North Carolina End-of-Course Tests
Biology

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 Biology assesses the biology 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 biology test has an increased focus on processing information, understanding the relationship between science and technology, and scientific concepts.

Each item on the biology test is related to one of the biology content objectives in the North Carolina *Standard Course of Study* for science. The content objective (goals 1 through 5) of biology describe the knowledge and skills that are to be taught in all biology 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 biology test assess whether a student can move beyond memorization and apply process skills to the investigation of science. 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/biology/.

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

Goal	Description of Goal	Percentage of Items on Test
1	The learner will develop an understanding of the physical, chemical, and cellular basis of life.	19.5%
2	The learner will develop an understanding of the continuity of life and the changes of organisms over time.	31%
3	The learner will develop an understanding of the unity and diversity of life.	18.5%
4	The learner will develop an understanding of the ecological relationships among organisms.	19.5%
5	Students will develop an understanding of the behavior of organisms, resulting from a combination of heredity and environment.	11.5%

How is the test administered? The North Carolina End-of-Course Test of Biology 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 biology test were written and reviewed by trained North Carolina teachers and educators during the 1999-2000 and 2000-2001 school years. The questions were field tested in the first and second semesters of the 2000-2001 school year. The field test involved approximately 24,250 students from randomly selected schools across the state. The revised biology 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 biology 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 Biology

Level	Scale Scores	Description
1	26-46	Students performing at Level 1 do not have sufficient mastery of biological concepts. They have a minimal understanding of: the physical, chemical, and cellular basis of life; the continuity of life and changes in organisms over time; classification systems and the structure and function of organisms; ecological relationships among organisms; and adaptive responses of organisms.
2	47-54	Students performing at Level 2 demonstrate inconsistent mastery of biological concepts. They have a limited understanding of: the physical, chemical, and cellular basis of life; the continuity of life and changes in organisms over time; classification systems and the structure and function of organisms; ecological relationships among organisms; and adaptive responses of organisms.
3	55-64	Students performing at Level 3 demonstrate mastery of biological concepts and are prepared for more advanced science courses. They have an adequate understanding of: the physical, chemical, and cellular basis of life; the continuity of life and changes in organisms over time; classification systems and the structure and function of organisms; and ecological relationships among organisms; and adaptive responses of organisms.
4	65-87	Students performing at Level 4 demonstrate superior understanding of biological concepts and are very well prepared for more advanced science courses. They have an advanced level of understanding of: the physical, chemical, and cellular basis of life; the continuity of life and changes in organisms over time; classification systems and the structure and function of organisms; ecological relationships among organisms; and adaptive responses of organisms.

Who takes the NC EOC in biology?

Students enrolled in biology 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 standard biology credit in a similar course, honors course, Advanced Placement (AP) course, or International Baccalaureate (IB) course shall take the

EOC test in biology. 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 Biology. 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 thinking skills 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.

1. Objective: 2.06

Thinking Skill: Generating

(p= .602)

Three experiments are often cited as crucial to the development of modern ideas about the origin of life forms.

1. In the 1700s, Francesco Redi showed that meat in a container covered by netting would not become infested with maggots.

2. Also in the 1700s, Lazzaro Spallanzani showed that a container of broth that is covered immediately after boiling would not become cloudy with microorganisms.

3. In the 1880s, Louis Pastuer repeated Spallanzani's experiment with one change. Instead of sealing the flask, he fitted it with a curved neck. The solution remained clear for up to a year.

What do these experiments show about the nature of science?

* A Modern theories often have their basis in past experiments.

B Theories are usually met with the disapproval of other scientists.

C Modern experiments represent sophisticated thinking.

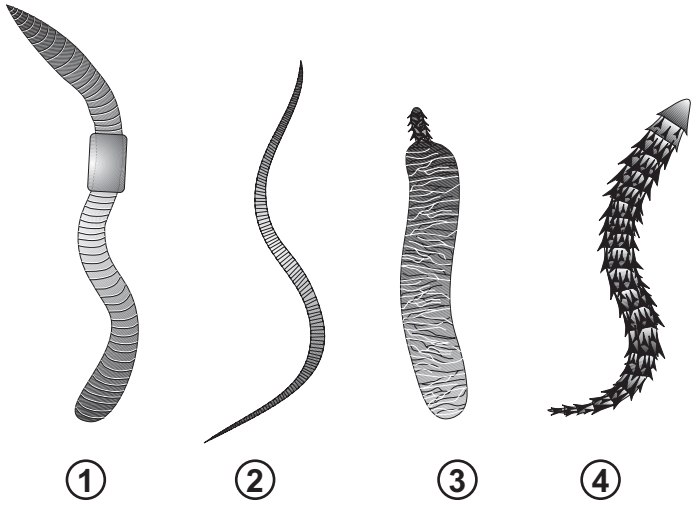
D Scientists have answered most questions about life.

