Chemical Reactions

# To react or not to react?

# THAT is the question!



**Concept Presentation: Tuesday July, 13th, 2010**

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**Background Information**

A chemical reaction is an extremely important concept for students to understand especially for those students who wish to advance to the next level, SCH 3U.

Teachers need to find strategies to help students stay motivated with the whole idea of chemistry, especially if chemical reactions are occurring all around us. As teachers we must find the reasoning behind why students are struggling with chemistry.

The main focus of this concept presentation is to help teachers find strategies to help students become motivated, to help students minimize the idea of memorization and for them to be able to understand the mechanism behind chemical reactions. Teachers are responsible to ensure that each student is confident and comfortable with the concept of chemical reactions, especially since this is the central theme in SCH 3U.

**Expectations:**

**Expectations: Connections to the Concept of Chemical Reactions**

**“Big Ideas” in Chemistry: Overall Expectations**

**TABLE 1: SNC 1D**

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| --- | --- |
| C2. | Investigate, through inquiry, the physical and chemical properties of common elements and compounds |

**TABLE 2: SNC 2D**

|  |  |
| --- | --- |
| C1. | Analyse a variety of safety and environmental issues associated with chemical reactions, including  the ways in which chemical reactions can be applied to address environmental challenges; |
| C2. | Investigate, through inquiry, the characteristics of chemical reactions; |
| C3. | Demonstrate an understanding of the general principles of chemical reactions, and various ways to  represent them. |

**TABLE 3: SCH 3U**

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| --- | --- |
| B2. | Investigate physical and chemical properties of elements and compounds, and use various  methods to visually represent them; |
| C1. | analyse chemical reactions used in a variety of applications, and assess their impact on society and  the environment; |
| C2. | Investigate different types of chemical reactions; |
| C3. | Demonstrate an understanding of the different types of chemical reactions. |
| D2. | Investigate quantitative relationships in chemical reactions, and solve related problems. |
| D3. | Demonstrate an understanding of the mole concept and its significance to the quantitative analysis  of chemical reactions. |

It is evident that most of the concepts concerning chemical reactions starts in grade 10 (SNC 2D). Students in grade nine (SNC 1D) are basically just taught about chemical and physical properties and how to count atoms. Does this create a problem for students in grade 10? Do students become overloaded in the unit of chemistry? As teachers it is our responsibility to ensure that the required expectations in SNC 2D are met by each student that advances to SCH 3U. Students need to clear up any misconceptions or roadblock they may have in grade 10 before they enter into SCH 3U, seeing that there is one full unit on chemical reactions in grade 11 chemistry.

**Societal Applications:**

Chemical reactions are occurring everywhere; therefore chemicals and their uses can be applied to any professional field. Examples: Construction (SiO2) pharmaceuticals(FeSO4), environment (CO2) Cooking (NaCl), Marine Biologist (CaCO3 )

**Description of Difficulties in Chemistry:**

**The main reasons why students are struggling with Chemistry?**

**1. Inability to count atoms in a chemical reaction**

This is the basic building block for chemical reactions and being able to balance equations (essential component to SCH 3U). Teachers can go through many examples showing the differences between a coefficient and subscript and what happens when a subscript is outside the brackets. Teachers can also provide students with modelling kits so students can visually see what atoms look like.

**2. Students are memorizing instead of understanding mechanism of Reactions**

Instead of students writing down overheads/ notes on chemical reactions, get the students involved. Teacher can do demonstrations on all types of reactions and students are engaged. Students physically themselves create different chemical reactions and predict to what the products will be. Students not just memorize what type of reaction but rather find the significance of its specific name. Student will learn that the names of reactions are significant to their actions (Example: “Synthesis” reaction= “to produce”). Lastly, it is always a good idea to show different analogies to represent the different types of reactions.

