



*2005 NAEP Science Test:
Summary of Results
for Massachusetts*

May 2006

Massachusetts Department of Education



MASSACHUSETTS DEPARTMENT OF EDUCATION

This document was prepared by the Massachusetts Department of Education.
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I. Executive Summary of the 2005 NAEP State Results in Science

More than 7,400 Massachusetts public school students at grades 4 and 8 participated in the 2005 state administration of the National Assessment of Educational Progress (NAEP) science assessment. This report provides state-level results for the science assessment. Results from the 2005 NAEP tests in reading and mathematics were previously reported in fall 2005 and are available at www.doe.mass.edu/mcas/2005/news/naep.pdf.

□ Interpreting this Report

When reviewing this report, it is important to keep in mind that the NAEP results are based on a *sample* of students across Massachusetts and not the *population* of Massachusetts students. In analyzing the results, tests of significance were employed to determine what differences in the data could be confidently characterized as *not occurring by chance*. This type of difference is commonly referred to as a statistically *significant* difference. In this report, a comparison in which one number is described as higher or lower than another number, or in which a group of students is described as having outperformed another group of students, indicates the difference was significant at the $p < .05$ level. In the report's tables, an asterisk is used to denote a value that is significantly different than the value for the same jurisdiction in 2005.

□ Overall Performance

Massachusetts tied for first among all states on the grade 4 science assessment and tied for second on the grade 8 science assessment.

- Based on average scaled scores, Massachusetts tied for first in the nation at grade 4 with ten other states. At grade 8, Massachusetts tied for second in the nation with seven other states. One state's average scaled score at grade 8 (North Dakota) was higher than the average scaled score for Massachusetts.
- In science at grade 4, the percent of Massachusetts students scoring at *Proficient* and above was higher than the percent of students at *Proficient* and above in 31 states and found not to differ significantly from the percent of students at *Proficient* and above in the remaining 12 states. At grade 8, the percent of Massachusetts students scoring *Proficient* and above in science was higher than the percent of students scoring *Proficient* and above in 35 states and found not to differ significantly from the percent of students scoring *Proficient* and above in the remaining 8 states.

Students in Massachusetts outperformed students nationally on the NAEP science tests.

- The average scaled score of Massachusetts fourth-grade students on the science assessment was 160, higher than the national average of 149. Eighth-grade Massachusetts students (161) also outscored their counterparts nationwide (147).
- Thirty-eight percent of Massachusetts fourth-grade students and 41 percent of eighth-grade students scored at or above the *Proficient* level. These percents were higher than the comparable percents of students nationally who scored at or above the *Proficient* level (27 percent at both grades 4 and 8).

Since the last NAEP science assessment in 2000, the performance of Massachusetts fourth-graders did not change, while eighth-graders scored higher in 2005 than in 2000.

- In 2005, the average scaled score of Massachusetts fourth-graders on the science assessment was 160. This score was not statistically different than the average scaled score for Massachusetts fourth-graders in 2000 (161). During the same time period, fourth-grade students nationally improved their performance, increasing their average scaled score from 145 in 2000 to 149 in 2005.
- At grade 8, Massachusetts students earned an average scaled score of 161 in 2005, which was higher than their average scaled score in 2000 (158). Nationally, the performance of eighth-grade students did not change significantly between 2000 (148) and 2005 (147).

□ Percent of Students Performing at or above *Proficient* in the Top Performing States

- The following table lists the top performing states on the 2005 NAEP science assessment according to the ordinal rank of the percent of students in each state that scored at or above the *Proficient* level.

Table 1			
2005 NAEP Science Assessment			
Percent of Students At or Above <i>Proficient</i> by State			
<u>Grade 4</u>		<u>Grade 8</u>	
Virginia	40	North Dakota	43
Massachusetts	38	Montana	42
Vermont	38	South Dakota	41
New Hampshire	37	Vermont	41
Montana	37	Massachusetts	41
North Dakota	36	New Hampshire	41
Maine	36	Minnesota	39
Missouri	36	Wisconsin	39
Kentucky	36	Wyoming	37
Wisconsin	35	Idaho	36
NATION	27	NATION	27

□ Student Subgroup Performance in Science in Massachusetts Compared to the Nation

- Race/Ethnicity: In 2005, white, African American/black, and Asian students at grade 4 in Massachusetts outperformed their counterparts nationally. The performance of Massachusetts Hispanic students at grade 4 did not differ significantly from the performance of their counterparts nationally. At grade 8, Massachusetts white, African American/black, Asian and Hispanic students outperformed their counterparts nationally.
- Gender: At grades 4 and 8, both female and male students in Massachusetts outscored their counterparts nationally.
- Student Status: At both grades 4 and 8, students with disabilities and students eligible for free/reduced price lunch in Massachusetts outscored their counterparts nationally. Massachusetts LEP students at grade 4 scored higher than their counterparts nationally, while at grade 8 there was no significant difference between the performance of LEP students in Massachusetts and across the nation.

