Ohio
Achievement Tests

Grade 8
Science
Student Test Booklet
May 2007

This test was originally administered to students in May 2007.

Not all items from the May 2007 administration will be released in this document. According to Ohio Revised Code (ORC) 3301.07.11:4(b) . . . not less than forty percent of the questions on the test that are used to compute a student’s score shall be a public record. The department (of education) shall determine which questions will be needed for reuse on a future test and those questions shall not be public records and shall be redacted from the test prior to its release as public record.

This publicly released material is appropriate for use by Ohio teachers in instructional settings. This test is aligned with Ohio’s Academic Content Standards for Science.

Copyright © 2007 by Ohio Department of Education. All rights reserved.
The Ohio Department of Education does not discriminate on the basis of race, color, national origin, sex, religion, age, or disability in employment or the provision of services.
Directions:

Today you will be taking the Ohio Grade 8 Science Achievement Test. Three different types of questions appear on this test: multiple choice, short answer and extended response.

There are several important things to remember:

1. Read each question carefully. Think about what is being asked. Look carefully at graphs or diagrams because they will help you understand the question.

2. For short-answer and extended-response questions, use a pencil to write your answers neatly and clearly in the space provided in the answer document. Any answers you write in the Student Test Booklet will not be scored.

3. Short-answer questions are worth two points. Extended-response questions are worth four points. Point values are printed near each question in your Student Test Booklet. The amount of space provided for your answers is the same for two- and four-point questions.

4. For multiple-choice questions, shade in the circle next to your choice in the answer document for the test question. Mark only one choice for each question. Darken completely the circles on the answer document. If you change an answer, make sure that you erase your old answer completely.

5. Do not spend too much time on one question. Go on to the next question and return to the question skipped after answering the remaining questions.

6. Check over your work when you are finished.

7. When you finish the test, you may not go on to, or look at, the social studies section of the Student Test Booklet.
1. A teacher places a ribbon of magnesium on a wire and suspends it in a flask. She then seals the flask and runs electricity through the wire to ignite the magnesium. After the magnesium is completely burned, a student notices a white powder in the bottom of the flask. The mass of the flask system (the flask and its contents) is determined before and after the magnesium is ignited.

Which statement correctly compares the mass of the flask system before the magnesium burned with the mass of the flask system after the magnesium burned?

A. The mass of the flask system before burning is greater than the mass of the flask system after burning.

B. The mass of the flask system before burning is less than the mass of the flask system after burning.

C. The mass of the flask system before burning is the same as the mass of the flask system after burning.

D. The mass of the flask system before burning is not related to the mass of the flask system after burning.
2. What interaction between organisms would be described as parasitic?

A. a mosquito feeding on the blood of a dog
B. a bee gathering nectar and pollen from a flower
C. a cleaner shrimp picking dead skin off a large fish
D. a nonpoisonous snake mimicking a poisonous snake
Use the information below to answer questions 3–6.

**Density Experiment**

The two graduated cylinders pictured can hold the same amount of water and use the same scale. A student measures the masses of two metal balls. One ball is made of aluminum and the other ball is made of lead. The student adds 50 mL of water to each graduated cylinder and then drops one metal ball into each graduated cylinder.

3. Which tool did the student use to measure the mass of each metal ball?
   A. ruler
   B. timer
   C. balance
   D. graduated cylinder

4. The student includes the sentence below in the write-up of this investigation.
   
   The lead ball has a measured mass of 113 grams.
   
   Which kind of scientific statement is this sentence?
   A. inference
   B. prediction
   C. explanation
   D. observation
5. The teacher asks the student to use the information she collected to compare the density of the two metal balls. The mass of the lead ball is 113 grams and the mass of the aluminum ball is 27 grams.

What can the student infer about the density of these metal balls based on this investigation?

A. The density of both metal balls is the same.
B. The density of both metal balls is less than the density of the water.
C. The density of the lead ball is less than the density of the aluminum ball.
D. The density of the lead ball is greater than the density of the aluminum ball.

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)
Use the information in the table and maps below to answer questions 7–11.

