

# Water Chemistry Bingo

**Adapted from:** An original Creek Connections activity.  
Creek Connections, Box 10, Allegheny College, Meadville, Pennsylvania 16335.

**Grade Level:** advanced

**Duration:** class period

**Setting:** classroom

**Summary:** Students will play a game that will teach them the most important features about the eight chemical parameters.

**Objectives:** Students will be reviewing the eight chemical parameters and will recognize how the aquatic life is affected by changes that occur.

**Related Module Resources:**

- All materials relate

**Vocabulary:** parameter

**Materials (Included in Module):**

- Handbooks for Water Quality Analysis of Waterways (B-3)
- 6 set of card masters per group (B-top envlp)
- one playing board per person (B-top envlp)
- one parameter heading per person (B-top envlp)
- one creek components heading per person (B-top envlp)

**Additional Materials (NOT Included in Module):**

- none

## ACADEMIC STANDARDS (ENVIRONMENT AND ECOLOGY)

### 7<sup>th</sup> Grade

4.1.7.B. Understand the role of the watershed.

- Explain factors that affect water quality and flow through a watershed.

4.3.7.B. Describe how human actions affect the health of the environment.

- Identify land use practices and their relation to environmental health.
- Explain how nonpoint source pollution can affect the water supply and air quality.

### 10<sup>th</sup> Grade

4.3.10.B. Explain how multiple variables determine the effects of pollution on environmental health, natural processes and human practices.

- Explain how human practices affect the quality of the water and soil.

### 12<sup>th</sup> Grade

4.1.12.C. Analyze the parameters of a watershed.

- Interpret physical, chemical and biological data as a means of assessing the environmental quality of a watershed.

## BACKGROUND:

There are many ways to study water bodies. Some ways include performing chemical testing, biological studies, evaluating land use effects and habitat health. Chemically, there are many different water quality parameters to study. A **parameter** is any set of information that is used to describe something and it can remain consistent to investigate other variables. Some examples of water quality parameters include temperature, pH, dissolved oxygen, total dissolved solids, nitrogen, phosphorus, turbidity, and alkalinity. These tests are very commonly studied parameters but there are numerous other chemical tests that can be conducted.

Each chemical parameter either exists at a natural or unnatural level in the stream. Some, like temperature and phosphorus, naturally have low levels in a stream while others, like dissolved oxygen and alkalinity, have high natural levels in streams. Everything that humans do on or with the land can influence the chemical parameters. We may add pollutants to the waterway or disturb the land surrounding a waterway. The government has studied many different chemical parameters and has determined suitable levels that waterways should maintain to be healthy or drinkable.

To learn more about each chemical parameter use the Information Sheets, Fact Sheets, or Handbook for

Water Analysis of Western Pennsylvania Waterways. These will give students information about why each chemical test is needed in a stream, how humans can disturb natural levels, and the effects unnatural levels have on the waterway.

**OVERVIEW:** Using various resources (Water Quality Analysis Handbook, websites, or other book resources) students review important facts about eight chemical parameters (temperature, pH, total dissolved solids, dissolved oxygen, nitrates, phosphates, alkalinity, and turbidity) by playing a board game.

**PROCEDURE:**

*This activity can be done in a variety of ways.....*

**OPTION 1:**

1. Have students familiarize themselves with the chemical parameters by reading the Water Quality Analysis Handbook, Information Sheets, and Fact Sheets. They will probably need handbooks to do this activity.
2. Students should split up in-groups of four. Each group gets a different color set of cards (in envelopes). Every player takes a game board, a horizontal parameter header, and a vertical creek components header. Place the headers along the edges of the game board.
3. Shuffle the deck of master cards and place the deck in a place that each player can reach, face down.
4. Within each group of four students, the first student will pick up a card from the deck and place it in the square where he/she feels it belongs. If the card truly fits the criteria for a spot on the game board, then they can place it there. If the player thinks that the card is not needed or has already been used, place it back in the card pile.
5. Then the next player does the same thing.
6. This goes on until someone completes a column of a particular parameter or a row of creek categories. If every one in the group agrees with the person's answers and if the **answer key** has been consulted, then this person is the winner.
7. If the player did in fact get a bingo, the game is over and the group can start another game. If the bingo was wrong, the game will continue until another bingo is called.

**A note about the cards...**

Some cards can apply to more than one space on the game board. There are also some cards that will be used more than once on the game board. Tell students, if the card truly fits the criteria for a spot on their game board, then put it there.

**OPTION 2:**

Instead of completing just a row or column, make students try to fill in the entire game board. Whoever is the first to fill all spots or whoever gets the farthest before class ends is the winner. There are enough cards in each color set to fill 4 game boards completely.

**OPTION 3:**

Instead of students working by themselves, pair them up (2 or 3 per game board). This is a great game for teamwork and consultation.

**OPTION 4:**

Make photocopies of the 2 pages of cards on different colors of paper. Make a card set for each student in class. Cut out cards keeping each set separate (this is why it is useful to use different colors). You may elect to have students cut them out. Mix up the cards in each set. Pass out game boards, headers, and a card set to each student and have them race to fill in all the spots on the game board.

**DISCUSSION:**

When the stream is healthy and all parameter levels are normal, what parameter do the students think is the most important to the stream's aquatic life under these circumstances? Most important to the humans if the stream is a drinking water source? *There really is no right or wrong answer, but it is a great debate question to have students defend their response with solid reasoning.*

Under unhealthy or unsafe levels, which parameter do the students think is the most detrimental to the overall stream health? Which is the least detrimental? *Once again, there really is no right or wrong answer, but make sure students support their answers.*

**EVALUATION:**

- Discussion questions above would be great essay questions.
- Identify the major roles of chemical parameters in the waterway.
- Explain how humans affect a waterway's chemical parameters.

**EXTENSIONS AND MODIFICATIONS:**

- Have students do a book report or oral report on one of the parameter covered by this game.
- Have students make more cards that could fit into the various categories for the game.

**NOTES (TEACHERS, PLEASE WRITE ANY SUGGESTIONS YOU HAVE FOR TEACHERS USING THIS ACTIVITY IN THE FUTURE):**