**3. Students struggling with Balancing Chemical Reactions**

Students need consistency. Always start by doing an element inventory and write results into a table. Teachers should stress that this should be done every time an equation needs to be balanced. Make it routine for students to do another inventory count at the end to ensure that students balanced it correctly. Afterwards ask students to check other students balanced equations. Students are now taking on a teacher role, allowing them to practice their element inventory counts. For those students who are visual /tactile learners could also balance chemical reactions by using marshmallows (different colours representing different atoms).

**4. Students are still putting coefficients in between compounds instead of the front of a compound.**

Make it a routine for students to put boxes around all chemical formulas as soon as they get an equation to balance. These boxes will remind students not to place any numbers instead of them. Students will learn exactly where coefficients are to be placed.

**5. Students are scared/psyched out about balancing equations.**

If students get long complex equations, they often feel defeated and could give up. Remind students to follow all steps they were taught on balancing equations and not to change their routines. Remind students that perhaps the long complex equations just deal with more elements being involved. This will boost their confidence and students will feel more comfortable with balancing. Students should be given many practice problems to practice balancing equations.

**6. Why do students need to know about chemical reactions?**

Understanding and being well prepared on the topic of chemical reactions will prepare students to the next advanced level, SCH 3U. Anytime teacher is performing a demonstration, ask students to predict the product(s) and ask them what their specific uses are in life. This way student can make connections to the outside world and hopefully can see which chemicals will be present in their future profession. Teachers, stay away from giving students the answers, allow students to explore.

**Lesson Sequence:**

**Day #1: FORMATIVE ASSESSMENT**

* Introduction to chemical reactions (reactants versus products); counting atoms and law of conservation of mass (time permitting)

**Day #2: FORMATIVE ASSESSMENT**

* Take up worksheets on counting atoms and law of conservation of mass
* Balancing Equations

**Day #3: FORMATIVE ASSESSMENT**

* Take up worksheet on balancing chemical equations
* Types of Chemical reactions
* Read and do pre-lab preparations for lab the following day

**Day #4: SUMMATIVE ASSESSMENT**

* Take up homework on types of reactions
* Lab on types of reactions: students should be able to count atoms, balance, find masses of products (law of conservation of mass), predict products, notify what type of reaction it is.

**Advance Preparation/Materials**

**1. PowerPoint:** showing analogies on different types of reactions

**2. Partner/group activity:** Students balance equations and switch with partner, where partner will correct their equation. Students taking on teacher role

**3. Demonstrations/Labs:**

*a. Synthesis reaction🡪* Magnesium ribbon (3cm), tongs, Bunsen burner

*b. Decomposition Reaction🡪* H2O2 (30%- 10mL), test tube, Mn02 (5 g), splint, scapula

*c. Single Displacement🡪* steel wool, CuSO4 (25 g), test tube

*d. Doble Displacement🡪* CaCl2 (25 g), + Na2CO3(25 g), test tube

*e. Combustion🡪* ballon, 250mL erlenmeyer flask, CaC2(1g), meter stick with lighter attacked to it (match, candle)

4. **Video:** A chemial Reaction: A documentary film by Brett Plymale

**Annotated Bibliography:**

**1. Website: A chemical Reaction**

<http://www.pfzmedia.com/#/images/stories/screen/small/HomeDepot3.jpg>

A Chemical Reaction is a 70 minute documentary movie that tells the story of Dr. June Irwin, a dermatologist, and her connection between her patients’ health conditions and their exposure to chemical pesticides and herbicides. She brought concerns to town meetings to warn her society about the chemicals they were putting on their lawns and how they posed severe health risks and unknown side effects on the environment.

**2. Website: Demonstrations Masterlist**

<http://boyles.sdsmt.edu/listbydemo.htm>

This is an alphabetized list of demonstrations on chemical reactions. Just click on any reaction and this website will provide you with key concepts, a video of the demonstration, a quiz on the demonstration and even a powerpoint presentations specifically to that reaction.

**3. Website: Demonstrations and Experiments**

<http://chemistry.about.com/od/demonstrationsexperiments/Demonstrations_Experiments.htm>

Website filled with tutorials for performing your own chemistry demonstrations, laboratory exercises, projects, and safety precautions/measures for students.