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Program Support Notes

Middle - **S**enior **S**econdary

30mins

Chemical Equations

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Suitable for:

Chemistry

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Chemical Equations

For Teachers:

Brief Summary of Program

This program covers:

- Lavoisier and Dalton – conservation of mass and atoms not being created or destroyed during chemical reactions.
- Combination, decomposition, displacement, precipitation and combustion reactions.

Introduction

The *Law of Conservation of Mass* and John Dalton's proposal that atoms are neither created nor destroyed during chemical reactions form the basis of how we study chemical processes. The process of balancing chemical equations and the way that certain types of reactions are classified are demonstrated during this program as a number of chemical reactions are performed and then analysed.

A combination reaction between zinc and iodine is followed by the visually stunning precipitation of lead iodide which is used to demonstrate the Law of Conservation of Mass. A clear method for balancing equations is introduced by considering the equation that describes ammonia forming from hydrogen and nitrogen, and this same method is reinforced throughout the program.

The program then focuses on the classification of reactions. Combination reactions are analysed through the combustion of magnesium and hydrogen. The electrolysis of water to produce hydrogen and oxygen is then used to demonstrate a decomposition reaction. The relationship between these and combination reactions as opposites is highlighted.

Displacement reactions are then addressed as we see silver oxide being removed from cutlery by aluminium foil. This leads into a look at the activity series and how it can be used to predict the products of some other displacement reactions.

The precipitation of lead iodide and barium carbonate are used to demonstrate precipitation reactions. The insolubility of certain ionic substances and the status of spectator ions is highlighted.

A series of common combustion reactions is then used to demonstrate a clear method for balancing equations for reactions that involve hydrocarbons and oxygen.

Throughout the program analogies using people and familiar objects are used to make the content more accessible.

Program Timeline

00.30	Introduction
02.28	Writing and balancing chemical equations
08.40	Summary
09.17	Combination reactions
12.21	Summary
13.03	Decomposition reactions
15.27	Summary
16.13	Displacement reactions
21.56	Summary
22.40	Precipitation reactions
24.57	Summary
25.42	Combustion reactions
29.05	Summary
29.42	Conclusion
30.12	Credits
30.38	Program end

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For Students:

While Viewing the Program

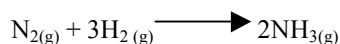
1. What are the signs that typically indicate that a chemical reaction is taking place?

2. The *Law of Conservation of Mass* states that mass is conserved. Explain why the mass of the reactants equals the mass of the products during a chemical reaction.

3. Dalton concluded that chemical reactions are simply rearrangements of atoms. What does this mean to you?

4. What signs of a chemical reaction are evident when zinc and iodine are mixed?

5. The reaction between hydrogen and nitrogen to form ammonia is used to demonstrate a method for balancing equations. The balanced equation is:



Why can you only balance equations by putting coefficients in front of reactants and products, and not by altering the subscripted numbers in the equation?

6. When magnesium is burnt to form magnesium oxide white smoke is given off. What do you think is in this white smoke? Explain your answer.

7. Explain why some reactions are described as composition reactions.

8. Why are some reactions called decomposition reactions?

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9. During the decomposition of water twice as many hydrogen molecules are produced as oxygen molecules. What relationship does this have to the volumes of these 2 gases produced?

10. Explain the significance of the gameboy confrontation? How is this an example of displacement?

11. What pattern can you observe in the activity series? Where do the most reactive metals sit on the Periodic Table? List some of the least reactive metals. What are they commonly used for?

12. Define what a displacement reaction is.

13. Explain what a precipitate is?

14. Lead iodide and barium carbonate are two ionic compounds that are used to demonstrate the formation of a precipitate. Do all ionic compounds form precipitates? Give some examples of ionic compounds that do not form precipitates and some that do.

15. What name is given to ions that do not form precipitates during a reaction? Name some of these ions from the reactions that you have just observed.

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16. Define precipitation reactions.

17. Explain what is meant by the term "combustion".

18. When balancing combustion reactions of hydrocarbons it is sometimes necessary to double the coefficients of the reactants and products. There is a pattern for when you need to do this. Starting with methane write combustion reactions for the first 10 alkanes. Can you see the pattern?

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Website References

You only get good at classifying and balancing chemical equations through practice. Try some of these websites.

1. Conservation of Mass

- Quiz on Dalton's theory of matter
<http://antoine.frostburg.edu/chem/senese/101/atoms/dalton-quiz.shtml>

2. Reaction Classification

- Examples of chemical reactions and how they are classified
http://aa.uncwil.edu/reeves/chm101jr/dist_F98/rxn_types.htm
- Interactive Q & A site on classifying reactions
<http://www.fordhamprep.org/gcurran/sho/sho/students/classof03/berrr1.htm>
- Lecture notes and examples on reaction classification
<http://antoine.frostburg.edu/chem/senese/101/reactions/index.shtml>

3. Balancing Equations

- Interactive tutorial for balancing equations:
<http://www.wfu.edu/%7Eylwong/balanceeq/balanceq.html>
- Interactive practice for balancing combustion equations:
<http://www.wfu.edu/%7Eylwong/balanceeq/combust.html>
- Interactive equation balancing site:
http://www.macromedia.com/shockwave/download/triggerpages_mmcom/default.html
- A virtual lecture on balancing equations that includes audio narration if your computer can play sound and you have Shockwave plug-in loaded. A text-only version is also available:
<http://www.chemistry.ohio-state.edu/betha/nealChemBal/>
- Interactive balancing game that shows structures of molecules to help reinforce the balancing process
<http://www.dun.org/sulan/chembalancer/ques4.htm>
- Classifies reactions into 6 different types – questions are included
<http://misterguch.brinkster.net/6typesofchemicalrxn.html>

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The Super-Charged World of Chemistry Series
Applied Chemistry – Science Bank Series
The Amazing Mole

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