□ Performance Trends Among Student Subgroups (2000–2005)

- In the following table, an upward arrow (↑) denotes the groups of Massachusetts students that scored higher on the NAEP science assessment in 2005 than in 2000.

Table 2		
NAEP Science Assessment: Results for Massachusetts		
Change in Average Scaled Scores between 2000 and 2005		
by Student Status		
Massachusetts	Grade 4	Grade 8
	Change in Average Scaled Score	Change in Average Scaled Score
All Students	=	↑
Race/Ethnicity		
African American / Black	=	=
Asian	=	=
Hispanic	=	↑
White	=	↑
Gender		
Female	=	=
Male	=	=
Student Status		
Students with Disabilities	=	↑
Limited English Proficient	N/A	N/A
Eligible for Free/Reduced Lunch	=	↑

- ↑ 2005 value is statistically higher than the same value from 2000.
- ↓ 2005 value is statistically lower than the same value from 2000.
- = There is no statistical difference between the 2005 value and the 2000 value.
- N/A Reporting standards for LEP students were not met in 2000.

□ Performance Gaps

The following comparison examines the change in score gaps between 2000 and 2005 among the following four student subgroups: (1) males and females; (2) whites and African American/blacks; (3) whites and Hispanics; and (4) students who were eligible for free/reduced lunch and students who were not eligible.

- At grade 4, some of the differences in average scaled scores between these student subgroups were smaller in 2005 than in 2000. However, the changes in the score gaps were not statistically significant.
- At grade 8, there were two instances where there was a statistically significant closing of the score gaps since 2000: (1) between white and Hispanic students and (2) between students who were eligible for free/reduced lunch and those students who were not eligible.

II. Background on the NAEP Science Assessment

Whereas participation in NAEP state assessments in reading and mathematics at grades 4 and 8 is mandated under No Child Left Behind, participation in NAEP state science assessments is voluntary, depending upon applicable state laws. In 2005, students from 44 states participated in the 2005 NAEP state assessments in science. The following six states chose not to participate in the science assessments: Alaska, Iowa, Kansas, Nebraska, New York, and Pennsylvania. Across the nation, roughly 142,700 fourth-grade students from 7,802 public schools and 138,950 eighth-grade students from 5,796 public schools were assessed in science in 2005.

□ Test Content for the Science Assessment

The NAEP Framework for each subject area specifies what is to be assessed and how it is to be assessed. The *Science Framework for the 2005 National Assessment of Educational Progress* guided the development of the 2005 science assessment. This is the same framework that was originally developed in 1990–1991 and used for the 1996 and 2000 science assessments.

The NAEP Science Framework established that science content would be assessed in three fields of science—Earth science, physical science, and life science—and in three areas of knowing and doing science—conceptual understanding, scientific investigation, and practical reasoning. Within the three content areas, the following subtopics were assessed: under Earth science, solid Earth, water, air, and Earth in space; under physical science, matter and its transformations, energy and its transformations, and motion; and under life science, change and evolution, cells and their function, organisms, and ecology. Physical science includes physics and chemistry; life science includes biology, health, and nutrition; and Earth science includes astronomy, geology, meteorology, and oceanography.

Each assessment item was classified under one of the fields of science and within one area of knowing and doing science. Table 3 demonstrates the distribution of test items according to the two dimensions of the science assessment.

	Grade 4	Grade 8
By Fields of Science		
Earth	33%	30%
Physical	33%	30%
Life	33%	40%
By Knowing and Doing Science		
Conceptual understanding	45%	45%
Scientific investigation	45%	30%
Practical reasoning	10%	25%

In addition to these two dimensions, the NAEP Science Framework stipulated that a limited number of test items measure a student’s knowledge of the nature of science (nature of science and technology) and understanding of themes (key concepts, such as systems, models, and patterns of change).