Weather Table and Maps

The weather information shown below was reported on Sunday, the 15th of the month, and two days later on Tuesday, the 17th of the month. The table includes conditions for Sunday only, whereas the maps report early morning conditions for both Sunday and Tuesday.

<table>
<thead>
<tr>
<th>City</th>
<th>Previous 24 Hour Temperatures</th>
<th>Barometric Pressure 6:00 a.m. (millibars)</th>
<th>Relative Humidity 6:00 a.m. (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High (Fahrenheit)</td>
<td>Low (Fahrenheit)</td>
<td></td>
</tr>
<tr>
<td>Cleveland</td>
<td>65</td>
<td>53</td>
<td>?</td>
</tr>
<tr>
<td>Dallas</td>
<td>75</td>
<td>50</td>
<td>1017</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>68</td>
<td>50</td>
<td>1007</td>
</tr>
<tr>
<td>Miami</td>
<td>80</td>
<td>64</td>
<td>1016</td>
</tr>
<tr>
<td>Minneapolis</td>
<td>54</td>
<td>39</td>
<td>1007</td>
</tr>
<tr>
<td>Seattle</td>
<td>64</td>
<td>57</td>
<td>998</td>
</tr>
</tbody>
</table>

Weather Map, Sunday the 15th 6:00 a.m.

Weather Map, Tuesday the 17th 6:00 a.m.
7. According to the weather map for Sunday, which is the approximate barometric pressure reading at Cleveland, Ohio, on Sunday at 6:00 a.m.?

A. 990 millibars  
B. 995 millibars  
C. 1000 millibars  
D. 1010 millibars

8. Look at the weather map and the table for Sunday at 6:00 a.m. Fog was reported for one city on Sunday morning at 6:00 a.m.

Which city was it?

A. Dallas  
B. Miami  
C. Minneapolis  
D. Seattle

9. You live in Ohio and want to paint the outside of your house. You need fair weather for at least two days for two coats of paint to dry completely.

According to the weather maps, on which day should you start painting?

A. Saturday, the 14th of the month  
B. Sunday, the 15th of the month  
C. Monday, the 16th of the month  
D. Thursday, the 19th of the month

10. According to the table of weather conditions, what was the average temperature in degrees Fahrenheit at Cleveland, Ohio, for the 24-hour period ending at 6 a.m. on Sunday?

A. 53 degrees Fahrenheit  
B. 59 degrees Fahrenheit  
C. 61 degrees Fahrenheit  
D. 65 degrees Fahrenheit

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)
Science

12. Coal is usually found underground, compressed in a layer between other types of rock. Coal is produced by what rock-forming process?

A. crystallization from melted rock
B. formation of sediment from weathering
C. deposition and burial of dead plant matter
D. eruption of volcanic ash followed by settling in a layer

13. Most electric power is generated by burning fossil fuels. A family living in central Ohio uses electric appliances for cooking and air conditioning. They use fuel oil for heating. What change could this family make to conserve fossil fuels?

A. convert to natural gas as a fuel for cooking
B. switch to the use of less expensive coal for heat
C. lower the temperature setting on the air conditioner
D. install solar roof panels to generate additional electricity

14. A park is home to a large number of robins, squirrels and rabbits. The robins and squirrels live in the park’s trees. The robins feed on earthworms and insects that live on the ground. The squirrels eat the acorns produced by the park’s oak trees. The rabbits hide in the bushes and feed on the grass. Which factor would directly limit the number of rabbits that could live in this park?

A. number of robins
B. number of bushes
C. number of acorns
D. number of squirrels

Use the following information to answer question 15.

15. The table below lists the densities of several materials.

<table>
<thead>
<tr>
<th>Material</th>
<th>Density (g/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limestone</td>
<td>2.70</td>
</tr>
<tr>
<td>Magnesium</td>
<td>1.74</td>
</tr>
<tr>
<td>Sulfur</td>
<td>2.07</td>
</tr>
<tr>
<td>Water</td>
<td>1.00</td>
</tr>
<tr>
<td>Wax</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Which material will float in water?

A. limestone
B. magnesium
C. sulfur
D. wax
Use the information and table below to answer question 16.

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.

