

## Assessment Content at Grade 4

The content of the assessment varies for each grade to reflect what students should know and be able to do. The percentage of the assessment dedicated to each of the fields of science and the elements of knowing and doing science is specified for each grade. To interpret the overall results and the student group results presented in this report, it is important to understand the content of the assessment.

At grade 4, one-third of the assessment was devoted to each of three science fields—Earth, physical, and life science. The framework specifies that 45 percent of assessment time should be devoted to conceptual understanding, 45 percent to scientific investigation, and 10 percent to practical reasoning.

Fourth-graders were presented with two 25-minute sections, each containing 9 to 17 multiple-choice questions and constructed-response questions, which require students to produce their own answers. One-half of the students in each school spent an additional 20 minutes to complete the hands-on portion of the assessment.

An example of one of the hands-on tasks administered in 1996 asked students to determine whether an unknown sample of water was fresh water or salt water after observing the levels at which a pencil floated in each type of water. Examples of hands-on tasks from the 2005 assessment have not yet been released.

## Science Achievement Levels at Grade 4

The science achievement levels at grade 4 represent what fourth-graders know and can do in science at each level. The following are excerpts of the science achievement-level descriptions with the corresponding minimum scores noted in parentheses. The full descriptions can be found at <http://www.nagb.org/pubs/pubs.html>.

**Basic** (138): Students performing at the *Basic* level demonstrate some of the knowledge and reasoning required for understanding the Earth, physical, and life sciences at a level appropriate to grade 4. For example, they can carry out simple investigations and read uncomplicated graphs and diagrams. Students at this level also show a beginning understanding of classification, simple relationships, and energy.

**Proficient** (170): Students performing at the *Proficient* level demonstrate the knowledge and reasoning required for understanding the Earth, physical, and life sciences at a level appropriate to grade 4. For example, they understand concepts relating to the Earth's features, physical properties, structure, and function. In addition, students can formulate solutions to familiar problems as well as show a beginning awareness of issues associated with technology.

**Advanced** (205): Students performing at the *Advanced* level demonstrate a solid understanding of the Earth, physical, and life sciences as well as the ability to apply their understanding to practical situations at a level appropriate to grade 4. For example, they can perform and critique simple investigations, make connections from one or more of the sciences to predict or conclude, and apply fundamental concepts to practical applications.

## Sample Grade 4 Multiple-Choice Question

The multiple-choice question on the right assesses conceptual understanding in the field of Earth science.

The percentages below the sample question indicate how students performed on the question. In addition to the overall percentage of students who answered the question correctly, the percentage of the students at each achievement level who answered correctly is presented.

As an example of how to interpret these percentages, 46 percent of the students overall answered this question correctly. When just the students in the *Proficient* category are considered, 73 percent answered correctly.

The surface of the Moon is covered with craters. Most of these craters were formed by

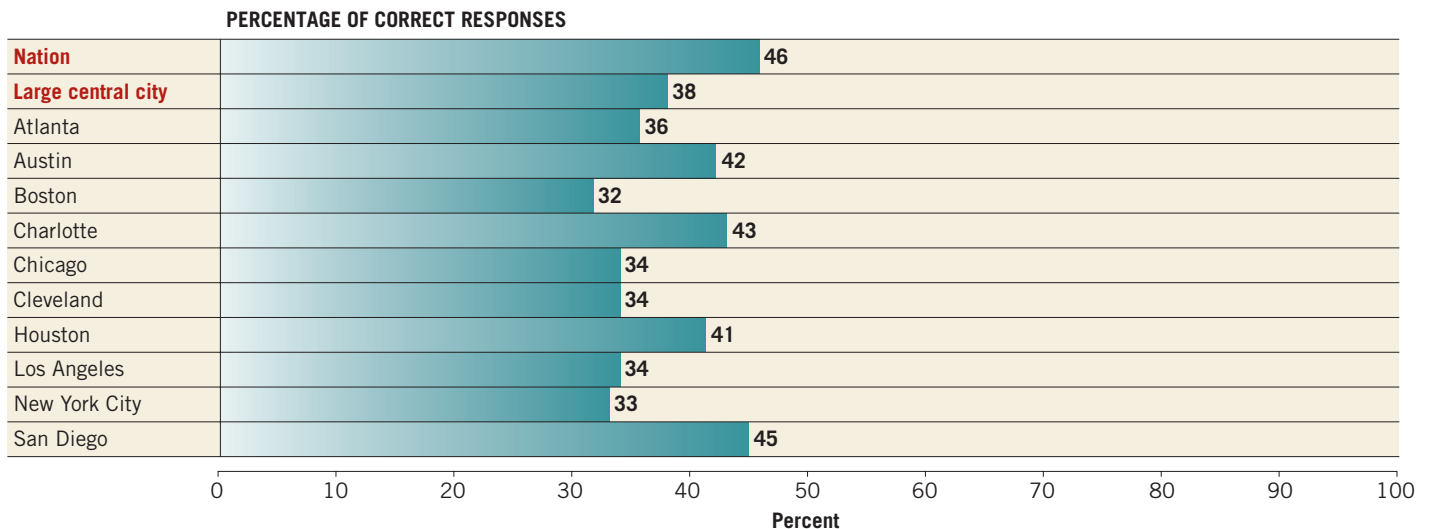
- (A) eruptions of active volcanoes
- (B) the impacts of many meteoroids
- (C) shifting rock on the Moon's surface ("moonquakes")
- (D) tidal forces caused by the Earth and Sun

