Sweet 16 Chemistry of Gases Tournament

Do your students eagerly compete to fill out their "March Madness" tournament brackets? Have some fun and inspire your students with March Madness chemistry! This activity combines the popularity of "bracketology" with a review of the preparation and properties of common gases. The historical foundation of modern chemistry was built on the study of gases, such as experiments with hydrogen and oxygen in the 18th century that led to the modern definition of an element versus a compound. From these historical roots, the study of gases continues to influence our lives. The role of "greenhouse gases," in particular, remains a vital area of research—and may help determine the winner of the Sweet 16 Chemistry of Gases tournament!

Review of Concepts

- Common gases
- Solubility of gases in water
- Acid–base properties
- Molar volume of gases at STP
- Ideal gas law
- Greenhouse gases

Tournament Rules

The rules for filling out the tournament bracket are summarized below. A supplementary chemical reactions worksheet has been provided to help identify the contestants in the Sweet 16 Chemistry of Gases tournament.

- First round: Predict the name and formula of the gaseous product obtained in a chemical reaction involving the reactants listed in the first round. The gas "escapes" to the second round!
- Second round: Compare the solubility of the gases in water. The winner is the gas that dissolves in water to form an **acidic** solution.
- Semifinals: Calculate the density of each gas in g/L based on its molar mass (g/mole) and the molar volume of an ideal gas at STP (22.4 L/mole). The winner is the gas that is **more** dense.
- Final: The winner of the tournament is a "greenhouse gas" that is produced in large quantities in volcanic emissions.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12
Constancy, change, and measurement
Content Standards: Grades 5–8
Content Standard B: Physical Science, properties and changes of properties in matter
Content Standard F: Science in Personal and Social Perspectives, natural hazards
Content Standards: Grades 9–12
Content Standard B: Physical Science, structure and properties of matter, chemical reactions
Content Standard D: Earth and Space Science
Content Standard F: Science in Personal and Social Perspectives, environmental quality, natural and human-induced hazards

Extension

Add small pieces of dry ice to a series of acid–base indicator solutions—the solutions immediately begin to "boil" and change color. Teach students about sublimation and the acid–base properties of carbon dioxide with this colorful and "cool" demonstration!

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Supplementary Chemical Equations Worksheet

Predict the products and balance the following chemical equations to identify the contestants in the Chemistry of Gases tournament.

1. $Na_2CO_3(s)$ + ___HCl(aq) →
   Sodium carbonate *Hydrochloric acid*

2. Zn(s) + ___HCl(aq) →
   Zinc *Hydrochloric acid*

3. ___H_2O_2(aq) $\xrightarrow{\text{Yeast}}$
   Hydrogen peroxide *(Catalyst)*

4. $Na_2SO_3(s)$ + ___HCl(aq) →
   Sodium sulfite *Hydrochloric acid*

5. Cu(s) + ___HNO_3(aq) →
   Copper *Nitric acid*

6. $CaC_2(s)$ + ___H_2O(aq) →
   Calcium carbide *Water*

7. NaOCl(aq) + ___HCl(aq) →
   Sodium hypochlorite *Hydrochloric acid*

8. NH_4NO_2 $\xrightarrow{\text{Heat}}$
   Ammonium nitrite

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