

## Introduction to Balancing Equations

**Recommended grades level(s)** 9-12

**Time Duration:** - 30-60 minutes

**Objective(s):**

The learner will be able to internalize how to balance equations.

**Materials and/or Resources:**

Worksheets

Free online game

**Background Information:**

Teaching balancing equations to high school students is difficult, because often some of the students are still at Piaget's concrete rather than abstract reasoning stage. That is, they cannot just see the molecules in their head and/ or draw them correctly. This lesson plan makes use of Chembalancer, an online app, which makes that abstraction concrete. The game is available at <http://www.dun.org/sulan/chembalancer>.

**Procedures:**

1. Go to the online game Chembalancer and check it out.
2. Go to the Worksheet location and print out a copy a photocopy as needed for your class.
3. Go to a computer lab, hand out the worksheet, and have the students play the Chemobalancer game (or just double-click the default.htm page if you had to download and install local copies from chemical.ZIP as described at the bottom of <http://www.dun.org/sulan/chembalancer>)
4. If you want, you can get the students to show you the final page when they finish (instead of you having to mark #1-#11 on the worksheet), then initial their worksheet to say they completed the game.
5. Get the students to do #12 and #13 on the back of the worksheet.

**Development Resources:**

Online Lesson Version

<http://www.dun.org/sulan/chembalancer/lesson.htm>

Chembalancer Game

<http://www.dun.org/sulan/chembalancer>

Name \_\_\_\_\_

### Worksheet to teach balancing equations

#### Directions:

1. Start Internet Explorer or Netscape and go to <http://www.dun.org/sulan/chembalancer>
2. Click 'Directions'. Read and understand the directions.
3. Click 'OK'
4. Click on 'Start Game'.
5. Try entering some numbers in the text boxes in front of each molecule. What happens?
6. If you forget the directions, click on the 'How to Play the Game' link. Click 'OK' when you finish reading them to return to the game.
7. When you think you have typed the right numbers in all the boxes, click the 'Balanced' button.
8. If you didn't get it right, try again.
9. If you did get it right, then fill in the correct answers on this worksheet for #1.
10. Repeat steps 7-9 for the other 10 questions.
11. Now do the two problems on the back of this worksheet. You can draw the molecules just like the program did to figure out the answer.

#### Questions:

Fill in the blanks below as you go through the game. This is so I have a record that you did your assignment.

1. \_\_\_\_Fe + \_\_\_\_S            \_\_\_\_FeS
2. \_\_\_\_H<sub>2</sub> + \_\_\_\_Cl<sub>2</sub>        \_\_\_\_HCl
3. \_\_\_\_Mg + \_\_\_\_O<sub>2</sub>        \_\_\_\_MgO

4.  $\underline{\quad}\text{O}_2 + \underline{\quad}\text{H}_2 \quad \underline{\quad}\text{H}_2\text{O}$
5.  $\underline{\quad}\text{HgO} + \underline{\quad}\text{Hg} \quad \underline{\quad}\text{O}_2$
6.  $\underline{\quad}\text{Ca} + \underline{\quad}\text{H}_2\text{O} \quad \underline{\quad}\text{Ca(OH)}_2 + \underline{\quad}\text{H}_2$
7.  $\underline{\quad}\text{CH}_4 + \underline{\quad}\text{O}_2 \quad \underline{\quad}\text{CO}_2 + \text{H}_2\text{O}$
8.  $\underline{\quad}\text{Na}_2\text{O}_2 + \underline{\quad}\text{H}_2\text{SO}_4 \quad \underline{\quad}\text{Na}_2\text{SO}_4 + \underline{\quad}\text{H}_2\text{O}_2$
9.  $\underline{\quad}\text{N}_2 + \underline{\quad}\text{H}_2 \quad \underline{\quad}\text{NH}_3$
10.  $\underline{\quad}\text{Al} + \underline{\quad}\text{O}_2 \quad \underline{\quad}\text{Al}_2\text{O}_3$
11.  $\underline{\quad}\text{KMnO}_4 \quad \underline{\quad}\text{K}_2\text{O} + \underline{\quad}\text{MnO} + \underline{\quad}\text{O}_2$

Draw the molecules just like the program did to figure out the answer to #12 and #13.



Fact for #12: Sodium metal, Na, is stored in kerosene so it won't react with water vapour. When added to water it reacts quickly to make hydrogen gas.



Fact for #13: This is an example of an acid base reaction. Acid + base      Salt +  
Water