D. pH

i. **Why is this test important?**
Scientists use this measurement to determine if a solution is either an acid, neutral or basic (alkaline). Most life does well around the number seven on the pH scale. Since the scale goes from one to fourteen, the further the water is in either direction from seven, the greater stress is upon living things. Normal fresh water lakes and streams will show a pH around the 6-8 range.

Strong acids, like "battery acid", would have pH around one while a strong base like "Draino" would have a pH near fourteen. Low pH (acidic) could be caused from acid rain or industrial pollution. High pH values (basic) could be caused industrial dumping or natural minerals leaching into the water, soaps and detergents.

PH is a logarithmic scale, which means something with a pH of 6 is ten times as acidic as a liquid with a pH of 7. A liquid with a pH of 5 is one hundred times as acidic as a liquid with a pH of 7.

ii. Water Quality Standards
The general range of pH for US surface waters is about 6.5 to 8.5. The pH depends on many factors such as stream vegetation, bed geology and the presence of water pollutants. In Texas, for example, the pH ranges from 5 to 9. Michigan soils tend to be high in calcium, which buffers lakes and streams from rapid changes in pH. Most Michigan water permits limit the discharge pH to 6.5 to 9 to protect aquatic life. The current drinking water standard for pH is between 6.5-8.5

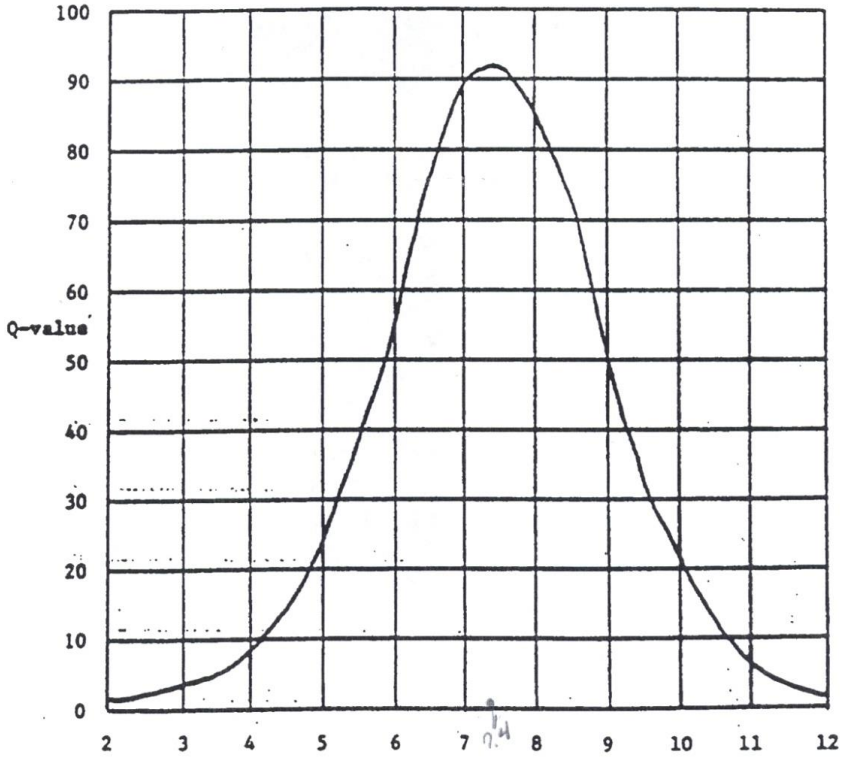
iii. How to conduct the test
The test method is very simple and can be performed in about one minute.

Read the directions that come with your testing kit.

iv. Determining the Q-Value

FIELD MANUAL FOR WATER QUALITY MONITORING

Chart 3: pH Test Results



Note: if pH<2.0, Q=0.0
if pH>12.0, Q=0.0

Once the pH is determined from the test method, the Q-value is determined directly by reading from a graph. The graph gives the highest Q-values for pH readings in the 7 to 8 range. The Q-value is lower as the pH decreases from 7 or increases from 8. For example, at a pH of 6 or 9 the Q-value is only 50. Interestingly, the highest Q-value is about 92 at a pH of 7.4. Based on the chart from Earthforce, a Q-value of 100 cannot be achieved even with a pH level of 7.4 which is considered "perfect."

v. What to watch for: Common Mistakes

1. Make sure you are using the correct indicator and colorimeter for the correct kit.

2. Use a white sheet of paper behind your colorimeter so background colors do not interfere with your matching of the color.

3. The most common error in this test is when adding 10 drops of the indicator solution. It is easy to add more or less than 10 drops if the student is not paying close attention. Adding more than 10 drops provides erroneous results, and may not produce repeatable data.

4. Another common error is in the location of the sampling site or the actual sampling. Sampling too close to the storm outfall presents challenges and in such cases the teacher or mentor should be consulted.

5. Sampling of the water should be performed carefully so that the bottom of the stream or river is not impacted, nor just a surface sample of water taken by the student. The student must be aware that the sample collected must represent the overall condition of the water body. The best place to take a sample is from the middle of a stream, not at the surface, not at the bottom, or not to close to the stream banks. This may be difficult depending on the site.

6. Sometimes the glassware is not washed properly from last year's test sampling. This can lead to faulty results.

vi. Consistency when doing multiple tests

Generally, three tests or more if time permits should be performed by the student. Test results should be plus or minus 0.5 pH units. The goal is to obtain data that is accurate and precise. Any result that is extreme should be questioned and with your classroom mentor or FRWC staff. The sample mode, which is the most common pH value should be reported, not the average or mean. For example, assume test pH values are determined to be 7.5, 7.5, 8.0, 7.5 and 8.0. The value of 7.5 should be used to assess the Q-Value, rather than 7.7 which is the mean.

vii. How to analyze why the results are good or bad

If you have a high pH reading, above 8.5, it could be the result of pollution in the water. The most common causes of high pH are detergents, runoff that includes ashes (from brushfires or campfires), or from limestone.

Low pH could be caused by some fertilizer runoff or industrial waste.