C_3 News

Newsletter of College Chemistry Canada / La Chimie Collégiale au Canada

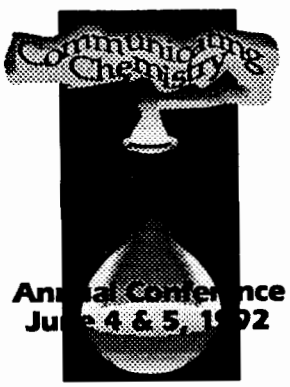
17th Annual C_3 Conference, June 4 & 5, 1992

Conference Speakers Announced

Fine to Address 17th Conference

The Plans for the 17th Annual College Chemistry Conference are moving along. Two of the featured speakers have been arranged, and if they are any indication of the quality and diversity of the conference program, this is one not to be missed!

Professor Leonard Fine of Columbia University is widely known for the excellent chemistry texts he has written. However, he also happens to be an expert in "post-consumer plastic waste". Professor Fine will separate the myths from the facts in the controversial area of plastic recycling.



Dr. David Rosenblatt is Professor of Medicine and Director of McGill University's Division of Medical Genetics. Dr. Rosenblatt is recognized world wide as an expert in the chemistry of rare genetic disorders.

One session, entitled "Chemshow and Share", will comprise presentations, each of which will be no more than ten minutes in length, with five minutes for discussion. Speakers who do not wish to present longer papers will be able to share an experiment, demonstration, analogy, anecdote, computer application, or any interesting classroom experience.

View of the Vanier College campus in Saint-Laurent.

The social program is also taking shape, including a "Shopping Tour of Montreal" on Saturday, June 6. This will be led by a shopping expert who knows the wholesale business, and who will direct participants to some real bargains. The compulsory gastronomic tours and walking tours of Old Montreal will also be available.

More details on the conference and registration particulars will be published in our next edition in March.

In this issue...

News from Medicine Hat College

By Brad J. Pavelich
Medicine Hat College

The first semester this year has been a busy and interesting one for everyone here at the Medicine Hat College, and I am sure the winter term will be equally so.

Our satellite campus at Brooks, Alberta opened officially on September 20. (Brooks is a town of approximately 10,000 people just 110 km west of Medicine Hat). Although I have not been out to the campus as yet, I have heard wonderful things about the facility. As yet there are no courses offered at the Brooks Campus not already offered here in Medicine Hat, but I am sure that will soon change. For students in the Brooks area the new campus saves them a great deal of travel time, or the expense of moving to Medicine Hat. The first year university transfer chemistry is taught in Brooks by **Ron Linowski**.

New and old faces made appearances at the main campus this fall. **Dr. Brian Lloyd** kept busy with his organic chemistry classes and setting up a 'slightly used' NMR. The NMR is being incorporated into the second year organic chemistry courses, allowing the students hands on experience with this technique.

Poor health forced me to miss most of the first semester. Taking over my lectures in the first year university transfer chemistry was **Errol Carruthers**, brought out of a short retirement to deal with over 100 first year students. I am certain this return to the classroom will make his present vacation to warmer climates much more enjoyable, if not deserved.

Helping out with the first year chemistry laboratories, and some upgrading chemistry courses, was **Dr. Brian Gomke**, also making a return to the Medicine Hat College. Brian started his undergraduate studies at the Medicine Hat College, and has earned degrees from Calgary (BSc in Chemistry), Queen's (MSc in Electroanalytical Chemistry), and Saskatchewan (PhD in Nuclear Analytical Chemistry and a BEd in Secondary Chemistry, Physics, and Mathematics). Brian is a welcome addition to our core of chemists teaching here in Medicine Hat.

Departing our group is **Bruce Perrin**, who after several years of teaching, has opted for early retirement. Bruce will not only be missed by everyone in the college, but envied for his opportunity to fine tune his golf and curling skills. He is already our 'resident pro' in these sports; not it is up to the rest of the community to try to defeat him. Best of luck Bruce!

Cynthia Mutch has not left our department, but will no longer be teaching chemistry for us. Let's hope we can still convince her to attend our yearly meetings as she is a friend to all, and would be surely missed.