<table>
<thead>
<tr>
<th>Time (seconds)</th>
<th>Mass (grams)</th>
<th>Temperature (degrees Celsius)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>57</td>
<td>18</td>
</tr>
<tr>
<td>20</td>
<td>55</td>
<td>17</td>
</tr>
<tr>
<td>25</td>
<td>54</td>
<td>17</td>
</tr>
<tr>
<td>30</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>54</td>
<td></td>
</tr>
</tbody>
</table>

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)
On the May 2007 Grade 8 Science Achievement Test, items 17–22 are field-test items, which are not released.
23. In which environment is white fur color an advantage for survival?
   A. desert
   B. grassland
   C. arctic tundra
   D. temperate forest

24. What is the major process of surface rock formation on volcanoes?
   A. Rock cools quickly from melted rock.
   B. Rock is recrystallized by extreme pressure.
   C. Rock solidifies slowly deep underground.
   D. Rock is formed from deposited sediment.
25. Which cell structure carries out a function for a cell that is similar to the function that bark carries out for a tree?
   A. cell wall
   B. nucleus
   C. chloroplast
   D. mitochondrion

26. Why is coal considered to be a nonrenewable energy source?
   A. Sunlight is the original source of energy for coal.
   B. The burning of coal could cause environmental pollution.
   C. Once coal is mined, it can take millions of years to be replaced.
   D. Coal is abundant, but it is very expensive to mine from underground.
Use the information below to answer questions 27–29.

The diagram below represents a cross section of a lagoon and some of its aquatic organisms. A magnified view (400X magnification) of each organism is shown.

Note: Diagram is not drawn to scale.
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)

28. Paramecia usually reproduce asexually. Fish reproduce sexually. Suppose the environmental conditions in the lagoon change.

What advantage will the fish population have over the paramecium population?

A. Sexual reproduction produces offspring that are identical to the parents.

B. Sexual reproduction decreases the genetic variability in the fish populations.

C. Sexual reproduction limits the spread of harmful characteristics in fish populations.

D. Sexual reproduction allows populations to adapt to new conditions over fewer generations.

29. Structure Z serves the same function in each of the organisms.

What is the function of structure Z in the water lily, fish and paramecium cells?

A. to move the cells

B. to control cellular activities

C. to carry out photosynthesis

D. to allow nutrients to enter and exit the cells
30. Which diagram shows the relative positions of Earth (E), the sun (S) and the moon (M) during a full moon?

(Note: Diagrams are not drawn to scale.)

A. 

B. 

C. 

D. 

E S M
M S E
S E M
E M S
Science

Use the information below to answer questions 31–34.

**Toy Car Race**

Ms. Williams’ science class uses a toy car race to study and collect data about forces and motion. The racetrack shown has a 6-meter ramp and a 5-meter level section to the finish line. Two cars compete at a time.

The data table and graph below show the speed and total distance traveled for car 1 and car 2 during the first three seconds of a race.

<table>
<thead>
<tr>
<th>Time (seconds)</th>
<th>Speed (meters/second)</th>
<th>Total Distance Traveled (meters)</th>
<th>Speed (meters/second)</th>
<th>Total Distance Traveled (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0.00</td>
<td>0.0</td>
<td>0.00</td>
</tr>
<tr>
<td>0.5</td>
<td>1.5</td>
<td>0.38</td>
<td>1.0</td>
<td>0.24</td>
</tr>
<tr>
<td>1.0</td>
<td>3.0</td>
<td>1.50</td>
<td>1.9</td>
<td>0.96</td>
</tr>
<tr>
<td>1.5</td>
<td>4.5</td>
<td>3.38</td>
<td>2.9</td>
<td>2.16</td>
</tr>
<tr>
<td>2.0</td>
<td>6.0</td>
<td>6.00</td>
<td>3.8</td>
<td>3.84</td>
</tr>
<tr>
<td>2.5</td>
<td>5.0</td>
<td>8.75</td>
<td>4.8</td>
<td>6.00</td>
</tr>
<tr>
<td>3.0</td>
<td>4.0</td>
<td>11.00</td>
<td>3.8</td>
<td>8.16</td>
</tr>
</tbody>
</table>
31. On what section of the racetrack will the forces on the cars be balanced?
   A. the starting block
   B. the ramp only
   C. the level section after the ramp
   D. the entire track

33. At what point on the track does a car reach its fastest speed?
   A. halfway down the ramp
   B. at the bottom of the ramp
   C. halfway down the level section
   D. at the finish line

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)
34. In the diagrams below, $g$ is the force of gravity, $r$ is the force of the ramp acting on the car and $f$ is the force of friction.