Percentage correct in nation's public schools in 2005

Overall	Below Basic	At Basic	At Proficient	At Advanced
46	22	46	73	92



Percentage of correct fourth-grade public school student responses on the question above in 2005, by jurisdiction



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2005 Trial Urban District Science Assessment.

## Sample Grade 4 Constructed-Response Question

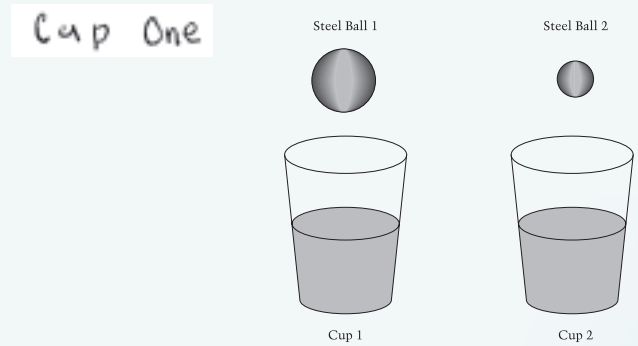
The constructed-response question on the right requires practical reasoning in the field of physical science. Responses were rated using a three-level scoring guide.

Responses that stated that the water level goes up more in cup 1 and gave a correct explanation were rated “Complete.” Responses that stated that the water level goes up more in cup 1, but had an inadequate explanation were rated “Partial.” Responses that stated that the water level goes up more in cup 2, or that ball 2 pushes the water level higher in cup 2 were rated as “Incorrect.” The sample student response shown here was “Complete.”



As shown in the picture, Christina has two identical cups that are filled to the same level with water. She also has two solid steel balls.

Christina puts ball 1 in cup 1 and ball 2 in cup 2. In which cup will the water level rise the most?



Tell why you think so

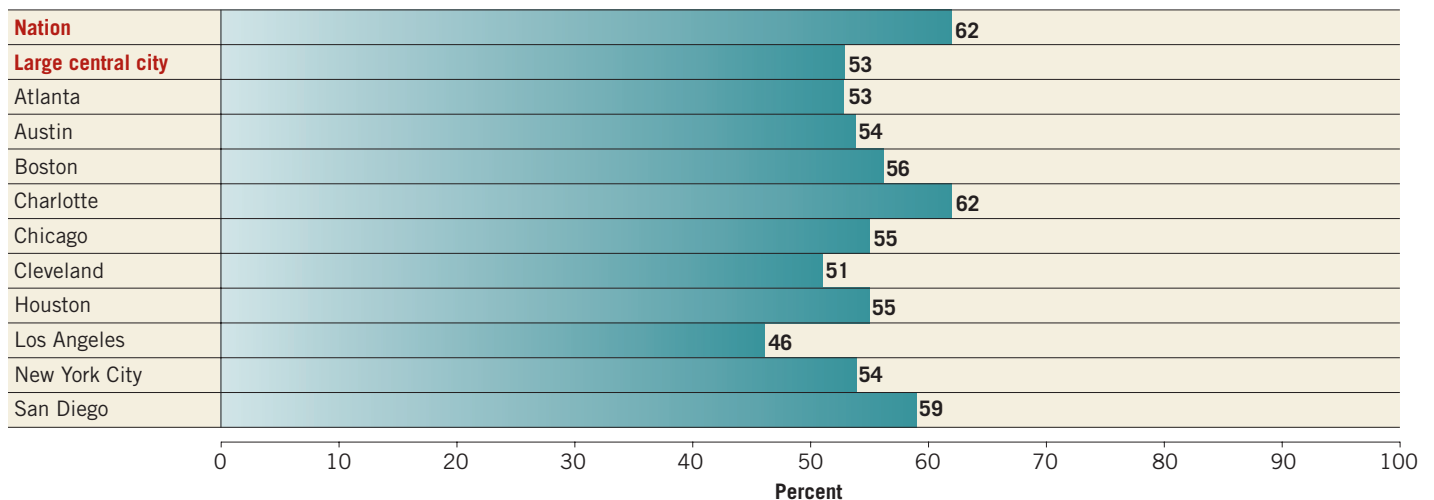
Cup ones water level will rise more because the steel ball one takes up more space because it is bigger then ball two.

Percentage “Complete” in nation’s public schools in 2005

Overall	Below Basic	At Basic	At Proficient	At Advanced
62	50	64	73	79

### Percentage of fourth-grade public school student responses rated “Complete” on the question above in 2005, by jurisdiction

PERCENTAGE OF RESPONSES RATED “COMPLETE”



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2005 Trial Urban District Science Assessment.