□ Types of Questions on the Science Assessment

The NAEP science assessment contained three types of questions, or items: multiple-choice, short constructed-response, and extended constructed-response. In addition, some students were asked to participate in a hands-on task that required them to conduct an experiment and answer questions related to the experiment. Examples of released NAEP science items are available on the Nation’s Report Card Web site at www.nces.ed.gov/nationsreportcard/itmrls/.

□ Student Participation

Each student selected for NAEP participates in only one subject-area test, and he/she takes only a portion of the entire test in that subject area. For instance, a student chosen for the 2005 science test took two 25-minute blocks or sets of test items out of a total of thirteen blocks of items at that grade level. In addition, about half of all students selected for science took a third 25-minute block of hands-on performance tasks and accompanying questions.

NAEP spirals blocks of items into different test booklets, administers them to representative samples of students, and combines the results in order to produce average scaled scores for the entire group and for subgroups of student populations. This approach reduces the burden on each individual student.

□ Reporting

Student performance on NAEP is indicated in two ways—scaled scores and achievement levels. The NAEP science assessment scale ranges from 0 to 300. Performance for each grade is scaled separately. Therefore, average scaled scores cannot be compared across grades.

Achievement levels are used to describe expectations for student performance according to a set of standards for what students should know and be able to do. The three achievement levels are *Basic*, *Proficient*, and *Advanced*. Table 4 provides general descriptions of each achievement level. To see how the achievement levels are used to describe science performance at each grade level, please see the Appendix to this report.

Table 4	
General NAEP Achievement Level Definitions	
ACHIEVEMENT LEVEL	DESCRIPTION
<i>Advanced</i>	Superior performance.
<i>Proficient</i>	Solid academic performance for each grade assessed. Students reaching this level have demonstrated competency over challenging subject matter, including subject-matter knowledge, application of such knowledge to real-world situations, and analytical skills appropriate to the subject matter.
<i>Basic</i>	Partial mastery of prerequisite knowledge and skills that are fundamental for proficient work at each grade.

III. Summary of 2005 NAEP Science Results for Massachusetts

□ Students Tested

In Massachusetts, students from 202 schools at grade 4 and 131 schools at grade 8 participated in the 2005 NAEP state assessments. 7,440 students were assessed in science (3,878 at grade 4 and 3,562 at grade 8).

□ Nationwide and Massachusetts Results in Science, 1996–2005

Table 5						
1996–2005 NAEP Results in Science: Massachusetts and the Nation						
<i>Average Scaled Scores and Percent of Students at Each Achievement Level</i>						
		Average Scaled Score	Percent of Students			
			<i>Advanced</i>	<i>Proficient and above</i>	<i>Basic and above</i>	<i>Below Basic</i>
GRADE 4 SCIENCE						
Massachusetts	2005	160	4	38	79	21
	2000	161	5	42	81	19
	2000 ⁿ	162	6	43	81	19
National	2005	149	2	27	66	34
	2000	145*	3	26	61*	39*
	2000 ⁿ	148	3*	28	64	36
GRADE 8 SCIENCE						
Massachusetts	2005	161	6	41	72	28
	2000	158*	5	39	70	30
	2000 ⁿ	161	5	42	74	26
	1996 ⁿ	157*	4*	37	69	31
National	2005	147	3	27	57	43
	2000	148	4*	29	57	43
	2000 ⁿ	149*	4	30*	59	41
	1996 ⁿ	148	3	27	60	40

* Denotes a value that is significantly different from the value for 2005. For example, in science at grade 8, the Massachusetts average scaled score in 2000 (158) was statistically lower than the average scaled score in 2005 (161).

ⁿ Denotes years in which accommodations were not permitted. In 2000, NAEP used a split sample of schools. In one sample accommodations were permitted for special-needs students who normally received them; in the other sample accommodations were not permitted. Comparisons of scores between the accommodations-not-permitted and the accommodations-permitted samples should be interpreted with caution.

The NAEP science scale ranges from 0 to 300. Achievement levels correspond to the following points on the scale at grade 4: *Basic*, 138–169; *Proficient*, 170–204; and *Advanced*, 205 and above. Achievement levels correspond to the following points on the scale at grade 8: *Basic*, 143–169; *Proficient*, 170–207; and *Advanced*, 208 and above.

