, that can't be right (only one posting for pentamminecobalt).

Note 16. "That's exactly what he wants."

Note 17. "False drops. The 5 printed out are not all that relevant."

Note 18. "Probably good background - only one that is really right on target."

Note 19.

Note 20. Gave assistance with using AND.

Search #2.
Note 48. Can't believe "carbon monoxide" not listed.

Note 49. Does not believe CO2 posting either.

Note 50. Only one paper directly applicable.
Search #2.
Note 51. These 20 are probably good background even though in the field of engineering and the requestor is an oceanographer. Could have done without prompting asking him if I wanted to continue printing citations.

Search #3.
Note 77. "I'm getting nowhere here." Never uses HISTORY command but often reels in paper to check earlier input.
Note 78. "You've got to be kidding (no match)."

Search #4.
Note 102. This searcher had printed these out online and would have given print to requestor. Automatically reviewed printout and crossed off not relevant citations.
Note 103. Total set would include online and these offline citations.
NOVICE J

GENERAL COMMENTS

Said he would like to create subset of Journals to search. Required CODENS which we didn't have access to.

Had not read handouts sent prior to testing, looked them over at my suggestion. Found system too imposing to search without assistance. That is, despite keen interest regarded it as an imposition on his time if expected to figure it out for himself.

Went on system to play around. Explained basic mechanics like operators. Said was very familiar with CA General Subject Index (trained in Chemical bibliography at Oklahoma).

Said he felt there were too many searches, that he would much prefer doing one thoroughly. Throws experiment off balance because he would normally have done a great deal of preparation.

Chemdex file not available today.

Looked over search requests. Did not like #3. Says way too general i.e. literature survey on polymer chemistry. Would send it back and try to tie him down. Decided he wants review articles to help define the topic further.

Would probably start off with Journal approach if CODENS available:

- Journal of American Chemistry Society
- Journal of Organic Chemistry
- Journal of Inorganic Chemistry (for #1)
- Journal of Physical Chemistry

Said he would do more preparation on 1, 2 and 3 before searching. Liked #4 the best and felt he would let stand, felt he would find information on it as is.

Search #1. (Observación: person who would normally use indexes for preparation is not using them when faced with new online system. I reminded him of indexes as a source of control terms. Did not care to use them.)

Does not think to ask me for help with vocabulary development since he considers chemistry his field.

Search #2. Asked if there was a set way to get review articles. I told him it was the same as any other topic i.e. review AND. (How to search for review articles would make a good canned search for prompting system.)

Asked how to formulate SSI. I told him any terms he could think of that would go with a review article, like history, etc. He acknowledged but didn't act on it in SSI. Seems reluctant to search same concept with different terms.
General Comments - Continued

Search #3. Said once more he felt the search request was way too general.
Satisfied with results given quality of search request.

Search #4. Feels the most confident about his ability to do a good search on this one. SS1 - "Than can't be." Turned to GSI to check term. Figured out the term must be hydrogen bond instead of hydrogen bonding.

SS5 - Said what he'd retrieved wasn't what the person wanted.
I asked him why. He said why and I suggested he search the topic he was defining for me orally.

Does not consider 185 postings unreasonable given the topic.
Went through an explanation of searching, the Index Guide etc. Went online to give him an idea of how system worked - searched "mass spectroscopy of dibenzoyl diimides."

Looked in Chemdex for RN and CAS 77, CAS 72-76 to give him "flavor" of how system works. He said he felt he understood basically how the system worked - thought he'd need help with commands though.
GENERAL COMMENTS

Saw AV, read over handouts. Since he was local, he has been able to take more time to prepare. Studied the materials, the tools. When I asked him if he had any questions, he said he found the "mechanics very confusing." Asked some questions which lead to a review of:

- continue on the next line
- the print commands and what they would give you
- an explanation of registry numbers
- CA policy regarding RN's
- content of a CHEMDEX record etc.
- can use as many terms as you like
- meaning of slash, then search field initials

