# Ohio Achievement Test Grade 8 Science

**May 2007** 

Answer Key and Scoring Guidelines

# Grade 8 Science Answer Key May 2007

Item No.	Туре	Content Standard	Content Standard Benchmark	Key
1	Multiple Choice	Physical Sciences	A	C
2	Multiple Choice	Life Sciences	С	A
3	Multiple Choice	Scientific Processes	A	С
4	Multiple Choice	Scientific Processes	В	D
5	Multiple Choice	Physical Sciences	Α	D
6	Short Answer	Physical Sciences	Α	2 pt rubric
7	Multiple Choice	Earth and Space Sciences	С	C
8	Multiple Choice	Earth and Space Sciences	С	D
9	Multiple Choice	Scientific Processes	С	С
10	Multiple Choice	Scientific Processes	В	В
11	Extended Response	Earth and Space Sciences	С	4 pt rubric
12	Multiple Choice	Earth and Space Sciences	D	С
13	Multiple Choice	Physical Sciences	С	D
14	Multiple Choice	Life Sciences	С	В
15	Multiple Choice	Physical Sciences	А	D
16	Short Answer	Scientific Processes	Α	2 pt rubric
17 – 22				
23	Multiple Choice	Life Sciences	В	С
24	Multiple Choice	Earth and Space Sciences	D	Α
25	Multiple Choice	Life Sciences	Α	Α
26	Multiple Choice	Physical Sciences	С	С
27	Short Answer	Life Sciences	С	2 pt rubric
28	Multiple Choice	Life Sciences	В	D
29	Multiple Choice	Life Sciences	Α	В
30	Multiple Choice	Earth and Space Sciences	Α	С
31	Multiple Choice	Physical Sciences	В	Α
32	Short Answer	Scientific Processes	В	2 pt rubric
33	Multiple Choice	Scientific Processes	В	В
34	Multiple Choice	Physical Sciences	В	Α
35	Multiple Choice	Life Sciences	D	D
36	Multiple Choice	Life Sciences	А	Α
37	Multiple Choice	Earth and Space Sciences	В	Α
38	Extended Response	Scientific Processes	А	4 pt rubric
39	Multiple Choice	Life Sciences	В	С
40	Multiple Choice	Earth and Space Sciences	В	D
41	Multiple Choice	Life Sciences	А	В
42	Multiple Choice	Earth and Space Sciences	Α	В
43	Multiple Choice	Physical Sciences	D	А
44	Multiple Choice	Earth and Space Sciences	A	С

Limited = 0-10; Basic = 11-20; Proficient = 21-29; Accelerated = 30-34; Advanced = 35-48 Multiple Choice = 1 point; Short Answer = 2 points; Extended Response = 4 points 6. In repeating the investigation, the student accidentally drops and steps on the lead ball. This action changes its shape from a sphere to an egg-shaped solid. The lead ball is placed back into the graduated cylinder.

In your **Answer Document**, predict what effect, if any, this change has on the amount of water displaced by the lead ball. Explain your prediction. (**2 points**)

	Guidelines
Points	Student Response
2 point	The response provides the correct prediction that once placed in the graduated cylinder, the egg-shaped ball will displace the same amount of water <b>AND</b>
	a correct explanation that this is because the egg-shaped ball will have the same volume as the original ball (the ball was only changed physically).  Exemplar Response:
	The ball went through a physical change. When the ball is put back into the graduated cylinder the water will rise to the same place – so the same amount will be displaced. The ball has the same volume after it was squished.  Sample Response:
	The amount of water displaced by the lead should be the same because stepping on it only changed its shape, not its volume.
1 point	The response provides a correct prediction of the effect of the change in the ball's shape on the volume of water it displaces <b>OR</b>
	if no prediction is given, a correct explanation of the effect on the amount of water displaced by demonstrating an understanding that the volume of the ball was not changed (the ball was only changed physically).
	[NOTE: No credit may be given if an incorrect prediction is made. Providing an explanation for an incorrect prediction does not provide evidence of an understanding of the task.]  Sample Response:
	The volume of the lead ball is the same after it's stepped on, even though the shape is different.
0 point	The response fails to provide a correct prediction of the effect of the change in the ball's shape on the volume of water it displaces nor does it demonstrate any understanding that the volume of the ball was not changed when it was deformed. The response does not meet the criteria required to earn one point. The response indicates inadequate or no understanding of the task and/or the idea or concept needed to answer the item. It may only repeat information given in the test item. The response may provide an incorrect solution/response and the provided supportive information may be totally irrelevant to the item, or possibly, no other information is shown. The student may have written on a different topic or written, "I don't know".  Sample Response:
	The amount of water displaced by the lead ball changes.

