

Date: _____

Your Name: _____

Partner's Name(s): _____



NEW ENGLAND COMMON ASSESSMENT PROGRAM

Practice Test Task & Answer Booklet 2008

Grade 11

Science Inquiry Task Acid Lakes

**GRADE 11
PRACTICE TEST SCIENCE INQUIRY TASK
TASK & ANSWER BOOKLET**

Directions:

This Inquiry Task will measure your ability to think scientifically. This task will ask you to form hypotheses, plan and critique investigations, analyze data, and develop explanations.

First you will read a short story, and then you will make predictions based on the information in the story. You will have 75 minutes to answer the questions about the story.

Write your answers in the spaces provided. Explain the reasons for all of your answers. You may include drawings or labeled diagrams to help explain your answers.

Read the story below.

Acid Lakes

This past summer, Holly and Jason spent a week visiting with their grandparents at a lake in a remote part of the White Mountains in New Hampshire.

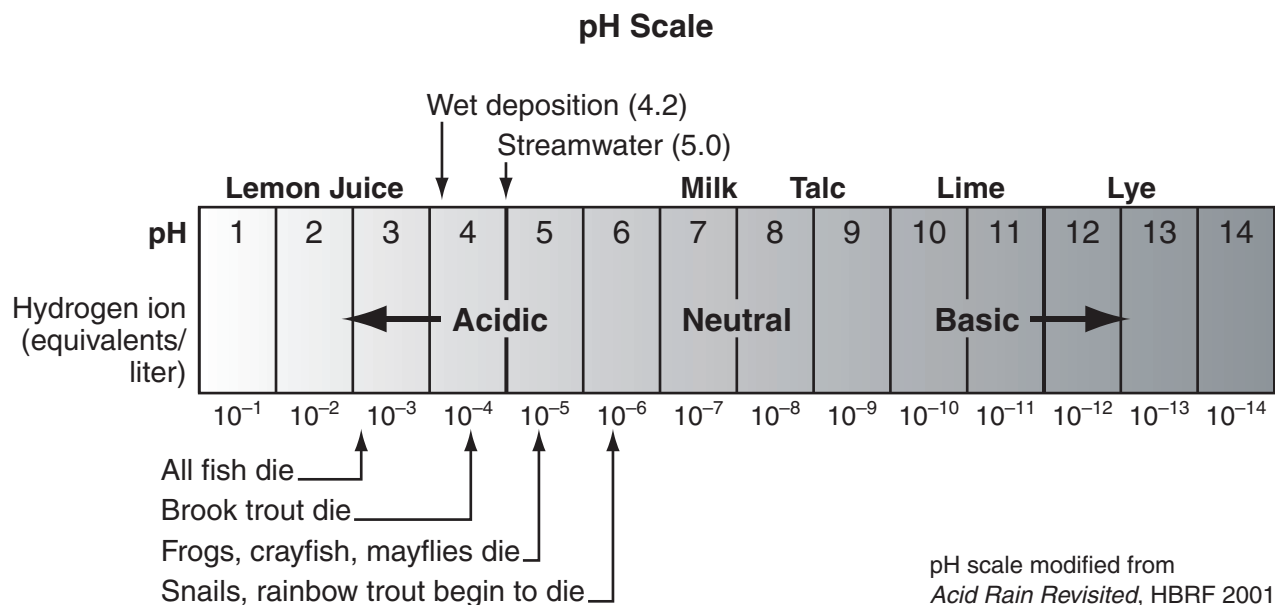
One day, after exploring the area around the lake and after swimming in the lake, Holly and Jason met their grandparents on the dock. Holly and Jason appeared puzzled. They told their grandparents that while they found the water in the lake to be clear and beautiful, they didn't see any fish in the lake or any frogs or salamanders in the area around the lake.

Their grandmother told them that, when she first moved to the area in the 1940s, the lake was full of fish and there were frogs and salamanders in the area around the lake. She told them that she hadn't seen fish, frogs, or salamanders in many years.

Holly and Jason's grandfather also told them that people in the community were very concerned about the health of the lake. A scientist from the state Environmental Protection Agency (EPA) tested the water in the lake and found that acid rain had changed its pH. Upset by this news, the people in the community demanded that the EPA take action to make the lake less acidic. In response, the EPA used airplanes to spread lime on the lake.

Back in school, Holly and Jason decided to investigate how the lake might recover from the effects of acid rain. They researched the problem on the Internet and found the pH scale shown on the next page to use in their investigation.