Once we started searching, it was obvious the difference between controlled vocab. and free text was not clear, if not in definition then in use. I felt an oral introduction and leading him through a practice search would have helped. Also, he didn't really seem to understand what a record was, or the relation between the search statements and a record, or between one search statement and another. In short, I feel he would have benefited greatly from more of an introduction. It was cumbersome to try to cover this material adequately while on line. I did not want to do this, but I did make mental note that he needed more explanation; otherwise he wouldn't keep trying to put in terms without an AND operator, wouldn't drastically limit his searches at the beginning with his knowledge that carbon monoxide, for instance would retrieve too many postings. Fundamental understanding of the nature of the relationship between terms and record needed.

His concluding remarks indicated that he felt that despite how closely he read handouts, etc., it was necessary to be lead through a search to understand. Also, it was apparent that computer search demanded a different approach and way of thinking than a manual approach.

I felt his understanding of the topics and the level at which to approach the searches was excellent but he felt the mechanics and basic understanding of searching a database were too much to conquer without training.

The session was essentially a training session and he left with a much better understanding of the system even though he had watched others search before.

Search #1. Found it necessary to lead him through the search even though his concept development was good. Overall, I feel he understood quickly but help was necessary. I felt not enough explanation of searching preceded session, that is, what a record is, what postings are, how to develop vocabulary, etc.

Search #2. Loses track of meaning represented by search statements. Decided he couldn't find anything on this one.
After reading handout and seeing AV, we talked about searching. He asked if there were any advantages to starting broad and then narrowing search or vice versa.

We ran a practice search.

I have started out with all novices to try to get them to just sit down and search. But the reactions to this have ranged from mild indignation to a dumb stare. As a result, it has turned into a tutorial anytime they "blank" out which is often until around the third search. At this point, they begin to enter the "semi-experienced" category. Testing the novices in the area has also changed the time demands. Especially true of novice who could have taken a whole day to run the test. Our "testees" have not had this kind of time to give us. However, when here locally they have had an hour here, and there. As a result, the testing has been broken up if necessary for their convenience. This has meant an introduction session and a testing session. They have taken the search requests away with them after the introduction. I have asked all who have done this to make note of any outside sources consulted.

His opinions of the searches (before searching):

#1. Confusing over the way the topic is presented. Felt the title was a much better description of the topic than the paragraph. Paragraph is confusing because it is not straightforward enough, especially if someone doesn't already know the subject. Things often come to a standstill once online.

#2. Difficulty getting beyond poor English. Problem seems straightforward enough.

#3. The searcher says he's interested in polymers too. Tremendously broad topic. At first, he thought the requestor didn't know what he wanted, then decided he might want a broad search before narrowing the topic. Felt the need to talk with search requestor.

#4. Pretty good project. Fairly straightforward. Thought it the best request. Has done some research on the topic himself.

Asked for an explanation of search guides. I explained the Index Guide and Subject Heading. He used IG after this to prepare searches. He couldn't believe there wasn't a registry number for hydrogen bond. I explained that there wouldn't be, that RN's are only for specific discrete chemical substances.
APPENDIX G: EXPERIENCED SEARCHER D

Experienced Searcher D's approach was so distinct that it is not possible to compare him with the others. For one thing, he uses an intelligent terminal with fairly sophisticated capabilities. This alters his approach to searching, and the way results were recorded for this project. This appendix includes only the final search histories. There is a great volume of data on this searcher's style but it is too much to include in this report.

