the influence of pH on the rates of reactions of different acid solutions with sodium bicarbonate. The questions in the problem are based on the concepts of pH, buffer solutions, strong and weak acids, rate laws, strong and weak electrolytes, and the microscopic interpretation of acid dissociation. The problem screen looks like the accompanying figure.

The students work through the eight questions using the video buttons to see video clips when needed. The first question describes three solutions — hydrochloric acid, acetic acid, and an acetic acid/acetate buffer. The first three videos show the measurement of the pH of these three solutions using pH paper. The students are asked if the relative pH values they observe agree with what they expect and to explain their answer. In Question2, as a follow-up the students are asked to calculate the pH of the buffer and to compare the results of the calculation with their observations.

In question 4, the students are asked to think about the rate law for the second reaction, H+ (aq) + HCO3- (aq) —> CO2 (g) + H2O. How would they expect the rate of the reaction to vary with [H+]? For which of the three acid solutions in this problem would they expect the reaction with bicarbonate ion to be highest? They then observe the fourth video, which shows the reactions with the three acids. The relative rates of reaction can be determined from the rate at which CO2 bubbles come and go in the test tube.

The questions also sometimes ask about a microscopic representation of what the stuents have seen. Question 6 shows four different representations of the HCl molecules in solution — one undissociated, two partially dissociated, and one completely dissociated2. The students are asked which picture best illustrates that HCl is a strong acid and why they think so.

Finally in Question 8, the students observe videos of the measurement of the electrical conductivity of three unknown solutions (one is water, one HCl, and one acetic acid) using a light-bulb probe. They are asked to think about the relative number of ions in each solution and to decide which solution corresponds to which unknown in the videos.

At the present we have finished twenty three of these problems on topics ranging from the drinking bird toy to the paramagnetism of solids, the phlogiston theory of combustion, and the electrolysis of water. Student reaction to the problems generally has been positive (with the exception of one situation in which the videos were incompatible with the computer network). The students seem to take them seriously. We are in the process of testing the problems further and hope to make them available to others later.

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1 ChemDemos I and II Laser Videodiscs, JCE: Software Special Issues, University of Wisconsin-Madison, Department of Chemistry, 1101 University Ave., Madison, WI 53706

2 Smith, K. J.; Metz, P. A. J. Chem. Educ. 1996, 73, 233.

Is There a Future for JCE Software?

Nancy S. Gettys
Technical Editor, JCE Software
University of Wisconsin-Madison
209 N. Brooks
Madison, Wisconsin 53015-1116

The title of this article may be surprising to readers who recall my article in last spring's newsletter (1) in which I reported many new developments at JCE Software. It comes from a question asked by a colleague visiting Journal House a few months ago. As he passed through my office, he asked if, with the comprehensive CDs developed by textbook publishers, there really was any reason to continue to publish the small programs that have been the staple of JCE Software issues. At the time I was a bit defensive. Upon reflection, I realize I should not have been.

It is obvious that JCE Software cannot compete with commercial publishing companies who can afford to hire teams of professional computer programmers and graphic artists to work with chemistry educators in developing instructional material. We do not have the resources, and frankly, it has never been our goal to provide a compressive chemistry curriculum on disk, CD, the Internet, or any other media. Our purpose has been and remains to make available innovative new

media for chemistry education. Our regular issues generally consist of modest projects developed by an individual or a small group of educators, designed to meet the specific needs they have encountered in their classrooms. These publications are useful to other educators and to students as they stand, but perhaps more important, they provide ideas and examples for others. Past publications are the ancestors and springboards of the current major efforts of commercial publishers on CD-ROM and the Internet. Some publishers have even purchased licenses to include JCE Software publications in their products.

It is important to encourage individual instructors to continue to experiment with and develop media for their students. In education, as in science, we cannot afford the attitude that it has all been done-that because you do not have the best tools or newest equipment, you cannot do important research and contribute to the field. New ideas developed from as many sources as possible and shared with the community are as vital to the health of chemistry education research as they are to laboratory research.

A greater danger to the continued existence of JCE Software may come from authors and developers publishing their own materials on the Internet rather than submitting them for publication. While this direct route is certainly easier than publication in a peer-reviewed academic journal, it has some major drawbacks for both the author and the user. Because the material does not go through the peer review or editorial process, there are no checks on the accuracy of the product. John Moore's editorial in the September 1997 issue of the Journal of Chemical Education (2) explores the consequences, both positive and negative, of the freedom of Internet publication. In short, there are no guarantees that what the user gets is correct, and there is no input to the author to help make the publication better. Also, after all the long hours of work put into the development of the product, there is no "stamp of approval" that comes from publication in a recognized academic journal. Such credentials are generally necessary for retention and advancement in academic positions.

Is there a future for JCE Software? There is a need for such a publication.
Innovative media for chemistry education should be made available to everyone and the authors deserve professional recognition for their achievements. In order to survive, changes will be necessary. As submissions of traditional software decline, publication of special issues, video, and applications of past publications including multimedia presentations and HTML documents incorporating JCE Software video will increase. With the publication of the Chemistry Comes Alive! CD-ROM series (3) the video and animation developed with funding from Images of Chemistry (4) and from other sources, some of which has been published on the ChemDemos and ChemDemos II and Titration Techniques Videodiscs (5, 6, 7) will be widely available to educators in an easy-to-use digital format. As instructors find uses for this tremendous resource in their lectures, lessons, homework, examinations, etc., they are encouraged to share their ideas with others by submitting their work to JCE Software. These publications in turn may inspire the next generation of new media for chemistry education. With the continued willingness of the chemistry education community to both submit their work and purchase issues, JCE Software has the potential of a very long and exciting future.

Citations:

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