□ 2005 NAEP Science Results by Student Subgroup for Massachusetts and the Nation

Table 6
2005 Massachusetts and Nationwide NAEP Science Results by Student Group: Grade 4
Average Scaled Scores and Percent of Students at Each Achievement Level

	Massachusetts						National					
	Average Scaled Score	Percent of Students					Average Scaled Score	Percent of Students				
		<i>Advanced</i>	<i>Proficient and above</i>	<i>Basic and above</i>	<i>Below Basic</i>	% Assessed		<i>Advanced</i>	<i>Proficient and above</i>	<i>Basic and above</i>	<i>Below Basic</i>	% Assessed
SCIENCE												
All Students	160	4	38	79	21	100	149	2	27	66	34	100
Student Status												
Students with Disabilities	145	1	19	62	38	17	133	1	13	45	55	11
Limited English Proficient	128	1	7	34	66	5	120	#	4	28	72	9
Gender												
Female	158	3	36	78	22	47	147	2	24	64	36	49
Male	162	6	40	80	20	53	151	3	30	68	32	51
Race/Ethnicity												
African American / Black	136	#	10	47	53	9	128	#	7	38	62	17
Asian / Pacific Islander	165	8	47	80	20	5	156	5	34	74	26	4
Hispanic	134	#	8	44	56	11	132	#	10	44	56	20
White	167	5	45	88	12	75	161	3	38	82	18	57
Free/Reduced-Price Lunch												
Eligible	140	1	14	54	46	30	135	#	12	47	53	45
Not Eligible	168	6	48	90	10	70	162	4	40	82	18	53
School Location												
Central City	141	1	15	54	46	28	141	2	19	54	46	31
Urban Fringe	168	6	48	89	11	64	153	3	31	71	29	44
Rural	166	5	44	88	12	8	153	2	30	72	28	25

Estimate rounds to zero.

Table 7
2005 Massachusetts and Nationwide NAEP Science Results by Student Group: Grade 8
Average Scaled Scores and Percent of Students at Each Achievement Level

	Massachusetts						National					
	Average Scaled Score	Percent of Students					Average Scaled Score	Percent of Students				
		Advanced	Proficient and above	Basic and above	Below Basic	% Assessed		Advanced	Proficient and above	Basic and above	Below Basic	% Assessed
SCIENCE												
All Students	161	6	41	72	28	100	147	3	27	57	43	100
Student Status												
Students with Disabilities	139	1	15	45	55	15	120	#	8	27	73	11
Limited English Proficient	106	#	1	12	88	2	107	#	3	14	86	5
Gender												
Female	160	5	39	72	28	48	145	2	25	55	45	50
Male	162	6	42	73	27	52	149	4	30	59	41	50
Race/Ethnicity												
African American / Black	133	1	10	37	63	9	123	#	7	27	73	17
Asian / Pacific Islander	166	11	45	75	25	5	155	6	34	65	35	4
Hispanic	133	#	9	37	63	10	127	#	10	33	67	17
White	168	7	48	81	19	75	159	4	38	72	28	60
Free/Reduced-Price Lunch												
Eligible	142	1	18	50	50	28	130	1	12	37	63	39
Not Eligible	168	8	49	81	19	70	158	4	38	71	29	58
School Location												
Central City	141	1	19	48	52	28	138	2	20	46	54	29
Urban Fringe	168	7	50	82	18	61	151	4	31	61	39	43
Rural	167	8	45	82	18	11	152	3	30	63	37	28

Estimate rounds to zero.

IV. Comparison of Massachusetts NAEP Results with Other States' Results

□ Grade 4 Science

Scaled Scores: In Massachusetts, the average scaled score in science for fourth-grade students (160) was higher than the average scaled scores in 33 states and not statistically different from the average scaled scores in the remaining 10 states (Kentucky, Maine, Missouri, Montana, New Hampshire, North Dakota, South Dakota, Wisconsin, Vermont, and Virginia).

Percent Proficient and above: The percent of Massachusetts fourth-grade students performing at or above *Proficient* in science (38 percent) was higher than the percent of students at or above *Proficient* in 31 states and not found to differ significantly from the percent of students at or above *Proficient* in the remaining 12 states.

□ Grade 8 Science

Scaled Scores: In Massachusetts, the average scaled score in science for eighth-grade students (161) was higher than the average scaled scores in 35 states, lower than the average scaled score in one state (North Dakota), and not statistically different from the average scaled scores in the remaining 7 states (Minnesota, Montana, New Hampshire, South Dakota, Vermont, Wisconsin, and Wyoming).