Please contact Maureen Corcoran if you would like to examine the raw data. Also, the searches were run on CAS77 instead of CAS7276. After we caught this mistake, some were redone for reference but the CAS77 searches were his first attempt. Since his style includes discussing his search strategy instead of end results, it is not possible to match final bibliographies with others. See main body of report for further discussion.
SEARCH #1

Final Logic Used on CAS77

SS 1: ALL METHYL:PYRIDINE (536)
SS 2: ALL PENTA:AMMINE (116)
SS 3: ALL METHYL:PYRIDINE (46)
SS 4: ALL FERRICYANIDE (339)
SS 5: ELECTRON AND (TRANSFER OR EXCHANGE) OR OXIDN AND REDN OR REDOX (10456)
SS 6: 5 AND ALL REACTION OR 5 AND ALL KINETIC OR 5 AND ALL MECHANISM (6414)
SS 7: COBALT (15016)
SS 8: COBALT AND III (1367)
SS 9: 6 AND (NICKEL OR IRON OR FERROUS OR FERRIC OR FERRYL OR TRANSITION OR 7) (885)
SS 10: ALL PENTA:AMMINE:COBALT OR 2 AND 7 (64)
SS 11: 10 AND 1 (1)
SS 12: ALL TAUBE, H:AU (32)
SS 13: 5 AND 12 (10) ← known author
SS 14: 12 AND 5 AND 6 (10) ← author's relevant hits
SS 15: 1-AND 2 AND 7 (1)
SS 16: 3 AND 5 (3) ← wanted product from REDOX
SS 17: 16 AND NOT 15 (3)
SS 18: 3 AND 1 (12) ← product from starting materials
SS 19: 18 AND NOT (15 OR 16) (12)
SS 20: 10 AND 9 (13)
SS 21: 5 AND 6 (6414) ← Redox reaction general
SS 22: 21 AND 9 (885) ← Redox reaction using related transition metals
SS 23: 22 AND 10 (13) ← Pentaammine cobalt redox reaction using transition metals

SEARCH #2

SS 1: CO OR CARBON AND MONOXIDE OR 630-08-0/RN (9858)
SS 2: CO2 OR CARBON AND DIOXIDE OR I24-38-9/RN (11064)
SS 3: 1 AND 2 (1701)
SS 4: 3 AND (OXIDN OR OXIDATION) (136)
SS 5: 1 AND (WATER OR SEAR OR OCEAN OR ALL AQUA:) (511)
SS 6: 3 AND 5 (132)
SS 7: 1 AND (ALL TRANSFER: OR EQUIL OR ALL EQUILIBRI:) (330)
SS 8: 1 AND (ALL BACTERIA: OR ALGAE) (39)
SS 9: 4 AND 5 (4)
SS 10: 7 AND 3 (85)
SS 11: 8 AND 3 (5)
SS 13: 1 AND 12 (214)
SS 14: 3 AND 12 (25)

(Continued next page)
SEARCH #2 - Continued

SS 15: 5 AND 12 (27)
SS 16: 6 AND 12 (4)
SS 17: 7 AND 12 (4)
SS 18: 8 AND 12 (29)
SS 19: 11 AND 12 (4) CO \text{*} CO \text{2} \text{ AND ALGAE \text{*} SEC}
SS 20: 18 AND NOT 19 (25) CO \text{*} ALGAE \text{*} SEC
SS 21: 17 AND NOT (18 OR 19) (4) CO \text{*} EQUIL \text {*} SEC
SS 22: 16 AND NOT (17 OR 18 OR 19) (3) CO \text{*} CO \text{2} \text{ AND WATER \text{*} SEC}
SS 23: 15 AND NOT (16 OR 17 OR 18 OR 19) (20) CO \text{*} WATER \text{*} SEC
SS 24: 14 AND NOT (15 OR 16 OR 17 OR 18 OR 19) (18) CO \text{*} CO \text{2} \text{ AND SEC}
SS 25: 13 AND NOT (14 OR 15 OR 16 OR 17 OR 18 OR 19) (140) CO \text{*} SEC
SS 26: 25 AND NOT (SMOKE OR SMOKING OR ALL CIGARETT+ OR TOBACCO) (116) CO \text{*} SEC

SEARCH #3

SS 1: SOLID AND PHASE AND SYNTHESIS (479)
SS 2: POLYMER AND BIOCHEMICAL (11)