Now that the holiday season is over, I should return to my work. Everyone here hopes you enjoyed your time away from the classroom, and wishes you the best in the New Year.

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Volume 17, No.1, Winter 1991/92

Published quarterly by
College Chemistry Canada Inc.

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Articles of any length will be gladly accepted. Please send typewritten copy to the Editor at the above address or send by fax. Copy can also be sent on a floppy disk, using WordPerfect, Word, or any word processor producing ASCII output.

ISSN 0843-4956

Layout and design by Bob Browne
Printing by the Douglas College Print Shop

C3 News Briefs

¤ The Spring meeting of 2YC3 is to be held at the College of Marin, in Marin County California, on April 3rd and 4th.
C3 Editor, Alan Davis, has been invited to speak on Chemistry by Open Learning, and to attend 2YC3 meetings as our liaison.
For more information on the conference, call Elizabeth Armstrong at Kanata College (415)-306-3291.

¤ The 75th Canadian Chemical Conference and Exhibition will be held at the Edmonton Convention Centre, from May 31 to June 4th, 1992.
Information on the program is available from:
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Programme C-Chair
75th CCC
Department of Chemistry
University of Alberta
Edmonton, Alberta
T6G 2G2
Tel: (403)-492-5581

¤ Correction: In our fall edition, Dr. Daniel McClean's name was omitted from the list of faculty associated with the Centennial College Environmental Protection Technician Program. It is he who should be contacted for more information on this program.
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ACID/BASE MISCONCEPTIONS

By Bob Perkins
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As has been described in a previous paper (What Are We Really Telling Our Students?: BC Catalyst Summer 1990 #4 p9-10), pre-conceptions by our students can pose a barrier to effective learning. We may feel that the presentation of a particular topic has been the best that we have ever given; only to be discouraged when the results of the next evaluation period do not support that belief. We may be tempted to say that the students have just not put any effort into the material (possibly true for some), or feel that it is just a "weak class". Some of the problem may lie with ideas that the students already have in their heads before entering our classrooms. They may have developed distinct hypotheses to rationalize various aspects of the world around them, and these pseudo-theories may be contrary to the material which we present to them. A significant portion of their time may revolve around trying to come to grips with the apparent (in their minds) contradictions.

For the past three years, I have been using a pre-test on acid/base chemistry to try and bring out these pre-conceived beliefs about the subject before we cover it in class. The test is administered the class the day before we begin our coverage of acid/base chemistry, and I ask the students to indicate the number of questions which they believe to have answered correctly.

The following results were obtained over the past three years from classes at the University of B.C. and Kwantlen College (Richmond campus), as well as from two presentations at science conventions. A total of 358 first year students (256 university/102 college) and 110 teachers (math and science) took part in the test. The number of responses and percentages are listed after each question. The three sets of numbers are for the teachers, university students, and college students.

Question 1

What is the $[H_3O^+]$ in a solution of NaOH having a pH = 10.3?

A) 5×10^{-11} B) 5.0×10^{-11} C) 5.01×10^{-11} D) other

Response	A	B	C	D
Teachers	57	8	42	3
	51.8%	7.3%	38.2%	2.7%
Students-U	53	64	118	21
	20.7%	25.0%	46.1%	8.2%
Students-C	6	11	51	34
	5.9%	10.8%	50.0%	33.3%

One common misconception involves the number of significant figures necessary when one takes the log (or ln) of a number. The pH scale is actually a log scale, a difference of 1 pH unit corresponds to a 10 fold difference in the $[H_3O^+]$. If one has a pH of 10.3, then the $[H_3O^+]$ is equal to $10^{-10.3}$. There is only one significant digit in the resulting answer (5×10^{-11}, response A). If the original pH had been 10.30, then the correct answer would have been $10^{-10.30}$ (5.0×10^{-11}).

Question 2

What is the pH of a neutral solution at body temperature (37.0°C)? The value of K_w is 2.42×10^{-14} at 37.0°C.