11. In your Answer Document, using the two weather maps and the table of weather data, predict the likelihood of precipitation and probable sky conditions (cloud cover) at Cleveland, Ohio, for Sunday and for the following Tuesday.
Give reasons for your predictions for each day. (4 points)

	Guidelines Student Beenenee	
Points	Student Response	
4 point	The response provides correct weather predictions (including sky conditions and	
	likelihood of precipitation) for both Sunday and Tuesday and a correct, supporting	
	reason for each prediction.	
	Exemplar Response:	
	On Sunday, the weather in Cleveland should be stormy or rainy because of the cold front that is passing through. There is a high likelihood of rain and the sky will be cloudy	
	when the front passes through. On Tuesday the weather should be sunny (no clouds or	
	precipitation) because of the nearby high pressure air mass.	
	Sample Response: On Sunday it should be windy and rainy with dark clouds and then	
	turn clear and colder as the cold front passes through. On Tuesday the sky should be	
	clear with no rain because there are no frontal systems nearby.	
	Acceptable answers include:	
	Sunday –	
	sky: cloudy, stormy weather; wind (could result in rapidly changing cloud cover);	
	possible clearing and turning colder after storm/rain/wind	
	precipitation: high probability of rain	
	Reasons: nearby cold front passing through; low pressure system	
	Tuesday –	
	sky: fair, clear, sunny	
	precipitation: precipitation not likely	
0 : 1	Reasons: nearby high pressure system; no frontal systems are nearby	
3 point	The response provides correct predictions for both Sunday and Tuesday, but the	
	supporting reason for one of the days is incorrect, unclear, or missing.	
	Sample Response:	
	The weather on Sunday should be cloudy and rainy because of the cold front nearby	
Oneint	and on Tuesday, it should be clear because the rain moved away.	
2 point	The response provides one correct prediction with a supporting reason, but an incorrect prediction on the other day	
	OR the response provides correct predictions for both days but has incorrect, unclear, or	
	missing supporting reasons for both days.	
	Sample Response:	
	The weather should be clear on Sunday because of the cold front nearby. The weather	
	should be sunny with no rain on Tuesday because of the high pressure system nearby.	
1 point	The response provides the correct prediction for one day but has an incorrect, unclear,	
-	or missing supporting reason for that day.	
	Sample Response:	
	The weather should be sunny on Tuesday because it is a couple of days after Sunday.	

#### 0 point

The response fails to provide a correct prediction for either day. The response does not meet the criteria required to earn one point. The response indicates inadequate or no understanding of the task and/or the idea or concept needed to answer the item. It may only repeat information given in the test item. The response may provide an incorrect solution/response and the provided supportive information may be totally irrelevant to the item, or possibly, no other information is shown. The response may name the days of the week without supporting information. The student may have written on a different topic or written, "I don't know".

## **Sample Response:**

There is a likelihood of precipitation and sky conditions on Sunday and Tuesday.

**16**. Use the information and table below to answer question # 16.

Students do an investigation on the reaction of baking soda with vinegar. They create a data table to record the mass (grams) and temperature (degrees Celsius) of the mixture every 5 seconds. Several pieces of data are missing from the table.

Time (seconds)	Mass (grams)	Temperature (degrees Celsius)
0		21
5		20
10	57	18
20	55	17
25	54	17
30	54	
35	54	

In your **Answer Document**, give one example of how the incomplete data make it difficult for the students to draw conclusions about the changes that occur when baking soda reacts with vinegar.

