MOLDY BREAD

Ralph's teacher gave him a slice of bread with small spots of mold on it to do an experiment on mold. To do the experiment, Ralph used tracing paper that had a square grid printed on it. He placed the paper on the slice of bread and traced the bread outline. There were 100 squares covering the whole slice of bread, and 2 squares covered mold spots.

Ralph counted the number of squares covering the mold spots every day for 5 days. Write one question that Ralph was trying to answer.

1. How many squares covered the mold spots each day?
The data Ralph collected is shown in the table below.

<table>
<thead>
<tr>
<th>Time</th>
<th>Mold Size (in squares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>2</td>
</tr>
<tr>
<td>Day 2</td>
<td>5</td>
</tr>
<tr>
<td>Day 3</td>
<td>8</td>
</tr>
<tr>
<td>Day 4</td>
<td>18</td>
</tr>
<tr>
<td>Day 5</td>
<td>41</td>
</tr>
</tbody>
</table>

On the grid below, create a line graph that shows the relationship between Time and Mold Size. Be sure to title your graph, label each axis, and indicate the appropriate units for each axis.
3 Using the table or your graph on page 2, estimate Mold Size on Day 6.

Estimate: ____________________________

Explain your estimate.

________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

Ralph decided to do another experiment. He took three slices of bread, each having mold spots covered by 2 squares. He put one slice in the oven at 200° F, one slice on the kitchen counter, and one slice in the refrigerator.

4 Write one hypothesis for Ralph’s experiment.

________________________________________________________________________________________
________________________________________________________________________________________
Ralph measured the mold growth the same way he had done before. His results are shown in the table.

<table>
<thead>
<tr>
<th>Day</th>
<th>Mold Size (in squares)</th>
<th>Slice in Oven</th>
<th>Slice on Kitchen Counter</th>
<th>Slice in Refrigerator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>0</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>0</td>
<td>19</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>0</td>
<td>39</td>
<td>3</td>
</tr>
</tbody>
</table>

Write one conclusion that Ralph could draw based on his data.

_______________________________________________________________________

_______________________________________________________________________

_______________________________________________________________________
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Item 1

Rubric

Key Elements:

*any one of the following:

- Does the number of mold spots increase over time?
- Does mold grow in size over time?
- How does size of mold change with time?
- How many days does it take for the mold to cover the bread?
- What is the growth rate of mold?
- Any question relating the mold size/number of mold spots to time.

Score Points

1 point one key element
0 points other

Standard 1: Scientific Investigation
Benchmark 1.3: Asking questions and stating hypotheses that lead to different types of scientific investigations.
Subcontent Area: experimental design and investigations
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Item 2

Rubric

<table>
<thead>
<tr>
<th>Key Element</th>
<th>Acceptable examples</th>
<th>Unacceptable examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>• Time vs. Mold Growth</td>
<td>• Graph</td>
</tr>
<tr>
<td></td>
<td>• Growth vs. Days</td>
<td>• Data Table</td>
</tr>
<tr>
<td></td>
<td>• Mold Growth Rate</td>
<td>• Mold Size</td>
</tr>
<tr>
<td></td>
<td>• Time vs. Size</td>
<td>• Mold Investigation</td>
</tr>
<tr>
<td>Length of Line</td>
<td>Line may extend beyond points in either direction.</td>
<td>If the line begins at 0 and connects with the five points, it is incorrect.</td>
</tr>
<tr>
<td>Space Utilization</td>
<td>• Scaled Day 1–Day 5 on x axis (each day after 2 or 3 lines) and 0–85 on the y axis (each line 5 squares)</td>
<td>Scale using less than half the graph space.</td>
</tr>
<tr>
<td></td>
<td>• Other scales that utilize more than half the graph space are acceptable</td>
<td></td>
</tr>
<tr>
<td>Correct information on both x and y axis</td>
<td>Time on the x axis, Mold Size on the y axis</td>
<td>Words such as “Time” on the y axis and “Mold Size” on the x axis are not acceptable.</td>
</tr>
<tr>
<td>x axis labeled with units</td>
<td>• Days (squares if x axis label is Mold Size)</td>
<td>Incorrect label.</td>
</tr>
<tr>
<td></td>
<td>• If the label is Time and divisions say Day 1, Day 2 . . .</td>
<td></td>
</tr>
<tr>
<td>y axis labeled with units</td>
<td>Squares (Days if the y axis is Time)</td>
<td>Incorrect or no label.</td>
</tr>
<tr>
<td>Data Plotted</td>
<td>Only the five mold sizes may be plotted.</td>
<td>Any other information plotted on either axis.</td>
</tr>
</tbody>
</table>

