ChemBalance 2.0
for TI-83/84 [Plus]

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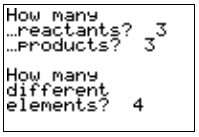
ChemBalance is a program to automatically balance any chemical equation. Instead of using the trial-and-error method that is sometimes taught, it uses an algebraic method. (Information on this method at http://en.wikipedia.org/wiki/Chemical_equation#Linear_system_balancing.)

Instructions

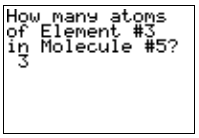
As an example of how to use the program, I'll use the equation

$$Ag^+ + AsH_3 + OH^- \rightarrow Ag + H_3AsO_3 + H_2O$$

1. Start the program by pressing PRGM and selecting BALANCE, or through a shell like MirageOS.
2. The calculator will ask you how many reactants and products there are in the equation. In this example, there are 3 reactants (Ag^+, AsH_3, and OH^-) and 3 products (Ag, H_3AsO_3, and H_2O).



3. The calculator will ask you how many different elements there are in the equation. Here, there are 4 elements (Ag, As, H, and O).
4. When prompted, tell the calculator whether the equation contains any ions that must be balanced. (There are ions in the example.)
5. The calculator will tell you to number each molecule and element. The numbers do not refer to the atomic number of each element, but rather to the order in which they appear in the equation. In the example, Ag^+ is Molecule #1, AsH_3 is Molecule #2, OH^- is Molecule #3, Ag is Molecule #4, and so on. Similarly, Ag is Element #1, As is Element #2, H is Element #3, and O is element #4. You do not need to memorize these numbers or write them down; the program works in a way that you only need to use them if you lose your place entering the equation, and if you forget which is which, you can find them again by counting.
6. Enter the number of atoms in each molecule. For example, there are 3 atoms of Element #3 (H) in Molecule #5 (AsH_3).



7. Enter the charge of each molecule. Positive charges are written *without* the + sign. For example, to enter the charge of Ag^+, type 1. Enter a negative number for a negative charge. (Use the (-) key, not the − key, on the calculator.) In the example, the charge of OH^- is entered as -1. Enter the charge of a neutral molecule as Ø.
8. After you've finished, the calculator will show a list of coefficients. (Use the arrow keys to scroll left and right, if necessary.) The coefficients are in order of the molecules in the equation. In the example, the calculator gives {6 1 6 6 1 3}, meaning that the balanced equation is

$$\mathbf{6}Ag^+ + AsH_3 + \mathbf{6}OH^- \rightarrow \mathbf{6}Ag + H_3AsO_3 + \mathbf{3}H_2O$$

Other Information

If you make a mistake entering any information into the calculator, or decide to exit halfway through, type a non-integer (such as 0.5) the next time the calculator asks you for a number. The program will stop and show a menu prompting whether to restart or exit. If you are not entering charges, a negative number will have the same effect.

If the equation contains an electron not associated with any molecule, it can be entered by treating it like a molecule that contains no elements, but has a negative charge. In other words, enter Ø for the number of any element in that "molecule," and enter ⁻1 as the charge.

This program is locked by default, but you can read or edit my code using a locking/unlocking utility for the calculator. (MirageOS has one built in.)

Bugs

Due to an error in the calculator's firmware, the program may occasionally seem to take a long time to calculate the coefficients, and it might display the coefficients as non-integers. I have tried to make this occur as little as possible, but it's possible that there are equations that still trigger this bug. If an equation has very large coefficients, this bug may occur.

Contact me

If you find a bug in the program, send me an e-mail at hanson.ira@gmail.com. Include information about how the error came about, specifically the equation that you were using. You can use this address to send me comments or suggestions about the program, as well.