A) 6.024 B) 6.808 C) 7.000 D) other

Continued on page 4

17th Annual College Chemistry Conference
Vanier College, June 4th and 5th, 1992

CALL FOR PAPERS

This is a preliminary call for papers for the conference, the theme of which is "Communicating Chemistry". Papers will be considered for inclusion in the conference programme on any topic of chemistry of chemical education.
Prospective presenters should send an abstract of their paper (200 words or less), indicating the preferred length of presentation (15, 30 or 45 minutes) to the Conference Coordinator:

Dr. Joe Schwarcz
Vanier College
821 Ste. Croix Avenue
Saint-Laurent
Quebec H4L 3X9
or by FAX 514-744-7501

Acid/Base Misconceptions

Continued from page 3

Response	A	B	C	D
Teachers	0	72	28	10
	0.0%	65.5%	25.5%	9.1%
Students-U	4	72	164	16
	1.6%	28.1%	64.1%	6.3%
Students-C	3	29	57	13
	2.9%	28.4%	55.9%	12.7%

Another common misconception is the belief that a neutral solution is one which has a pH of 7.0. We (and most textbooks) spend a great deal of time dealing with equilibria and the effects of a change in pressure, volume, and temperature on the position of an equilibrium system. We try and ensure that they understand that the only thing which can affect the value of an equilibrium constant is temperature. We then move on to acid/base chemistry and then give (unconsciously I suggest) the impression that K_w is somehow different, and that it always has the value of 1.00×10^{-14}. For a neutral solution:

$[H_3O^+] = [OH^-] = K_w^{1/2}$

$pH = pOH = 1/2\ pK_w = 1/2\ (-\log 2.42 \times 10^{-14})$

Thus for a neutral solution at 37.0°C, the pH should be equal to 6.808 rather than the most common student answer of 7.000.

Question 3

3. What is the pH (at 25.0°C) of a solution of HCl(aq) of concentration 1.00×10^{-10}?

A) 4.000 B) 7.000 C) 10.000 D) other

Response	A	B	C	D
Teachers	13	15	64	18
	11.8%	13.6%	58.2%	16.4%
Students-U	44	7	185	20
	17.2%	2.7%	72.3%	7.8%
Students-C	23	1	60	18
	22.5%	1.0%	58.8%	17.6%

Students (and instructors) quite often let the mechanics of problem-solving take over from carefully reading a question before reaching for the calculator. The most common answer for this question was a pH of 10; clearly ridiculous as we are dealing with an acidic solution. In most cases the $[H_3O^+]$ resulting from the hydrolysis of water is ignored as it is small compared to the concentration of the acid (or base) under consideration. In this case we cannot ignore the hydrolysis of water, and the pH of the solution is 7.000 (at least to 3 decimal points).

Question 4

What is the pH at the end-point of a titration between an acid and a base at at 25.0°C?

A)< 7.000 B) 7.000 C) > 7.000 D) can't say

Response	A	B	C	D
Teachers	2	29	0	79
	1.8%	26.4%	0.0%	71.8%
Students-U	10	128	13	105
	3.9%	50.0%	5.1%	41.0%
Students-C	4	53	5	40
	3.9%	52.0%	4.9%	39.2%

The end-point of a titration is when the indicator being used changes colour. As the change could take place anywhere from pH 1 to 12 depending upon which indicator is used, one cannot say where the colour change will take place. Several students mistakenly believed that the end-point was the position where the # of moles of acid equaled the # of moles of base. This is known as the equivalence point, and the correct answer would still be D, as the pH at the equivalence point would depend upon the relative values of K_a and K_b for the acid and base used in the titration.

Question 5

What is the conjugate base of NH_3?

A) NH_4^+ B) OH^- C) NH_2^- D) other

Response	A	B	C	D
Teachers	2	29	0	79
	1.8%	26.4%	0.0%	71.8%
Students-U	10	128	13	105
	3.9%	50.0%	5.1%	41.0%
Students-C	4	53	5	40
	3.9%	52.0%	4.9%	39.2%

If students are uncertain about the concept of acid/base conjugate pairs, it is very easy to get the answer backwards. If one wants the conjugate base of NH_3, then NH_3 must be acting as an acid (i.e. losing H^+), resulting in the formation of the NH_2^- anion (answer C).

C3 News
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