Percent Proficient and above: The percent of Massachusetts eighth-grade students performing at or above *Proficient* in science (41 percent) was higher than the percent of students at or above *Proficient* in 35 states and not found to differ significantly from the percent of students at or above *Proficient* in the remaining 8 states.

□ Comparison of Massachusetts with Top Performing States

	<i>Average Scaled Score</i>	Percent of Students			
		<i>Advanced</i>	<i>Proficient and above</i>	<i>Basic and above</i>	<i>Below Basic</i>
GRADE 4 SCIENCE					
New Hampshire	161	2	37	83	17
Virginia	161	5	40	80	20
North Dakota	160	2	36	82	18
Massachusetts	160	4	38	79	21
Maine	160	3	36	81	19
Montana	160	3	37	80	20
Vermont	160	4	38	78	22
<i>National</i>	149	2	27	66	34
GRADE 8 SCIENCE					
North Dakota	163	4	43	77	23
Montana	162	4	42	76	24
Vermont	162	4	41	76	24
New Hampshire	162	4	41	76	24
South Dakota	161	4	41	76	24
Massachusetts	161	6	41	72	28
Wyoming	159	3	37	74	26
<i>National</i>	147	3	27	57	43

V. Massachusetts NAEP Results for Student Subgroups

□ Student Status

The following comparisons refer to Tables 9 and 10.

- In 2005, students with disabilities in Massachusetts scored lower than non-disabled students on the NAEP science assessment at both grades 4 and 8. Similarly, limited English proficient (LEP) students in Massachusetts scored lower than students who were not LEP.
- At grade 8, Massachusetts students with disabilities and non-LEP students scored higher on the NAEP science assessment in 2005 than in 2000.

		Average Scaled Score	Percent of Students				Percent of Students Assessed**
			<i>Advanced</i>	<i>Proficient and above</i>	<i>Basic and above</i>	<i>Below Basic</i>	
GRADE 4 SCIENCE							
Students with Disabilities	2005	145	1	19	62	38	17
	2000	148	#	24	68	32	14*
Non-Disabled Students	2005	163	5	42	82	18	83
	2000	163	5	45	83	17	86*
GRADE 8 SCIENCE							
Students with Disabilities	2005	139	1	15	45	55	15
	2000	125*	#	8	34	66	15
Non-Disabled Students	2005	165	7	45	77	23	85
	2000	164	6	44	76	24	85
<p>* Denotes a value that is significantly different from the value for 2005. For example, in science at grade 8, the Massachusetts average scaled score for students with disabilities in 2000 (125) was statistically lower than the average scaled score of students with disabilities in 2005 (139).</p> <p>** NAEP assesses a representative portion of a state's grade-level student population.</p> <p># Estimate rounds to zero.</p>							

Table 10
2005 Massachusetts NAEP Science Results by LEP Status
Average Scaled Scores and Percent of Students at Each Achievement Level

	Average Scaled Score	Percent of Students				Percent of Students Assessed**	
		<i>Advanced</i>	<i>Proficient and above</i>	<i>Basic and above</i>	<i>Below Basic</i>		
GRADE 4 SCIENCE							
LEP Students	2005	128	1	7	34	66	5
	2000	‡	‡	‡	‡	‡	3
Non-LEP Students	2005	162	4	40	81	19	95
	2000	163	5	43	83	17	97
GRADE 8 SCIENCE							
LEP Students	2005	106	#	1	12	88	2
	2000	‡	‡	‡	‡	‡	2
Non-LEP Students	2005	162	6	41	74	26	98
	2000	158*	5	39	71	29	98

* Denotes a value that is significantly different from the value for 2005. For example, in science at grade 8, the Massachusetts average scaled score for non-LEP students in 2000 (158) was statistically lower than the average scaled score for non-LEP students (162) in 2005.

** NAEP assesses a representative portion of a state's grade-level student population.

Estimate rounds to zero.

‡ Reporting standards not met.

□ Race/Ethnicity

- In Massachusetts in 2005, white students scored higher than African American / black and Hispanic students in science at both grades 4 and 8. White and Asian students in Massachusetts scored comparably in science at both grades.
- At grade 8, Massachusetts white and Hispanic students scored higher in 2005 than in 2000.

