**Balancing Chemical Equations Using Matrices**

Boron sulfide and water violently react to from boric acid and hydrogen sulfide. The unbalanced equation is:

We assign unknown variables to each the equation above as follows:

and rewrite the equation:

This chemical formula/mathematical equation implies separate equations for boron, sulfur, oxygen and hydrogen as follows:

|  |  |
| --- | --- |
| Boron |  |
| Sulfur |  |
| Hydrogen |  |
| Oxygen |  |

We can rewrite this in augmented matrix form:

Enter this matrix into your calculator and execute the RREF function:

Note the last row implies that there are an infinite number of solutions, but that’s OK, we only need one. This matrix represents the following set of equations:

or

Now select a value for that is equal to the least common denominator for the fractions in the final set of equations, i.e. . Therefore . We now have the balanced equation:

**Homework:**

Apply this method to balance the following chemical equations:

1. Burning propane:
2. “Plop, plop, fizz, fizz, Oh what a relief it is” … The Alka-Selzer Reaction
3. Fun with parathesis …