

The American Chemical Society (ACS) Division of Chemical Education (Chem Ed) Examinations Institute (found at <http://chemexams.chem.iastate.edu/>) has several standardized examinations in various disciplines of chemistry. These exams can be found by following the “Exams” link on the webpage aforementioned.

For General Chemistry (our CHM 138 & 139 lecture course sequence), there are specialized exams for each semester as well as exams that cover the full year course (found by clicking “General Chemistry” on <http://chemexams.chem.iastate.edu/materials/exams.cfm>). We chose an exam that covered the full year course material, but was only an hour long (55 minutes)—GC06B. Since the students taking this exam are doing so voluntarily in exchange for the hopes of scholarship money (more on that below), the collected faculty members of the Department of Chemistry decided that a one-hour exam would have more takers than a two-hour exam.

The exam (Stock Code GC06B, Title: General Chemistry 2006 (brief) – a short test for the full year course) is a 50 question, multiple choice timed examination. The exam is confidential, so I cannot provide a copy. There are 5 questions on “Atomic Structure”, 5 questions on “Molecular Structure”, 5 questions on “Stoichiometry”, 6 questions on “Energetics” (thermodynamics), 4 questions on “Dynamics” (kinetics), 5 questions on “States of Matter/Solutions”, 6 questions on “Equilibrium”, 4 questions on “Electrochemistry and Redox”, 5 questions on “Descriptive Chemistry/Periodicity” and 5 questions on “Experimental”.

The ACS Chem Ed Examinations Institute collects data on all examinations given and reports statistical data for every examination. They are still collecting data for GC06B. Currently (on February 16, 2010) the mean is 58.27%, standard deviation ( $\sigma$ ) 20.21%, the median is 56.00%, KR21 is 0.94 and Std error/meas 4.93 for 539 students. These convert to a mean 29.1,  $\sigma$  10.1, and median 28.

For previous versions of the short test for the full year course, the full data are available. For GC02B, the mean was 24.77, the  $\sigma$  was 7.14, the median was 24.0, KR-21 rel 0.77 and Std error/meas 3.42. One  $\sigma$  below the mean is 17.63, and a score of 18 is the 19<sup>th</sup> percentile. One  $\sigma$  above the mean is 31.91, and a score of 32 is the 84<sup>th</sup> percentile. Similarly, for GC00B, the mean was 23.85,  $\sigma$  was 6.80, the median was 23.3, KR-21 rel 0.74 and Std error/meas 3.43. One  $\sigma$  below the mean is 17.05, and a score of 17 is the 17<sup>th</sup> percentile. One  $\sigma$  above the mean is 30.65, and a score of 31 is the 85<sup>th</sup> percentile. For GC98B, the mean was 24.15,  $\sigma$  was 7.36, the median was 23.8, KR-21 rel 0.79 and Std error/meas 3.41. One  $\sigma$  below the mean is 16.79, and a score of 17 is the 18<sup>th</sup> percentile. One  $\sigma$  above the mean is 31.51, and a score of 32 is the 86<sup>th</sup> percentile.

One last issue to address is the scholarship money. We offered \$250 to the person making the highest score on the exam in any semester. We also offered \$200 to anyone scoring in the 85<sup>th</sup> percentile (or higher), \$150 to anyone scoring in the 75<sup>th</sup> to 84<sup>th</sup> percentile, and \$100 to anyone scoring in the 50<sup>th</sup> to 74<sup>th</sup> percentile.