

Activity



Misconceptions about Acids and Bases: A Learning Exercise

Activity developed at Kwantlen University College, Surrey, B.C.
By **ROBERT PERKINS** and **SUZANNE PEARCE**
(Adapted by Catherine Filteau of Champlain Regional College in Lennoxville)



Misconceptions about Acids and Bases: A Learning Exercise

Date Last Tested

2005

Author's Name

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Originating Cegep

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Scientific Discipline

Chemistry

Average Age of Students

17-18 years old

Course Title and Number

**Chemical Energetics and Dynamics
(CHEM 1210, equivalent to
Chemistry of Solutions, 202-NYB-05)**

Duration of Activity

20-30 minutes

NOTE

In this document, the masculine is used without discrimination and solely to make the text easier to read.

Appendices are available in PDF and Word format on the CD provided with this document.

In addition, an instructional analysis of the activity is available in the pedagogical treasures section (*Trésors pédagogiques*) on the Saut Quantique Web site at:

<http://www.apsq.org/sautquantique>.

Use of this text is authorized for instructional purposes, provided that author's name and college are mentioned.

Adherence to these recommendations will encourage authors to share their experience.



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Description of Activity

OVERVIEW

In small groups of 3-4 people, students must solve six multiple-choice questions about acids and bases, and agree on the answers to be formulated. Further to this initial exchange, the teacher tells each team how many correct answers were obtained, but does not specify which are the right answers. Discussions then resume to increase the number of correct answers. After the second round of discussions, the members of the team with the most correct answers are asked to mix with the other groups to provide assistance. Further to this exchange, the teacher explains the best answers.

RELEVANCE AND ORIGINALITY OF ACTIVITY

Concepts about acids and bases are taught in high school, and when this topic is addressed in cegep, many students rely on formulas and use their calculators without thinking. This exercise allows students to evaluate their knowledge while helping them determine their limits. The object is to use this exercise as an introduction to the section on acids and bases. Further to discussions, all students will have had an opportunity to give their point of view and rank the reasons, whether good or bad, that guided their choices. This will make it easier for them to change their misconceptions about acids and bases, and help them better understand the chemistry principles involved. The time spent to complete this exercise in class facilitates subsequent learning of concepts of acids and bases.

Objectives and Relation to the Program

PEDAGOGICAL OBJECTIVES OR TARGETED COMPETENCIES

Better understanding of pH calculations, chemical reactions and acid-base titrations.

LINK BETWEEN THE ACTIVITY AND THE PROGRAM

General Program Goals Targeted

This activity targets the following general goals of the *Science* program:

- To take a systematic approach to problem solving;
- To reason logically.

Link with Course

This activity serves as an introduction to the section on acids and bases.

Number of Students and Educational Support

APPROXIMATE NUMBER OF STUDENTS IN CLASS

30-35 students

NUMBER OF STUDENTS PER TEAM

3-4 people

EDUCATIONAL SUPPORT

The teacher provides questions (Appendix S.1) and specifies the number of correct answers obtained by each team further to their exchanges. After discussion, the teacher explains the best answer for each question.

Conducting the Activity

CONDUCTING THE ACTIVITY AND TIME REQUIRED TO COMPLETE EACH STEP

Before

Students team up in groups of 3-4 people (2 minutes).

During

Students analyze the questions and choose their answers.

The teacher verifies the number of correct answers (twice).

Then, the members of the best team mix with the other groups to provide assistance (about 15 minutes).

After

The teacher explains the best answer for each question (5-10 minutes).

Evaluation and Required Material

SUGGESTED EVALUATIONS

The evaluation is formative. There is no summative evaluation for this exercise.

APPENDICES

Teacher

Appendix T.1: Analysis of Questions and Answers

Students

Appendix S.1: Questions on Acids and Bases

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Other Suggestions and Media Directory

OTHER IDEAS TO EXPLORE

The last question, which deals with the conjugate base of NH_3 , is somewhat advanced for students entering cegep. It may be replaced by another question related to the difference between strong and weak acids, for example.

MEDIA DIRECTORY

PERKINS, Robert and Suzanne PEARCE. (December 2005). "A Teachable Moment Exercise – Acid/base Misconceptions", Chem 13 News, no. 334, p. 6-7.



Activity 9

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