Table 11
2005 Massachusetts Grade 4 NAEP Science Results by Race/Ethnicity
Average Scaled Scores and Percent of Students at Each Achievement Level

		Average Scaled Score	Percent of Students				Percent of Students Assessed**
			<i>Advanced</i>	<i>Proficient and above</i>	<i>Basic and above</i>	<i>Below Basic</i>	
GRADE 4 SCIENCE							
African American/Black	2005	136	#	10	47	53	9
	2000	140	1	12	51	49	6
	2000 ⁿ	137	1	12	47	53	7
Asian/Pacific Islander	2005	165	8	47	80	20	5
	2000	159	5	38	78	22	4
	2000 ⁿ	159	5	39	78	22	4
Hispanic	2005	134	#	8	44	56	11
	2000	121	#	7	31	69	9
	2000 ⁿ	125	1	8	33	67	10
White	2005	167	5	45	88	12	75
	2000	168	5	48	89	11	79
	2000 ⁿ	169	7	50	90	10	79

** NAEP assesses a representative portion of a state's grade-level student population.

Estimate rounds to zero.

n Denotes years in which accommodations were not permitted.

Table 12
2005 Massachusetts Grade 8 NAEP Science Results by Race/Ethnicity
Average Scaled Scores and Percent of Students at Each Achievement Level

		Average Scaled Score	Percent of Students				Percent of Students Assessed**
			<i>Advanced</i>	<i>Proficient and above</i>	<i>Basic and above</i>	<i>Below Basic</i>	
GRADE 8 SCIENCE							
African American/Black	2005	133	1	10	37	63	9
	2000	131	1	11	34	66	8
	2000 ⁿ	133	1	11	37	63	8
	1996 ⁿ	125	#	10	27	73	7
Asian/Pacific Islander	2005	166	11	45	75	25	5
	2000	156	10	42	66	34	5
	2000 ⁿ	161	12	44	66	34	5
	1996 ⁿ	150	5	36	61	39	4
Hispanic	2005	133	#	9	37	63	10
	2000	121*	#	7	26	74	6
	2000 ⁿ	121	1	7	26	74	6*
	1996 ⁿ	123	#	10	31	69	6*
White	2005	168	7	48	81	19	75
	2000	164*	5	44	78	22	80
	2000 ⁿ	167	6	48	82	18	80
	1996 ⁿ	162*	4*	41*	76	24	83*

* Denotes a value that is significantly different than the value for 2005.
 ** NAEP assesses a representative portion of a state's grade-level student population.
 # Estimate rounds to zero.
 n Denotes year in which accommodations were not permitted.

□ Gender

- In 2005, male students in Massachusetts outscored female students in science at grade 4. At grade 8, the difference between male and female students was not found to differ significantly.

Table 13							
2005 Massachusetts NAEP Science Results by Gender							
<i>Average Scaled Scores and Percent of Students at Each Achievement Level</i>							
		Average Scaled Score	Percent of Students				Percent of Students Assessed**
			<i>Advanced</i>	<i>Proficient and above</i>	<i>Basic and above</i>	<i>Below Basic</i>	
GRADE 4 SCIENCE							
Male	2005	162	6	40	80	20	53
	2000	164	6	46	84	16	53
	2000 ⁿ	164	7	46	82	18	52
Female	2005	158	3	36	78	22	47
	2000	157	3	36	77	23	47
	2000 ⁿ	159	4	38	79	21	48
GRADE 8 SCIENCE							
Male	2005	162	6	42	73	27	52
	2000	159	6	40	70	30	51
	2000 ⁿ	162	6	44	74	26	49
	1996 ⁿ	159	5	40	71	29	52
Female	2005	160	5	39	72	28	48
	2000	157	4	37	70	30	49
	2000 ⁿ	160	4	40	73	27	51
	1996 ⁿ	154*	3	33	67	33	48
* Denotes a value that is significantly different from the value for 2005. ** NAEP assesses a representative portion of a state's grade-level student population. n Denotes year in which accommodations were not permitted.							

□ School Lunch Eligibility

- In 2005, Massachusetts students who were eligible for free/reduced price lunch were outscored by students who were not eligible at both grades 4 and 8.
- In Massachusetts, students eligible for free/reduced price lunch at grade 8 scored higher in science in 2005 than in 2000.

