

North Carolina End-of-Course Tests

Chemistry

What are the purposes of the NC Testing Program?

The North Carolina End-of-Course Tests are required by General Statute 115C-174.10 as a component of the North Carolina Annual Testing Program. As stated, the purposes of North Carolina state-mandated tests are “(i) to assure that all high school graduates possess those minimum skills and that knowledge thought necessary to function as a member of society; (ii) to provide a means of identifying strengths and weaknesses in the education process in order to improve instructional delivery; and (iii) to establish additional means for making the education system at the State, local, and school levels accountable to the public for results.”

For school, school system, and state accountability, prediction formulas (first used in 2000-2001) are used to determine growth expectations for end-of-course tests. The prediction formula is used to determine a student’s performance (average scores) on the North Carolina EOG or EOC tests, which serve as predictors of the same students’ performance in the EOC course where they are currently enrolled.

What is measured by the test?

The North Carolina End-of-Course Test of Chemistry assesses the chemistry curriculum of the 1999 North Carolina *Standard Course of Study* for science. On the test, students are expected to demonstrate knowledge of important principles and concepts, understand and interpret laboratory activities, and relate scientific information to everyday situations. In order to align with the curriculum’s focus on inquiry instruction and higher order thinking, the revised chemistry test has an increased focus on processing information, understanding the relationship between science and technology, and scientific concepts.

Each item on the chemistry test is related to one of the chemistry content objectives in the North Carolina *Standard Course of Study* for science. The content objectives (goals 1 through 4) of chemistry describe the knowledge and skills that are to be taught in all chemistry classes in North Carolina and provide the basis for the content of the items on the tests. Many of the items in this revision of the chemistry test assess whether a student can move beyond memorization and apply process skills to the investigation of science. The chemistry testing materials include reference tables containing the periodic table and Bohr model of the atom in addition to common formulas that students will have access to when taking the test. A copy of the reference tables can be obtained from the NCDPI Web site at www.ncpublicschools.org/accountability/testing/eoc. Additional information about the content of the objectives can be obtained from the NCDPI Web site at <http://www.ncpublicschools.org/curriculum/science/scos/1999/chemistry/>.

Table 1. Descriptive Information for the North Carolina Test of Chemistry

Goal	Description of Goal	Percentage of Items on Test
1	The learner will build an understanding of the structure and properties of matter.	30%
2	The learner will build an understanding of regularities in chemistry.	36%
3	The learner will build an understanding of energy changes in chemistry.	18%
4	The learner will build an understanding of equilibrium and kinetics.	16%

How is the test administered?

The North Carolina End-of-Course Test of Chemistry consists of 88 multiple-choice questions administered during a fixed block of time within the last week (block schedule or summer school) or the last two weeks (traditional schedule) of the course. Three equivalent forms are administered in each classroom to provide a breadth of information for curriculum evaluation and planning.

How was the test developed?

The questions on the chemistry test were written and reviewed by trained North Carolina teachers and educators during the 1999-2000 school year. The questions were field tested in the first and second semesters of the 2000-2001 school year. The field test involved approximately 21,500 students from randomly selected schools across the state. The revised chemistry test was implemented statewide for the first time in the fall of the 2001- 2002 school year.

What kinds of scores do students receive on the test?

Results of the chemistry test are reported as scale scores and achievement levels. The scale used was designed to have a range of 20 to 80 with a mean of 50 and a standard deviation of 10. The use of scale scores provides for easier and more consistent interpretations of the results from test to test. The use of achievement levels provides an interpretation of student performance relative to a pre-determined standard. The four achievement levels are typically established by linking teacher judgments to the performance distribution of student scores from the field test or the first operational administration of the test.

Table 2. Achievement Levels for the North Carolina Test of Chemistry

Level	Scale Scores	Description
1	23-47	Students performing at Level 1 do not have sufficient mastery of chemical concepts. They have minimal understanding of: structure and properties of matter; regularities and energy changes in chemistry; and equilibrium and kinetics.
2	48-55	Students performing at Level 2 demonstrate inconsistent mastery of chemical concepts. They have limited understanding of: structure and properties of matter; regularities and energy changes in chemistry; and equilibrium and kinetics.
3	56-64	Students performing at Level 3 demonstrate mastery of chemical concepts and are prepared for more advanced science courses. They have an adequate understanding of: structure and properties of matter; regularities and energy changes in chemistry; and equilibrium and kinetics.
4	65-88	Students performing at Level 4 demonstrate superior understanding of chemical concepts and are very well prepared for more advanced science courses. They have an advanced level of understanding of: structure and properties of matter; regularities and energy changes in chemistry; and equilibrium and kinetics.

Who takes the NC EOC in chemistry?

Students enrolled in chemistry for credit regardless of the grade level of the student shall take the EOC test. Students who are repeating the course for credit shall take the EOC test. Students enrolled for chemistry credit in a similar course, honors course, Advanced Placement (AP) course, or International Baccalaureate (IB) course shall take the EOC test in chemistry. Even if a local system exempts students from final exams, the student must take the EOC test and by state law beginning with the 2001–2002 school year, it shall count as 25% of the student’s grade.