Explain how the incomplete data will affect the ability of other students to reproduce the experiment. (2 points)

Points	Student Response
2 point	The response shows that the student uses skills of scientific inquiry to identify errors in data table that will affect the students' ability to draw conclusions from the experiment and difficult for other students to replicate the experiment.  The response provides a correct explanation about why the students will have difficulty drawing conclusions about the changes that occur when baking soda reacts with vinegar <b>AND</b>
	a correct explanation of how the incomplete data will affect the ability of other students to replicate the experiment.
	<b>Exemplar Response:</b> The students will be unable to draw conclusions about the change in mass that occurs because they did not record the beginning mass of the mixture. Students who try to replicate the experiment will have a hard time because they have an incomplete data table to compare to their data.
	Sample Response:
	The response may provide examples of how the incomplete data make it difficult to draw conclusions:
	<ul> <li>Data at 15 seconds – No data was taken at the 15 second time interval. The students will only be able to estimate the general trend in the change of mass and temperature during this time period.</li> </ul>
	<ul> <li>Final two temperature readings – the final two temperature measurements are missing. This will prevent the students from accurately describing the change in temperature over the course of the experiment, and prevent them from identifying the final temperature of the mixture.</li> </ul>
	<ul> <li>The students will be unable to draw conclusions about the change in temperature that occurs because they did not record the ending temperature of the mixture and they will not be able to identify a trend in the data that are there.</li> </ul>
	<ul> <li>The response may provide examples of how the incomplete data make it difficult for</li> </ul>

other students to replicate the experiment:

• It will be difficult for other students to replicate the experiment because the initial ratio of the masses of vinegar to baking soda is unknown.

# 1 point

The response shows that the student lacks a full understanding of the skills of scientific inquiry by providing a correct explanation about why the students will have difficulty drawing conclusions about the changes that occur when baking soda reacts with vinegar **OR** 

a correct explanation of how the incomplete data will affect the ability of other students to replicate the experiment.

# Sample Response:

Students that try to replicate the experiment will have a hard time because they will have an incomplete data table to compare to their data.

## 0 point

The response fails to demonstrate any understanding of the skills of scientific inquiry. The response only repeats words from the stem or lists errors from the data table, but does not address why the missing data will make it difficult to draw conclusions or how the missing data will affect the ability of others to replicate the experiment. The response does not meet the criteria required to earn one point. The response may provide an incorrect solution/response and the provided supportive information may be totally irrelevant to the item, or possibly, no other information is shown. The student may have written on a different topic or written, "I don't know".

#### Sample Response:

Students make a data table but do not record all of the necessary data for the experiment.

**27**. Choose one of the organisms in the diagram.

In your **Answer Document**, identify two nonliving resources the organism needs to live.

Explain how the organism uses each of the two nonliving resources. (2 points)

	Guidelines
Points	Student Response
2 point	Response identifies two abiotic (nonliving) resources <b>AND</b> provides plausible
	explanations of how the organism uses both resources.
	<b>NOTE</b> : The fish and paramecium produce carbon dioxide as a waste product of cellular respiration. A response that provides that the fish or paramecium uses carbon dioxide is incorrect.
	Students should not be penalized for including inaccurate science that is beyond grade level, specific to organisms, or otherwise not part of the content being assessed (i.e., identify abiotic resources and explain how those resources are used).  Exemplar Response:
	The water lily needs sunlight and water to live. The water lily uses the sunlight to carry out photosynthesis and gets nutrients from the water.  Sample Response:
	Possible resources and explanations include:
	<ul> <li>Sunlight – The water lily uses the sunlight for photosynthesis. Fish use sunlight to see.</li> </ul>
	<ul> <li>Water – The water lily gets nutrients and all three organisms get shelter from the water of the lagoon. The fish and paramecium get oxygen from the water. The fish in the picture and paramecium both need water in order to move. The paramecium uses its cilia to move water and food particles into its body (mouth). Water is necessary for the proper cellular functioning of the fish, paramecium and water lily. The water lily uses water in photosynthesis/combines water with carbon dioxide to form glucose/sugars.</li> </ul>
	• Soil/ground – The water lily uses the soil/ground to hold onto (to stay in one place). The water lily gets nutrients from the soil. The fish may get shelter/protection from the soil if it burrows.
	<ul> <li>Oxygen – All three organisms use oxygen for respiration (to provide energy from food)</li> </ul>
	Carbon Dioxide – The water lily uses carbon dioxide for photosynthesis.
	<ul> <li>Nutrients – All three organisms use nonliving nutrients to build/grow/regenerate themselves.</li> </ul>
1 point	Response provides only one abiotic (nonliving) resource and a correct explanation <b>OR</b>
	identifies two abiotic resources but fails to give a plausible and generally correct explanation for either.
	Sample Response:
	The fish uses water to get nutrients and oxygen.
<b></b>	,,