SEARCH #4

SS 1: HYDROGEN AND ALL BOND (3858)
SS 2: 1 AND (ALL BACKER, A:/AU OR ALL RAO, C:/AU OR ALL BERNAL, J:/AU OR ALL LIPPINCOTT, E:/AU OR ALL POPLE, J:/AU OR ALL HANNA, M:/AU OR ALL MCCLELLAN, A:/AU OR ALL MURTHY, A:/AU) (4)
SS 3: 1 AND NOT 2 (3854)
SS 4: 3 AND (ALL MONOMER+ OR ALL DIMER OR ALL SEC35:/CC) (235)
SS 5: 4 AND ALL HINDER: (1)
SS 6: 4 AND (ALL STRENGTH: OR ALL STRONG:) (5)
SS 7: 4 AND NOT 6 (230)
SS 8: 7 AND (ALL ALSC OR ALL ALCOHOL:) (10)
SS 9: 7 AND ALL HYDROXYL+ AND NOT 8 (9)
SS 10: 7 AND NOT (8 OR 9) (211)
SS 11: 10 AND ANALYSIS (3)
SS 12: 10 AND PROPERTIES (22)
SS 13: 10 AND REACTIONS (29)
SS 14: 10 AND (NMR OR IR OR HEAT OR 11) (75)
SS 15: 14 AND NOT (8 OR 9) (75)
SS 16: 10 AND NOT (8 OR 9 OR 14 OR 6) (136)
SS 17: 16 AND 12 (14)
SS 18: 1 AND (ALCS OR ALL ALCOHOL: OR ALL HYDROXYL+) (360)
SS 19: 18 AND ALL HINDER: (2)
EXPERIENCED SEARCHER D

GENERAL COMMENTS

These comments taken from letters.

Search #1. Here are my notes on Question 1. I spent about three hours (off and on, among the usual business interruptions) plus about one hour of on-line time. I am not at all satisfied with the performance, but it does illustrate the problem of not having direct access to the requestor.

I made the erroneous first assumption that the REDOX synthesis of methylpyridone via a cobalt transition metal was well known. I entered the logic via Orbit in SAVE (ss 1 - 8 of INITIAL TRY) only to find no hits in the SS 4 and 5. I tried to resolve the problem on-line, but eventually admitted that I need to restructure the approach since I was not going to find the specific technology wanted.

In this type of request, I would search only CAS77, and give the requestor the list of hits from the following search statement sets, asking him to review the CA abstracts and then come back to me for either modifying the CAS77 search or to apply the same logic to CAS7276 and Chem 7071 if needed:

- SS 16 (3) Methylypyridones and REDOX reactions
- SS 18 (12) Methylypyridones and Methylypyridines
- SS 20 (13) Pentaaminecobalt and transition metals; since no hits resulted in SS 23 and 20, the 13 hits of SS 20 probably do not relate to REDOX reactions.
- SS 14 (10) Author H. taube items on REDOX
- SS 21 (885) This set represents the general subject of REDOX reactions using related transition metals. A 20 hit sampling might be in order for the requestor.

I found no hits that included all of the specific concepts in the requestor's written description. Namely, Methylypyridone REDOX synthesis using pentammine cobalt complex produced no hits (SS 3 and 7, or 3 and 10).

The following is a list of questions that came to mind as I tried to interpret the requestor's written No. 1 Search Description. In my opinion, the search description is well done. But since it covers a subject area where I have little experience, I would have preferred to discuss the request before making the search:

Questions to ask the requestor--

1. Does the user want a "concept" search or a search specific to methylpyridinium salts, pentamine cobalt (III), N-methylpyridone, ferricyamide?
Search #1 - Continued

2. Is the user an expert in this field? If he is, I would discuss his subject interest to be sure:
   1. My interpretation of the request meets his objective.
   2. Appropriate terminology use in this subject field.
   3. Develop additional terms and concepts that aids definition and logic.