		Average Scaled Score	Percent of Students				Percent of Students Assessed**
			<i>Advanced</i>	<i>Proficient and above</i>	<i>Basic and above</i>	<i>Below Basic</i>	
GRADE 4 SCIENCE							
Eligible	2005	140	1	14	54	46	30
	2000	138	1	15	52	48	27
	2000 ⁿ	139	1	16	53	47	26
Not eligible	2005	168	6	48	90	10	70
	2000	170	6	52	92	8	69
	2000 ⁿ	171	7	53	91	9	70
Info not available	2005	‡	‡	‡	‡	‡	#
	2000	160	4	38	80	20	5
	2000 ⁿ	155	3	37	75	25	5
** NAEP assesses a representative portion of a state's grade-level student population. ‡ Reporting standards are not met. # Estimate rounds to zero. n Denotes year in which accommodations were not permitted.							

Table 15 2005 Massachusetts Grade 8 NAEP Science Results by School Lunch Eligibility <i>Average Scaled Scores and Percent of Students at Each Achievement Level</i>							
		Average Scaled Score	Percent of Students				Percent of Students Assessed**
			<i>Advanced</i>	<i>Proficient and above</i>	<i>Basic and above</i>	<i>Below Basic</i>	
GRADE 8 SCIENCE							
Eligible	2005	142	1	18	50	50	28
	2000	131*	1	13	39	61	20*
	2000 ⁿ	134	1	14	42	58	20*
	1996 ⁿ	133*	1	13	38*	62*	18*
Not eligible	2005	168	8	49	81	19	70
	2000	165	6	45	78	22	74
	2000 ⁿ	168	7	49	82	18	75
	1996 ⁿ	164*	5*	44	79	21	73
Info not available	2005	162	6	43	71	29	2
	2000	157	7	41	70	30	6
	2000 ⁿ	164	7	46	74	26	6
	1996 ⁿ	149	3	29	57	43	9
* Denotes a value that is significantly different than the value for 2005. ** NAEP assesses a representative portion of a state's grade-level student population. n Denotes year in which accommodations were not permitted.							

□ Type of Community

Table 16 2005 Massachusetts NAEP Science Results by Type of Community <i>Average Scaled Scores and Percent of Students at Each Achievement Level</i>							
	Average Scaled Score	Percent of Students				Percent of Students Assessed**	
		<i>Advanced</i>	<i>Proficient and above</i>	<i>Basic and above</i>	<i>Below Basic</i>		
GRADE 4 SCIENCE							
Central City	2005	141	1	15	54	46	28
Urban Fringe	2005	168	6	48	89	11	64
Rural	2005	166	5	44	88	12	8
GRADE 8 SCIENCE							
Central City	2005	141	1	19	48	52	28
Urban Fringe	2005	168	7	50	82	18	61
Rural	2005	167	8	45	82	18	11
** NAEP assesses a representative portion of a state's grade-level student population.							

Appendix: NAEP Science Achievement Level Descriptors (Grade Specific)*

Achievement Level	Description
<i>Basic – Grade 4</i>	<p>Students performing at the <i>Basic</i> 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.</p> <p>Fourth-grade students performing at the <i>Basic</i> level are able to follow simple procedures, manipulate simple materials, make observations, and record data. They are able to read simple graphs and diagrams and draw reasonable but limited conclusions based on data provided to them. These students can recognize appropriate experimental designs, although they are unable to justify their decisions.</p> <p>When presented with diagrams, students at this level can identify seasons; distinguish between day and night; and place the position of the Earth, Sun, and planets. They are able to recognize major energy sources and simple energy changes. In addition, they show an understanding of the relationship between sound and vibrations. These students are able to identify organisms by physical characteristics and group organisms with similar physical features. They can also describe simple relationships among structure, function, habitat, life cycles, and different organisms.</p>
<i>Proficient – Grade 4</i>	<p>Students performing at the <i>Proficient</i> 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.</p> <p>Fourth-grade students performing at the <i>Proficient</i> level are able to provide an explanation of day and night when given a diagram. They can recognize major features of the Earth’s surface and the impact of natural forces. They are also able to recognize water in its various forms in the water cycle and can suggest ways to conserve it. These students recognize that various materials possess different properties that make them useful. Students at this level are able to explain how structure and function help living things survive. They have a beginning awareness of the benefits and challenges associated with technology and recognize some human effects on the environment. They can also make straightforward predictions and justify their position.</p>
<i>Advanced – Grade 4</i>	<p>Students performing at the <i>Advanced</i> 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.</p> <p>Fourth-grade students performing at the <i>Advanced</i> level are able to combine information, data, and knowledge from one or more of the sciences to reach a conclusion or to make a valid prediction. They can also recognize, design, and explain simple experimental procedures.</p> <p>Students at this level recognize nonrenewable sources of energy. They also recognize that light and sound travel at different speeds. These students understand some principles of ecology and are able to compare and contrast life cycles of various common organisms. In addition, they have a developmental awareness of the benefits and challenges associated with technology.</p>