#### 0 point

The response fails to either identify an abiotic resource and explain how it is used or fails to identify two abiotic resources. The response does not meet the criteria required to earn one point. The response indicates inadequate or no understanding of the task and/or the idea or concept needed to answer the item. It may only repeat information given in the test item. The response provides only biotic resources (i.e., plants and animals), an incorrect solution/response and the provided supportive information may be totally irrelevant to the item, or possibly, no other information is shown. The student may have written on a different topic or written, "I don't know".

## **Sample Response:**

A resource in the lake is the frog or other animals in the lake.

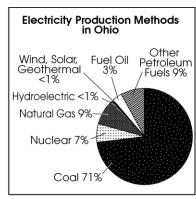
**32**. The data table and graph show speeds and distances during a race between car 1 and car 2.

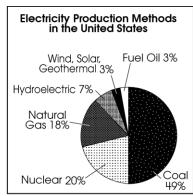
In your **Answer Document**, state which car won the race. Provide support to explain why your answer is correct. (2 points)

Scoring	Guidelines	
Points	Student Response	
2 point	The response identifies car 1 as the winner and provides a correct <b>AND</b> supported reason.	
	Exemplar Response:	
	According to the table, car 1 went 11.0 meters in 3 seconds. Car 2 went only 8.16 meters in 3 seconds – the race course is 11.0 meters so car 1 reached the finish line at 3 seconds and car 2 was far behind. Car 1 won.	
	Sample Response:	
	Car 1 won the race. According to the graph and table, it was going faster than car 2 all through the race and so must have won.	
	At all points in time, car 1 had gone a further distance than car 2, so car 1 won the race.	
	Possible explanations that support the statement that car 1 won the race:  Car 1 had the greatest speed throughout the race.	
	<ul> <li>Car 1 went 11.0 meters in 3 seconds and so finished the race, car 2 was behind – it only went 8.16 meters in 3 seconds.</li> </ul>	
	The data table and/or graph line for car 1 shows that it was ahead of car 2 at all points in time.	
1 point	The response provides that car 1 won the race <b>OR</b>	
	a reason why car 1 won the race.	
	Sample Response:	
	Car 1 was ahead of car 2 in the race.	
0 point	The response fails to correctly identify the winner as car 1 or provide a reason why car 1 won. The response does not meet the criteria required to earn one point. The response indicates inadequate or no understanding of the task and/or the idea or concept needed	
	to answer the item. It may only repeat information given in the test item. The response	
	may provide an incorrect solution/response and the provided supportive information may	
	be totally irrelevant to the item, or possibly, no other information is shown. The student	
	may have written on a different topic or written, "I don't know".	
	Sample Response:	
	Car 2 won the race because it went faster.	

## **38**. Use the charts and information below to answer question #38.

The two charts below show percentages of production methods for generating electricity in Ohio and in the entire United States in 2002.





Source: Department of Energy, 2002

The charts show some differences in the amount of electricity produced by different methods in the United States and in Ohio. Various constraints, such as geographic, social or economic factors, influence the method used for electricity production in a region.

In your **Answer Document**, choose one method of electricity production used in Ohio.