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Holly and Jason had learned from their science lab that the mineral talc might buffer acidic solutions. They wondered if adding talc to the lake might have the same effect as adding lime (calcium carbonate).

They designed an investigation in order to answer the following question:

How do the effects of talc on the pH of an acidic lake compare with the effects of lime (calcium carbonate)?

Critiquing Investigations and Predicting

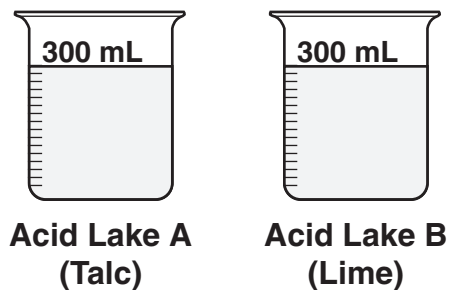
- Holly and Jason identified two variables, talc and lime, to investigate. Explain why it is important for them to test the effects these two variables have on pH separately rather than at the same time.

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2. Predict how the effects of talc on an acidic lake's pH will compare with the effects of lime. Use information from the story and your understanding of acids and bases to explain your thinking.

Evaluating Explanations

In order to investigate how the two variables, talc and lime, affect pH, Holly and Jason filled two 300-mL beakers with acidic lake water to make two model lakes, as shown below.



Holly and Jason made sure the pH of the water in the two beakers was the same. They filled a 3-mL plastic cup with talc and added it to Acid Lake A. They repeated this procedure five times. After each addition, they measured the pH of the water in Acid Lake A. They used the same procedure to add lime to Acid Lake B.

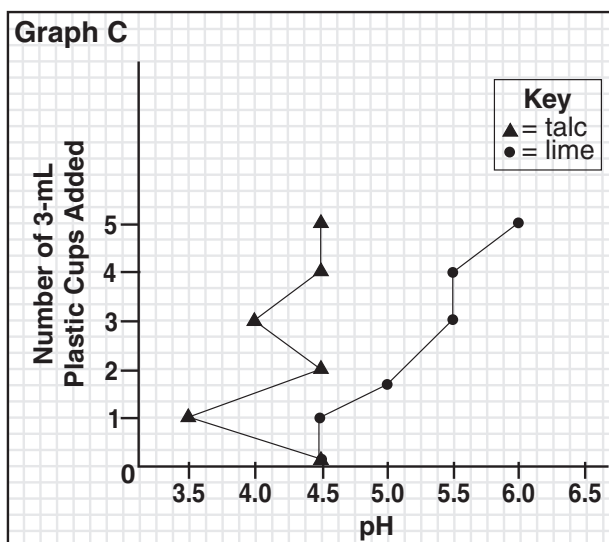
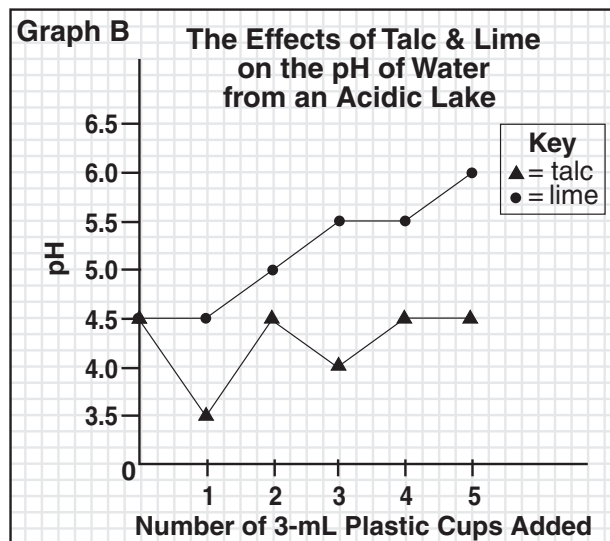
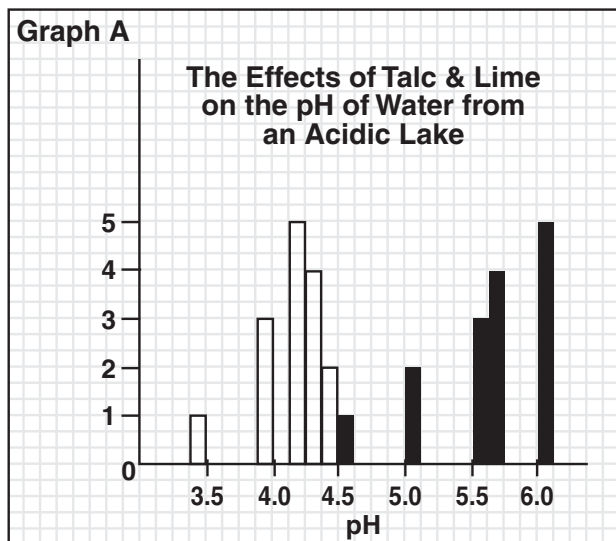
The table on the next page shows the data they collected.