Sample Items

The items on the following pages are samples of the types of items that appear on the North Carolina End-of-Course Test of Chemistry. The objective indicates the curriculum objective the item is designed to assess. The thinking skill corresponds to the level of thinking the item requires as defined by a thinking skills framework adapted from *Dimensions of Thinking* by Robert J. Marzano and others. For more information about the framework used with the end-of-course tests, please read

Understanding North Carolina Tests: Thinking Skill Level, found on the NCDPI Web site at

http://www.ncpublicschools.org/docs/accountability/testing/eog/asb_thkskl.pdf.

The number indicated by **p** represents the proportion of students who selected the correct answer when the item was field tested.

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1. Objective: 1.04

Thinking Skill: Applying

(p=.659)

If the solubility of ammonium chloride is 36.0 grams per 100. grams of water at 20.0°C, what is the maximum amount of this chemical that can be dissolved in 150. grams of water at 200.°C?

A 18.0 grams

B 36.0 grams

* C 54.0 grams

D 72.0 grams

2. Objective: 4.04

Thinking Skill: Generating

(p=.480)

Many lakes in the midwestern part of the United States seem able to resist changes in pH caused by acid rain. Studies have revealed substantial amounts of limestone rock contains CaCO_3 in these lakes. What is the limestone **most likely** doing for the water in the lake?

* A increasing $[\text{OH}^-]$

B decreasing $[\text{OH}^-]$

C increasing $[\text{H}_3\text{O}^+]$

D decreasing $[\text{CO}_3^{-2}]$

3. Objective: 1.07

Thinking Skill: Analyzing

(p=.343)

Which statement **best** explains why oil and water do not mix?

A One is miscible, and the other is immiscible.

* B One is a polar compound, and the other is a non-polar compound.

C Both are ionic compounds.

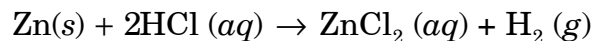
D Both have different densities.

4. Objective: 2.04

Thinking Skill: Applying

(p=.512)

The equation shown below is unbalanced:



Totally reacting 130 g of zinc with excess hydrochloric acid will release what mass of hydrogen?

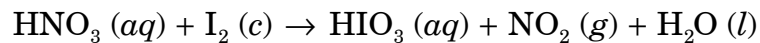
- * A 4.0 grams
 - B 6.0 grams
 - C 40. grams
 - D 65 grams
-

5. Objective: 2.06

Thinking Skill: Analyzing

(p=.240)

Which element is reduced in the following oxidation-reduction reaction?



- A H
- B I
- * C N
- D O

6. Objective: 4.04

Thinking Skill: Applying

(p=.649)

What is the pH of a solution in which $[\text{H}_3\text{O}^+]$ is $1 \times 10^{-6} \text{ M}$?

A -6

B 1

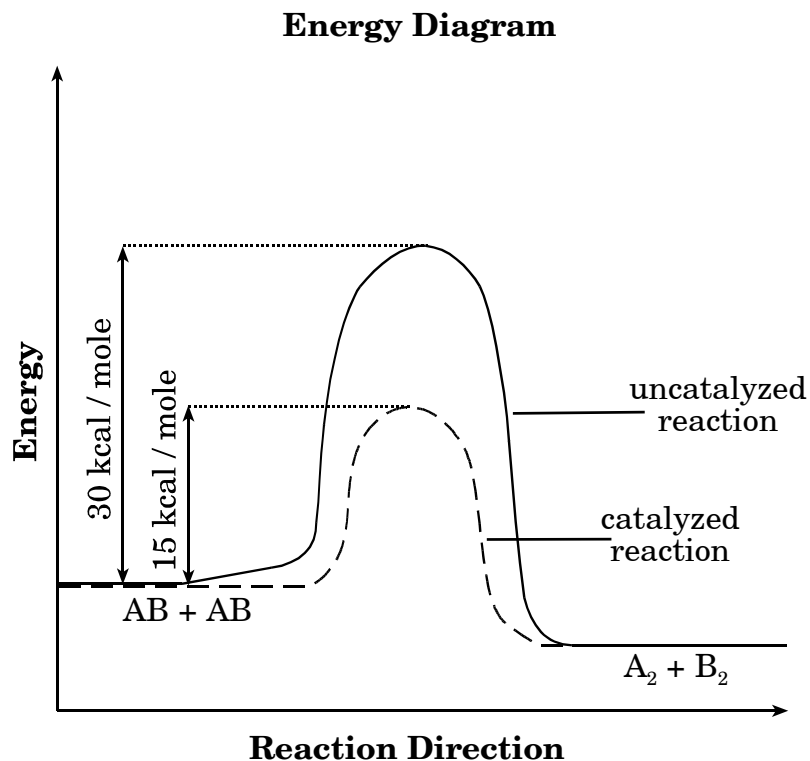
* C 6

D 8

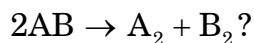
7. Objective: 4.03

Thinking Skill: Analyzing

(p=.635)



The energy diagram above describes which of the following facts about the reaction:



- A The catalyzed reaction has too little energy to form the appropriate products.
- B The catalyzed reaction forms more products than does the uncatalyzed reaction.
- * C The catalyzed reaction requires a lower activation energy than does the uncatalyzed reaction.
- D The catalyzed reaction forms fewer products than does the uncatalyzed reaction.