Module 3.1: Electrolytes

Background

- What do Electrolytes Actually Do? (LO 3.1.1)
    - Description: This video provides a relevant connection between the topic of electrolytes and sports drinks. This could be used to launch the discussion of electrolytes or as a wrap-up of the module to provide an application of the topic relevant to chemistry in our everyday lives.
    - License: By the American Chemical Society, under a standard YouTube license.

Learning Objectives

By the end of this sub-module, students should be able to:

- LO 3.1.1: Distinguish between strong electrolytes, weak electrolytes, and nonelectrolytes.
- LO 3.1.2: Describe the relationship between the strength of the electrolyte and solubility.

Prior Knowledge Review

- Chem I Module 2.3 Molecular Formula and Structure
    - Description: Module 2.3 may serve to help students distinguish between molecular and ionic compounds.
- Chem I Module 8.1 Aqueous Solutions (Chemistry I)
- Chem I Module 8.2 Precipitation Reactions (Chemistry I)
    - Description: Aqueous solutions (Module 8.1) and solubility (Module 8.2) are typically introduced in chemistry I as students learn about reaction stoichiometry in solutions. Therefore, these modules could be used as a review to facilitate student learning to prepare for more advanced topics related to solutions.

Instructional Materials

Textbook Sections

- OpenStax: Chemistry Atoms First 2e Sections 11.1 The Dissolution Process and 11.2 Electrolytes (LO 3.1.1, 3.1.2)
    - Section 11.1 The Dissolution Process (LO 3.1.2)
    - Section 11.2 Electrolytes (LO 3.1.1, LO 3.1.2)

Video Resources

- Identifying Strong Electrolytes,Weak Electrolytes, and Nonelectrolytes (LO 3.1.1)
    - Description: This video provides a guide to identify strong electrolytes, weak electrolytes, and non-electrolytes.
    - License: By The Organic Chemistry Tutor, under a standard YouTube license.
- Solubility of Electrolytes (LO 3.1.2)
    - Description: This video describes the dissolution process while describing the difference between strong electrolytes, weak electrolytes, and non-electrolytes.
    - License: By The Organic Chemistry Tutor, under a standard YouTube license.
- Demo: Conductivity Experiment (LO 3.1.1)
    - Description: Description: This video demonstrates the electrical conductivity of various strong electrolyte, weak electrolyte, and non-electrolyte solutions.
    - License: By Center for Professional and Distance Education at the University of Central Oklahoma (CPDEatUCO), under a standard YouTube license.

Other Resources

- Instructional Materials: Instructor Google Slides (Slides #1-26) (LO 3.1.1, 3.1.2)
    - Description: These editable slides contain relevant background information to describe the formation of a solution in molecular terms by comparing intermolecular forces and the relationship between the strength of an electrolyte

and solubility. These slides could be used with a live or recorded lecture in the form of videoconferencing or face-to-face instruction.

- License: By Joseph DePasquale, licensed under CC BY-NC-SA 4.0.

Activities and Assessments

Conceptual Activities/Assessments

- Study Guide: Electrolytes (LO 3.1.1)
  - Description: A portion of this study guide/worksheet (labeled as “electrolytes”) is connected to the Openstax textbook section 11.2.
  - Teaching Tip: This worksheet is designed to be used in a flipped classroom but may be useful in other formats as well. This worksheet could be utilized by students as a reading guide as they read through the course material and/or listen to the lecture videos. This resource may need to be modified since for example, there may or not be a “video tutorial on Blackboard” as referenced on the study guide.
  - Answer Key: Solutions for selected items under End of Chapter 11 Practice Problems are available here.
  - License: This content by user Alycia Palmer is used under a Creative Commons Attribution 4.0 International license.
- Textbook Exercises: OpenStax: Chemistry Atoms First 2e
  - Section 11.2 Electrolytes Exercises #13-14 (LO 3.1.1)
  - Description: In these exercises, students will identify strong electrolytes, weak electrolytes, and non-electrolytes and relate the response to electrical conductivity.
  - Teaching Tip: These exercises could be suggested for independent practice, self-study, or used during a class discussion.
  - Answer Key: Solutions to selected exercises have linked answers and are available here.
- Textbook Exercises: OpenStax: Chemistry Atoms First 2e
  - Section 11.2 Electrolytes Exercises #9-10 (LO 3.1.2)

    - Description: These exercises help students to relate the strength of the electrolyte to solubility.
    - Teaching Tip: These exercises could be suggested for independent practice, self-study, or used during a class discussion.
    - Answer Key: Solutions to selected exercises have linked answers and are available here.

Lab Resources

- PhET Virtual Lab for Conductivity (Instructions) (LO 3.1.1, 3.1.2)
    - Description: This online activity provides an opportunity to compare and contrast the dissolution and electrical conductivity of various concentrations of sodium chloride and sucrose solutions. This could be utilized as a virtual lab or as a simulation activity.
    - License: By PhET, University of Colorado Boulder