* Source: National Assessment Governing Board. (2004) *Science Framework for the 2005 National Assessment of Educational Progress*. Washington, DC. www.nagb.org/pubs/s_framework_05/761907-ScienceFramework.pdf

Achievement Level	Description
<i>Basic – Grade 8</i>	<p>Students performing at the <i>Basic</i> level demonstrate some of the knowledge and reasoning required for understanding the Earth, physical, and life sciences at a level appropriate to grade 8. For example, they can carry out investigations and obtain information from graphs, diagrams, and tables. In addition, they demonstrate some understanding of concepts relating to the solar system and relative motion. Students at this level also have a beginning understanding of cause-and-effect relationships.</p> <p>Eighth-grade students performing at the <i>Basic</i> level are able to observe, measure, collect, record, and compute data from investigations. They can read simple graphs and tables and are able to make simple data comparisons. These students are able to follow directions and use basic science equipment to perform simple experiments. In addition, they have an emerging ability to design experiments.</p> <p>Students at this level have some awareness of causal relationships. They recognize the position of planets and their movement around the Sun and know basic weather-related phenomena. These students can explain changes in position and motion such as the movement of a truck in relation to that of a car. They also have an emerging understanding of the interrelationships among plants, animals, and the environment.</p>
<i>Proficient – Grade 8</i>	<p>Students performing at the <i>Proficient</i> level demonstrate much of the knowledge and many of the reasoning abilities essential for understanding the Earth, physical, and life sciences at a level appropriate to grade 8. For example, students can interpret graphic information, design simple investigations, and explain such scientific concepts as energy transfer. Students at this level also show an awareness of environmental issues, especially those addressing energy and pollution.</p> <p>Eighth-grade students performing at the <i>Proficient</i> level are able to create, interpret, and make predictions from charts, diagrams, and graphs based on information provided to them or from their own investigations. They have the ability to design an experiment and have an emerging understanding of variables and controls. These students are able to read and interpret geographic and topographic maps. In addition, they have an emerging ability to use and understand models, can partially formulate explanations of their understanding of scientific phenomena, and can design plans to solve problems.</p> <p>Students at this level can begin to identify forms of energy and describe the role of energy transformations in living and nonliving systems. They have knowledge of organization, gravity, and motions within the solar system and can identify some factors that shape the surface of the Earth. These students have some understanding of properties of materials and have an emerging understanding of the particulate nature of matter, especially the effect of temperature on states of matter. They also know that light and sound travel at different speeds and can apply their knowledge of force, speed, and motion. These students demonstrate a developmental understanding of the flow of energy from the Sun through living systems, especially plants. They know that organisms reproduce and that characteristics are inherited from previous generations. These students also understand that organisms are made up of cells and that cells have subcomponents with different functions. In addition, they are able to develop their own classification system based on physical characteristics. These students can list some effects of air and water pollution as well as demonstrate knowledge of the advantages and disadvantages of different energy sources in terms of how they affect the environment and the economy.</p>

Achievement Level	Description
<i>Advanced – Grade 8</i>	<p>Students performing at the <i>Advanced</i> level demonstrate a solid understanding of the earth, physical, and life sciences as well as the abilities required to apply their understanding in practical situations at a level appropriate to grade 8. For example, students perform and critique the design of investigations, relate scientific concepts to each other, explain their reasoning, and discuss the impact of human activities on the environment.</p> <p>Eighth-grade students performing at the <i>Advanced</i> level are able to provide an explanation for scientific results. They have a modest understanding of scale and are able to design a controlled experiment. These students have an understanding of models as representations of natural systems and can describe energy transfer in living and nonliving systems.</p> <p>Students at this level are able to understand that present physical clues, including fossils and geological formations, are indications that the Earth has not always been the same and that the present is a key to understanding the past. They have a solid knowledge of forces and motions within the solar system and an emerging understanding of atmospheric pressure. These students can recognize a wide range of physical and chemical properties of matter and some of their interactions and understand some of the properties of light and sound. Also, they can infer relationships between structure and function. These students know the differences between plant and animal cells and can apply their knowledge of food as a source of energy to a practical situation. In addition, they are able to explain the impact of human activities on the environment and the economy.</p>