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The Effects of Talc & Lime on the pH of Water from an Acidic Lake

Number of 3-mL Plastic Cups Added	pH for Acid Lake A (Talc)	pH for Acid Lake B (Lime)
0 (before adding talc or lime)	4.5	4.5
1	3.5	4.5
2	4.5	5.0
3	4.0	5.5
4	4.5	5.5
5	4.5	6.0

Holly and Jason graphed their data three different ways, as shown below.



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3. Which graph best represents Holly and Jason's data? Explain why the graph you chose best represents their data.

4. How do the results of Holly and Jason's investigation support or refute your prediction about how the effects of talc on **Acid Lake A's** pH compare with the effects of lime? Use the data to explain your answer.

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Holly and Jason surfed the Web to find more information about acid lakes. They found that the bedrock under and around the lake in the White Mountains in New Hampshire is primarily made of granite, which is composed of silicates similar to the talc they tested. They also found that bedrock under and around lakes in other parts of the country is primarily made of limestone rock (lime), which is composed of calcium carbonate.

5. How would you expect the pH of a lake with granite bedrock (talc) to compare with the pH of a lake with limestone bedrock (lime) if both lakes receive the same amount of acid rain? Support and justify your answer with the data provided from Holly and Jason's investigation.

To learn more about acid lakes and streams, Holly and Jason researched acid rain. They found data about the water chemistry of Watershed W6, a mountainside stream within the Hubbard Brook Experimental Forest in New Hampshire. The information indicated that the Watershed W6 sits on granite bedrock. The table below shows these data.

**Long-term Water Chemistry for Watershed W6 within
Hubbard Brook Experimental Forest**

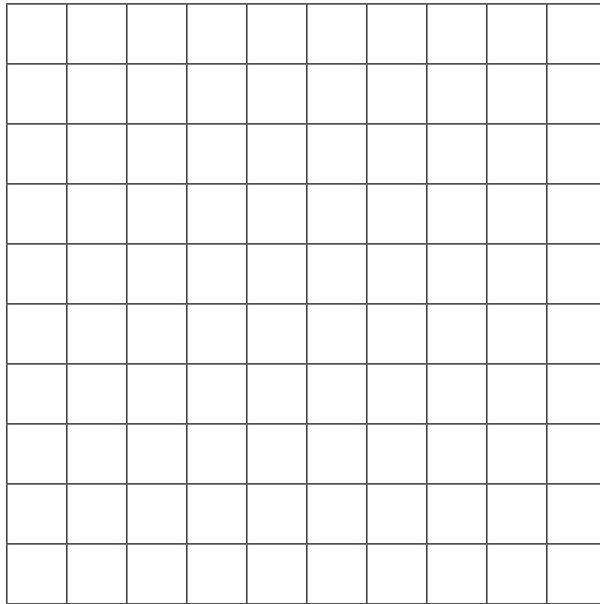
Year	Average Annual pH	Average Annual Concentration (mg/L)		
		Calcium (Ca)	Nitrates (NO ³)	Sulfates (SO ⁴)
1965	4.84	1.18	0.74	6.19
1975	4.91	1.36	2.06	5.99
1985	4.92	0.94	0.56	5.22
1995	4.92	0.81	0.21	4.66
2005	5.09	0.61	0.13	3.70

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Developing Explanations and Applying What You Learned

Directions: Use the water chemistry data in the Watershed W6 table on the previous page to answer questions 6, 7, and 8.

6. Organize the data from the Watershed W6 table into a graph that shows how the concentrations of calcium, nitrates, and sulfates change over time.



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7. Explain how changes in the concentrations of calcium, nitrates, sulfates, and pH in Watershed W6 relate to one another. If this trend continues into the year 2020, describe one possible effect on an abiotic or biotic factor of the ecosystem.

8. Suppose you are a fishing guide in an area adjacent to Watershed W6. You are worried about the effects of acid rain on the fish populations. Design a study to monitor how acid precipitation affects the population of trout in the streams and lakes you frequent. **Make sure you include the scientific procedures, materials, and data you plan to collect in this investigation.**