3. Does the user expect a large number of hits? Is this an active field of broad participation, or a very specific field of chemistry where only a few probable articles/patents exist. If a large field, then a narrow search is appropriate; if a narrow field, it may be necessary to search broad concepts in the hope of finding those few relevant hits that may exist. Discussion with the user is necessary.

4. If the user is uncertain of this field of chemistry and how much literature is out there, I would normally develop search logic to sample specific and broad as two separate packages. His analysis of the results would aid term/logic development if further searching is necessary--including use of data bases other than CA.

5. Is the user interested in all CA literature, including patents?

6. Has the user made a preliminary manual search of the CA index to confirm appropriate CA terminology?

7. Can the user draw the chemical structure of materials involved (molecular formula)?

8. Is the work "induced" critical to the subject area?

Search #2. Here are the results of Search Two. The terminal record (scroll) labeled OK is the search logic and sampling of various sets that I would want the requestor to review before going further with the search. The original logic package may be of some use—it was run against your ID. Since I am finding it difficult to find uninterrupted time to run your searches, I repeated the "OK" run on my costs.

As I commented on Search One, I would normally review these type of search requests with the requestor before spending time to structure and run the search. The requestor appears to be asking several questions which need clarification of objective as well as terminology. Obviously the requestor needs to know the time limitations of the data bases. They only go back about ten years.

Finally, I would not limit this subject to Chemical Abstracts. I would try Enviroline, Pollution, Compendex, Oceanic and NTIS for a comprehensive try.

Search #3. I found the Search Three description sufficiently difficult to interpret as to make a trial search essentially worthless. The requestor presents a general subject, but it is not clear what type of terminology and search objective is involved. Therefore, I am returning this search with only a cursory trial search attached.

I need to either talk with the requestor or he needs to supply a clearer description of the subject area, associated terminology and useful articles. Likewise, the penmanship is such that I cannot be positive on word and author spellings.

Enclosed is a copy of our search request form which I find is reasonably directive to the user. Actually, few requestors use it initially, but I use it in my presearch consultation with them.
Experienced Searcher D
General Comments - Continued

Search #4. Enclosed are my results on Search Four. As noted previously, the requester appears to be asking several questions. I normally would review the request with him before running the search. A five or ten minute phone call would probably suffice. This is no small matter since a clear understanding is required between requester and searcher.

None of the search requests permitted clear understanding of the requestors' objective and subject specifications (terms). My conclusion is that either (1) the requestors have little experience in using written requests as the primary communication vehicle to an on-line searcher, or (2) the instructions by the NSF study to the requestors placed unfortunate restrictions on the requestors, or (3) the search description forms were not designed for effective communication to the on-line searcher.

However, I tried to interpret Search Four as a four-part request:

1. General subject about the role played by hydrogen bonding in monomers, dimers and high-polymers.
2. Strength characterization of the hydrogen bond as associated with monomers, etc.
3. Hydrogen bonding associated with alcohols, including those hindered.
4. Sets of hits (and citation sampling) involving analysis, properties and reactions as associated with hydrogen bonding.

The high on-line time is the result of excessive on-line printing at 30 cps. My normal practice is to print off-line those sets containing more than five or ten hits.

We are installing a 1200 band printer at one of our terminals which will make on-line printing more economically feasible—especially effective when only a portion of the full format is needed by the requestor.

As a side comment to my handling of the four search requests, work time priority and the pressure of company work played a significant role in my ability to concentrate on any one search. I quite naturally place top priority on meeting my company's demands. And there were circumstances that interfered with clear thinking and terminal performance. I state this not as an excuse, but a statement of facts affecting the operating atmosphere. I felt more comfortable running Search Four—just the opposite of the circumstances surrounding Searches One and Two.

My various notes to you are my personal reactions. I trust you will use these comments carefully as there is no intent to downgrade anyone. After all, my comments are only one point of view and are made with very little background on the NSF study.