Score Points for graph format
2 points six or more key elements
1 point four or five key elements
0 points three or fewer key elements/irrelevant, unclear, or inaccurate information

Score Points for graph accuracy
2 points five data points plotted correctly with a line connecting the points
1 point four data points plotted correctly with a line connecting the points or all data points plotted correctly but not connected with a line
0 points four data points plotted correctly but not connected with a line or three or fewer data points plotted correctly with a line connecting the points or irrelevant, unclear, or inaccurate information

Standard 1: Scientific Investigation
Benchmark 1.7: Communicating results of their investigation in appropriate ways.
Subcontent Area: results and data analysis

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Item 3

Rubric

Key Elements:

- any number between 70 and 100

any one of the following:

• Mold size almost doubled every day.
• Any explanation indicating extrapolation of the line/curve.
• any explanation indicating that mold size is increasing with time (every day)

Score Points

2 points two key elements
1 point one key element
0 points other

Standard 1: Scientific Investigation
Benchmark 1.6: Interpreting and evaluating data in order to formulate conclusions.
Subcontent Area: results and data analysis

Item 4

Rubric

Key Elements:

any one of the following:

• Temperature/location does not affect mold growth.
• Change in temperature/location changes the rate of mold growth.
• Mold growth will be best/worst at a specified place (counter/refrigerator/oven).
• any statement (not question) connecting temperature/location to growth rate of mold

Score Points

1 point one key element
0 points other

Standard 1: Scientific Investigation
Benchmark 1.3: Asking questions and stating hypotheses that lead to different types of scientific investigations.
Subcontent Area: experimental design and investigations
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Item 5

Rubric

Key Elements:

\textit{any one of the following:}

- Mold grows best at room temperature.
- Mold grows at different rates at different temperatures.
- Mold does not grow at 200° F.
- any reasonable conclusion that relates temperature/location to mold growth

Score Points

1 point one key element
0 points other

Standard 1: Scientific Investigation
Benchmark 1.6: Interpreting and evaluating data in order to formulate conclusions.
Subcontent Area: results and data analysis
The graph below shows the amount of wind energy consumption in the United States from 1993–1997.

**Wind Energy Consumption**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Trillion BTU</td>
<td>35</td>
<td>38</td>
<td>30</td>
<td>32</td>
<td>33</td>
</tr>
</tbody>
</table>

How much did wind energy consumption decrease from 1994 to 1995?

- [ ] 1 trillion BTU
- [x] 3 trillion BTU
- [ ] 33 trillion BTU
- [ ] 36 trillion BTU

Standard 1: Scientific Investigations
Benchmark 1.6: Interpreting and evaluating data in order to formulate conclusions.
Subcontent Area: results and data analysis
Directions
The graph below shows the distance traveled over time by a student walking down a hall. Use the information shown on the graph to do Numbers 7 and 8.