2. Objective: 3.02

Thinking Skill: Organizing

(p=.659)

Taxonomic Key to Worms



1. a. worm has divided body parts (segmented)	(Go to 3.)
b. worm is not divided (unsegmented)	(Go to 2.)
2. a. worm has spine-covered head	*Acanthocephala*
b. worm does not have spiny projections, body is long and round	*Ascaris*
3. a. worm does not have spines, has saddle-like portion	*Lumbricus*
b. no saddle portion, has spines	*Nais*

Worm (2) belongs to which category?

A *Acanthocephala*

* B *Ascaris*

C *Lumbricus*

D *Nais*

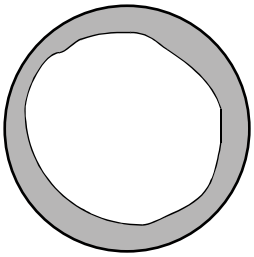
3. Objective: 3.03

Thinking Skill: Applying

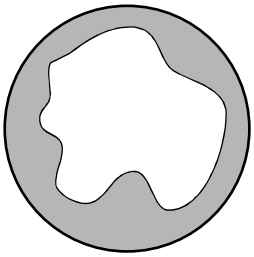
(p=.501)

Shown below are cross sections of four small intestines. Which intestine will absorb the most food per unit of time?

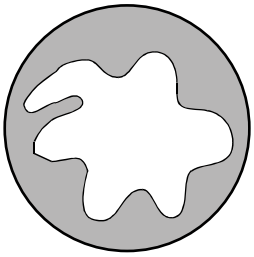
A



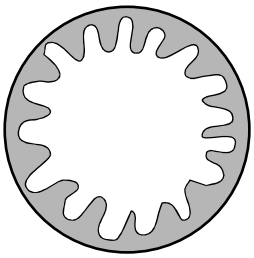
B



C



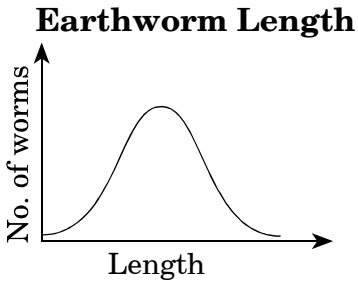
* D



4. Objective: 4.01
Thinking Skill: Generating
(p=.253)

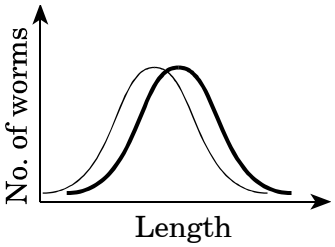
5. Objective: 3.03
Thinking Skill: Applying
(p=.289)

The curve below shows the distribution of worm length in a population of earthworms. A predatory bird migrates into this population's habitat. The bird does not prey on the small worms and is not strong enough to pull large ones from the ground.

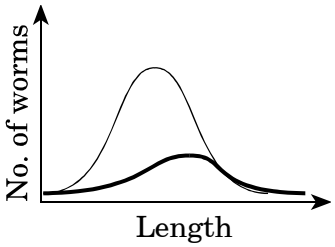


4. Which new curve (heavy line) would describe the changed earthworm population?

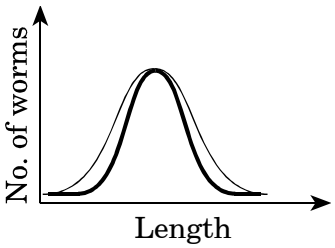
A



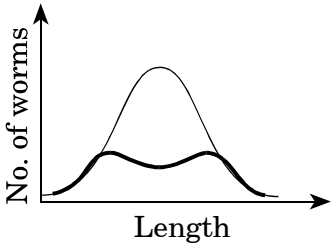
B



C



* D



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5. How is a range of earthworm sizes helpful to its population stability?

* A Ecosystem changes will not likely affect all sizes to the same extent.

B The range will prevent one size from dominating the others.

C The variety will produce a healthier breeding stock of organisms.

D Diversity in a population produces genetic superiority.