

Chemistry

General Chemistry

Chemistry Competence Test (CCT)

This is a diagnostic test developed initially to document proficiencies of first-time entering students to South African universities and has proved to be a versatile instrument for multiple uses.

Marietjie Potgieter and Bette Davidowitz. Preparedness for tertiary chemistry: multiple applications of Chemistry Competence Test for diagnostic and prediction purposes. *Chemistry Education Research Practices* 12, pp. 193-204, 2011.

Chemistry Reasoning Test (CRT)

This instrument was designed to be an easy-to-use tool for measuring conceptual understanding and critical scientific thinking of general chemistry models and theories.

Carrie A. Cloonan and John S. Hutchinson. A Chemistry Concept Reasoning Test. *Chemistry Education Research Practices*. 12, pp. 205-209, 2011. DOI: 10.1039/C1RP90025K.

Chemistry Concept Inventory (ChCI)

The ChCI assesses thermochemistry, bonding, intermolecular forces, equilibrium, acids and bases, and electrochemistry. Thirty of the sixty questions for the first semester of a two-semester chemistry course, and the other thirty are for the second semester of the course. Please contact Jim Birk at Arizona State University about this inventory.

J. Birk, B. Jenkins, R. Bauer, S. Krause, M. Pavelich, *Development and Application of a Chemistry Concept Inventory*, Symposium on Research in Chemistry Education, 227th National Meeting of the American Chemical Society, Anaheim, CA, (2004).

Chemistry Concept Inventory (CCI)

The questions are based on common commonly observed student misconceptions about topics generally covered in the first semester of a college chemistry course. The inventory can be found at http://www.jce.divched.org/jcedlib/qbank/collection/CQandChP/CQs/ConceptsInventory/Concepts_Inventory.html.

Mulford DR and Robinson WR (2002) An inventory for alternate conceptions among 1st semester general chemistry students. *J Chem Ed* 79: 739-744.

Journal of *Chemical Education* On-Line: Library of Conceptual Questions. American Chemical Society Division of Chemical Education. 13 December 13 2001.

Jack Barbera, A Psychometric Analysis of the Chemical Concepts Inventory. *J. Chemical Education*, 90 (5), pp. 546-553 (2013). DOI: 10.1021/ed3004353

Solution Chemistry

This two-tier diagnostic instrument is designed to test 16-17 year-old students' understanding of solution chemistry concepts.

Ermine Adadan and Funda Savasci. An analysis of 16-17 year-old students' understanding of solution chemistry concepts using a two-tier diagnostic instrument. *International Journal of Science Education* 34(4), 2012.

Organic Chemistry

Acid Strength

This instrument is a nine-item multiple-tier, multiple-choice concept inventory to identify alternative conceptions that organic chemistry students hold about acid strength, to determine the prevalence of these conceptions, and to determine how strongly these conceptions bias student reasoning.

LaKeisha M. McClary and Stacey Lowery Bretz. Development and Assessment of a diagnostic tool to identify organic chemistry students' alternative conceptions related to acid strength. *International Journal of Science Education* 34(15), 2012.

Thermodynamics

Thermodynamics Concept Inventory (TCI)

The TCI is intended for use in introductory thermodynamics courses. Please contact Clark Midkiff at the University of Alabama about this inventory.

Midkiff, K.C., Litzinger, T.A., and Evans, D.L., "Development of Engineering Thermodynamics Concept Inventory Instruments," *Proceedings, Frontiers in Education Conference*, Reno, Nevada, 10–13 October 2001.

Introductory Thermal Concept Evaluation (ITCE)

Developed to assess a wide range of beliefs or understandings about thermodynamic concepts in 15-18 year old students. Administered in less than 30 minutes.

Shelly Yeo and Marjan Zadnik. Introductory Thermal Concept Evaluation: Assessing Students' Understanding. *The Physics Teacher*, Volume 39, 2001.

Quantum Mechanics

The Quantum Mechanics Visualization Instrument (QMVI)

The QMVI is designed to assess student's understanding of core concepts in introductory quantum mechanics. It is available by contacting Richard Robinett at Penn State.

Description of the development of the instrument is found in Erdat Cataloglu's dissertation (<https://etda.libraries.psu.edu/paper/5937/>).

Quantum Mechanics Survey (QMS)

This survey is designed to evaluate student's conceptual understanding of quantum mechanics in junior-level courses. It is available after obtaining a password via <http://perusersguide.org/items/detail.cfm?ID=11903>.

Chandralekha Singh and Guangtian Zhu. *Surveying students' understanding of quantum mechanics in one spatial dimension*, *Am. J. Phys.* **80** (3), 252-259.

Quantum Mechanics Conceptual Survey (QMCS)

This twelve question survey is designed to assess students' conceptual understanding of quantum mechanics.

S.B. McKagan, K.K. Perkins and C.E. Wieman. Design and validation of Quantum Mechanics Conceptual Survey. *Physics Education Research* 6, 020121 (2010) DOI: 10.1103/PhysRevSTPER.6.020121

Quantum Mechanics Assessment Tool (QMAT)

This assessment was developed to (1) reflect faculty learning goals, provide an assessment of student learning difficulties, and act as a tool to help guide faculty efforts at improving QM instruction. Contact Steve Pollack at University of Colorado.

Steve Goldhaber, Steven Pollack, Paul Beale and Katherine Perkins. *Transforming Upper-Division Quantum Mechanics: Learning Goals and Assessment*. American

Institute of Physics Conference Proceedings 1179, 145 (2009). doi:
10.1063/1.3266699.