Which diagram shows the directions of the forces acting on a car as it travels down the ramp?
Scientists see three layers of rock exposed on the side of a hill. The bottom layer is sandstone with fossils of a certain species of reptile found only in this geographic location. The middle layer is volcanic ash. The top layer is mudstone (shale) with fossils of a different species of reptile.

The fossil evidence supports which hypothesis about the extinction of the older reptile species?

A. The older reptile species went extinct because sea levels rose and flooded its habitat.
B. The older reptile species went extinct because a predator was introduced into the environment.
C. The older reptile species went extinct because it could not compete with the younger reptile species.
D. The older reptile species went extinct because a volcanic eruption caused the environment to change.
Use the diagrams and information below to answer question 36.

36. The diagrams below show the digestive systems of an earthworm and a bird.

**Digestive System of a Worm**

![Digestive System of a Worm Diagram](image)

**Digestive System of a Bird**

![Digestive System of a Bird Diagram](image)

Earthworms and birds have strong muscular gizzards. The gizzard grinds food into small bits before it passes on to the intestine. Mammals, in contrast, do not have gizzards.

Why do earthworms and birds need to have gizzards but mammals do not?

A. Earthworms and birds are not equipped to chew food.
B. Earthworms and birds eat food that is difficult to digest.
C. Earthworms and birds have intestines that work inefficiently.
D. Earthworms and birds do not have stomachs to mix moistened food.
37. Why do satellites and spacecraft launched from Earth need to reach a specific speed to escape Earth’s surface?

A. to overcome Earth’s gravitational force
B. to protect equipment from radiation
C. to break through the sound barrier
D. to avoid Earth’s magnetic field
Use the charts and information below to answer question 38.

38. The two charts below show percentages of production methods for generating electricity in Ohio and in the entire United States in 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)
39. Male mussels release sperm into the water. Female mussels take the sperm into their gill chambers where fertilization occurs. Young mussel larvae are released into the water where they float freely until they attach to the gill of a host fish. After a few weeks, they reach the juvenile stage and drop off. After the juvenile drops off the fish gill, it burrows into the river bed and begins the life cycle all over again.

The parasitic behavior of the larvae benefits the mussel in two ways. One benefit is that the fish provides nutrition for the larvae when they are attached to its gill.

What is the second way this behavior enhances the survival of the mussel species?

A. The large size of the fish provides the mussel larvae with plenty of room to grow.
B. The parasitism increases the opportunity for the mussels to mate with other mussel species.
C. The mobility of the fish spreads the mussels to areas they would otherwise be unable to reach.
D. The location of the larvae on the gills of fish reduces the exposure of the larvae to oxygen-rich water.
Use the following information to answer question 40.

40. This photograph of Galaxy M-82 was taken by students at the Kitt Peak observatory in Arizona.

Which type of equipment did the students use to collect the light to make this photograph?

A. satellite  
B. binoculars  
C. microscope  
D. optical telescope

Source: Adam Block; NOAO, AURA, NSF

41. Which is an example of a group of cells with a common structure and function?

A. stomach  
B. muscle tissue  
C. mitochondria  
D. digestive system

42. Which phenomena occur as a result of the gravitational attraction between the moon and Earth?

A. eclipses  
B. ocean tides  
C. seasonal changes  
D. phases of the moon
43. Electricity is produced in a hydroelectric plant when moving water turns a turbine. Which describes this energy transformation from the turning turbine to electricity?

A. kinetic energy into electric energy
B. nuclear energy into electric energy
C. thermal energy into electric energy
D. chemical energy into electric energy

44. What change would occur if Earth’s rate of rotation significantly increased?

A. The year would be shorter.
B. The year would be longer.
C. The day would be shorter.
D. The day would be longer.