## Sample Grade 4 Constructed-Response Question

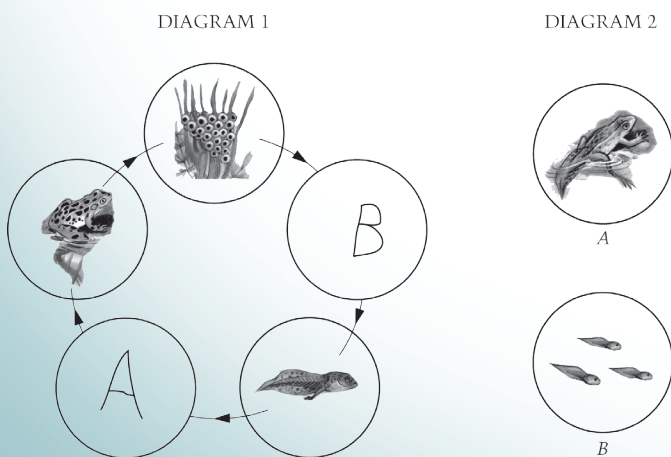
The following constructed-response question assesses conceptual understanding in the field of life science. A student response was judged “Complete” if both stages *A* and *B* were placed correctly, and a valid explanation of the placement of both diagrams was provided.

A response was judged “Partial” if the student provided an acceptable explanation for stage *A* or *B*, OR a partially acceptable explanation for one stage or both stages. (Stages *A* and *B* may be placed correctly or incorrectly or left blank.) Responses were judged “Unsatisfactory/Incorrect” when a student did not provide a valid explanation for either placement. The sample student response below was “Complete.”

**Diagram 1** shows a frog’s life cycle with two missing stages.

Explain why you placed the letters *A* and *B* where you did.

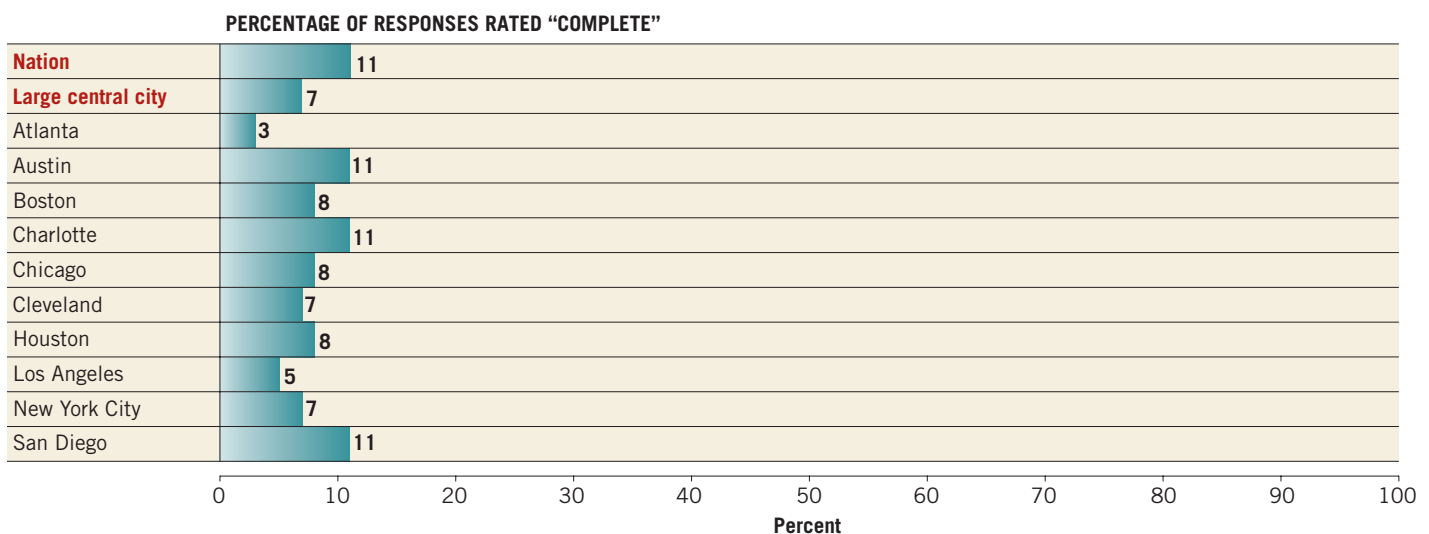
I placed them there because after the eggs hatch they turn into tadpoles and more mature tadpole grow front and back legs the crawls up on land and loses tadpole tail and becomes a frog.



Percentage “Complete” in nation’s public schools in 2005

Overall	Below Basic	At Basic	At Proficient	At Advanced
11	3	10	19	34

### Percentage of fourth-grade public school student responses rated “Complete” on the question above in 2005, by jurisdiction



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2005 Trial Urban District Science Assessment.