Give two reasons or factors that support using this method in Ohio, and give two reasons or factors that can be used to argue against using this method in Ohio. (4 points)

Points	Student Response
4 point	The response identifies an energy production method used in Ohio and provides two factors that would favor the chosen method  AND
	two factors that would disfavor the chosen method.
	<b>NOTE</b> : Credit will be given for a factor if correct reasoning is demonstrated even if information <b>not given</b> in the prompt is inaccurate (information for which the student is not responsible).
	Exemplar Response:
	Coal is used to produce electricity in Ohio.  Factors that favor coal use:
	<ul> <li>Coal is abundant locally because there are many coal mines near Ohio. This means</li> </ul>
	that coal is less expensive because it costs less to transport it.
	<ul> <li>Since coal mining is a local industry, local people can have jobs in this mining industry.</li> </ul>
	Factors against coal use:
	• Even though there is new technology for making coal cleaner-burning in power plants, it still produces air pollution.
	<ul> <li>Coal is nonrenewable – it takes too long to make new coal so when we run out of it there is no more.</li> </ul>

## Sample Response:

Some acceptable factors used to influence decisions on how to produce electricity in a given area:

## Fossil fuels - coal, natural gas, oil, other petroleum fuels:

Factors in favor of choosing one of the above energy sources

- abundance/availability if locally abundant, may choose to use because would cut down on transportation costs
- cost those fossil fuels that are locally abundant in Ohio, e.g. coal, may be less expensive than other energy resources
- provides jobs coal mining provides many jobs in some parts of Ohio

#### Factors against choosing one of the above energy sources

- nonrenewable all fossil fuel derived energy resources are nonrenewable, student may argue for using renewable, rather than nonrenewable, energy resources
- air pollution burning fossil fuels produces air pollution (including carbon dioxide)

Global warming – burning fossil fuels produces carbon dioxide which is a greenhouse gas and its increased concentrations in the atmosphere are suspected to play a role in global warming

## Renewable sources – hydroelectric, wind, solar, geothermal:

Factors in favor of choosing one of the above energy sources

- availability areas with large numbers of rivers and dams may favor hydroelectricity as an energy source
- renewable energy resource

Factors against choosing one of the above energy sources

- cost the technology associated with these types of energy resources are costly to develop and install
- availability these resources (falling water, locations of easily accessible geothermal heat, etc.) are not always readily accessible

#### Nuclear:

Factors in favor of choosing one of the above energy sources

- produces a small amount of air pollution
- large amounts of nuclear fuel (uranium) are available
- individual nuclear power plants use small amounts of uranium and produce large amounts of energy
- although a finite amount of uranium is available, because of the small amount used to generate energy, the supply will last for a very long time

Factors against choosing one of the above energy sources

- safety although the risk is small, the potential exists for radioactive contamination
- disposal of wastes although small amounts of wastes are produced, they are radioactive, which presents a disposal issue

The response provides two factors that would favor the chosen method and one factor that would disfavor the chosen method

## OR

one factor that would favor the chosen method and two factors that would disfavor the chosen method.

3 point

**NOTE**: Credit will be given for a factor if correct reasoning is demonstrated even if information **not given** in the prompt is inaccurate (information for which the student is not responsible).

#### **Sample Response:**

Natural gas is used in Ohio because it is relatively clean burning. It should not be used because it still produces air pollution and because it is nonrenewable so we can run out of it.

	The response provides two factors that would favor the chosen method <b>OR</b>
	two factors that would disfavor the chosen method
	OR
	one factor that would favor the chosen method and one factor that would disfavor the
2 point	chosen method.
	NOTE: Credit will be given for a factor if correct reasoning is demonstrated even if
	information <b>not given</b> in the prompt is inaccurate (information for which the student is not
	responsible).
	Sample Response: Nuclear energy is used in Ohio. It doesn't produce air pollution, which is good, but we still
	haven't figured out a very good way to store the leftover radioactive waste.
	The response provides one factor that would favor the chosen method
	OR
	one factor that would disfavor the chosen method.
1 point	NOTE: Credit will be given for a factor if correct reasoning is demonstrated even if
1 point	information not given in the prompt is inaccurate (information for which the student is not
	responsible).
	Sample Response:
	Fuel oil is not produced in Ohio and so it is too expensive to use.
	The response fails to demonstrate any understanding of the factors that are considered
	when choosing a method to use for electricity production. The response does not meet
	the criteria required to earn one point. The response indicates inadequate or no understanding of the task and/or the idea or concept needed to answer the item. It may
	only repeat information given in the test item. The response may provide an incorrect
0 point	solution/response and the provided supportive information may be totally irrelevant to the
	item, or possibly, no other information is shown. The student may have written on a
	different topic or written, "I don't know".
	Sample Response:
	Various geographic, social, or economic factors influence the methods used.