7. During which time interval was the student moving the fastest?
   - A
   - B
   - C
   - D

8. What was the average speed of the student from 0 seconds to 5 seconds?
   Average speed: ________________________________
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Item 7
Standard 1: Physical Science
Benchmark 2.3.5: Describing, measuring, and calculating quantities that characterize moving objects and their interactions within a system.
Subcontent Area: physics

Item 8
Rubric

Key Elements:

- 2 meters/second
- 2m/s

Score Points

1 point one key element
0 points other

Standard 2: Physical Science
Benchmark 2.3.5: Describing, measuring, and calculating quantities that characterize moving objects and their interactions within a system.
Subcontent Area: physics
The following table lists characteristics of five different types of animals. Use the information in the table to do Numbers 9 and 10.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
<th>Type IV</th>
<th>Type V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segments</td>
<td>Fewer than 5 segments</td>
<td>5 or more segments</td>
<td>Fewer than 5 segments</td>
<td>Fewer than 5 segments</td>
<td>5 or more segments</td>
</tr>
<tr>
<td>Antennae</td>
<td>One pair of antennae</td>
<td>One pair of antennae</td>
<td>No antennae</td>
<td>Two pairs of antennae</td>
<td>No antennae</td>
</tr>
<tr>
<td>Number of Legs</td>
<td>Fewer than 10 legs</td>
<td>10 or more legs</td>
<td>Fewer than 10 legs</td>
<td>10 or more legs</td>
<td>No legs</td>
</tr>
<tr>
<td>Mandibles</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Exoskeleton</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Wings</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

9 You observe an animal that has 20 body segments and has no mandibles. Which type of animal is it?
- Type II
- Type III
- Type IV
- Type V  

10 You observe an animal that has 12 legs and an exoskeleton. Which two types of animals could it be?

1) ________________
2) ________________

What additional information would allow you to decide which type of animal it is?

________________________

________________________
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Item 9
Standard 3: Life Science
Benchmark 3.1.1: Constructing and using classification systems based on the structure of an organism.
Subcontent Area: not assigned

Item 10
Rubric
Key Elements:

Type II and Type IV

* any answer indicating one of the following:
  * number of antennae
  * number of body segments

Score Points
2 points two key elements
1 point one key element
0 points other

Standard 3: Life Science
Benchmark 3.1.1: Constructing and using classification systems based on the structure of organisms.
Subcontent Area: not assigned
If the temperature of Earth rose over time, which of the following would occur?
- Sea level would fall, and the polar ice caps would decrease in size.
- Sea level would fall, and the polar ice caps would increase in size.
- Sea level would rise, and the polar ice caps would decrease in size.
- Sea level would rise, and the polar ice caps would increase in size.

Which of these is an immediate result of the movement of tectonic plates?
- ocean currents
- earthquakes
- glaciers
- tides

Item 11
Standard 4: Earth and Space Science
Benchmark 4.3.2: Describing the distribution and circulation of the world’s water through oceans, glaciers, rivers, ground water, and atmosphere.
Subcontent Area: earth science

Item 12
Standard 4: Earth and Space Science
Benchmark 4.1.4: Explaining the distribution and causes of natural events.
Subcontent Area: earth science
Look at this list of renewable resources.

- biomass
- hydroelectric
- wind
- geothermal
- solar

Circle one of the renewable resources in the list and describe one negative impact of the use of this renewable resource.

Rubric

Key Elements:

<table>
<thead>
<tr>
<th>Resource Type</th>
<th>Matching Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>biomass</td>
<td>air pollution, toxic chemicals</td>
</tr>
<tr>
<td>hydroelectric</td>
<td>destroys fish habitat (e.g. salmon), prevents sediment transport to coasts</td>
</tr>
<tr>
<td>wind</td>
<td>noise, unsightly windmills, kills birds</td>
</tr>
<tr>
<td>geothermal</td>
<td>thermal pollution, smells bad</td>
</tr>
<tr>
<td>solar</td>
<td>takes up space, looks bad, pollution from parts manufacturing</td>
</tr>
</tbody>
</table>

Note: For each resource type any other reasonable response may be accepted.

Score Points

1 point one key element
0 points other

Standard 5/6: Science and Technology
Benchmark 5.2: Describing advantages and disadvantages that might accompany the introduction of a new technology.
Subcontent Area: not assigned