Cycle 7 Chemistry I Lesson 1

"Counting Atoms" Unit
AGENDA - Review Scientific Notation

Hand in Shoptimes!

Warmup: Watch "Powers of Ten".
https://www.youtube.com/watch?v=0fKBhvDjuy0

Classwork:

Scientific Notation Practice Problems

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Atoms and Molecules are TINY

- We will need to deal with very big & very small numbers in this unit. Scientific Notation makes this possible.

- In this unit, we will need very small numbers
  - A single water molecule has a mass of 3×10^{-23} g
  - A water molecule has a diameter of 2×10^{-10} m

- We will need very large numbers too
  - A liter of water contains 3×10^{25} molecules

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Ben Franklin's Oil Slick Experiment

- Old Ben found that 2 cm^3 of oil would cover 2000 m^2 of pond water with a 'slick'. How thick is this layer of oil? We will do a similar lab this week.

Ben Franklin's Oil Slick Experiment

- Volume = area x thickness.
- Volume of oil: $V = 2\ cm^3 = 0.000002\ m^3$
  - There are 100 cm in 1 meter. Therefore, there are 1,000,000 cm^3 in 1 m^3.
- Area of slick: 2000 m^2
- Thickness = Volume / Area = 0.000002 m^3 / 2000 m^2
- Thickness = 0.000000001 m
- Better: Thickness = 10^{-9} m
- This is about the size of one oil molecule!

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Trying it in Scientific Notation

- Volume = area x thickness.
- Volume of oil: $V = 2\ cm^3 = 2 \times 10^{-6}\ m^3$
- Area of slick: $2 \times 10^3\ m^2$
- Thickness = Volume / Area = $2 \times 10^{-6}\ m^3 / 2 \times 10^3\ m^2$
- Thickness = $(2 \div 2) \times 10^{(-6\ -\ 3)}\ m$
- Thickness = $1 \times 10^{-9}\ m$
- This is about the size of one oil molecule!

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Get a Scientific Calculator! Use it!

- If you cannot afford one, see me after school.

- Scientific calculators have a button for 'exponent'
  - **[EXP] [EE] [x 10^x]** or similar
  - You should not actually multiply by 10 to the power of … this messes up precedence etc.

- Thickness = Volume / Area = 2 x 10^{-6} m^3 / 2 x 10^3 m^2
- You will type: 2 **[EXP] [+/-]** 6 **[÷]** 2 **[EXP]** 3 **[=]**
- Answer may read something like 1^{-09}. This actually does mean 1 x 10^{-9}

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Scientific Notation (p. 62-63)

Scientific Notation in Calculations

1. In scientific notation, exponents are count values.

2. In addition and subtraction problems, all values must have the same exponent before they can be added or subtracted. The result is the sum of the difference of the first factors multiplied by the same exponent of 10.

3. In multiplication problems, the first factors of the numbers are multiplied and the exponents of 10 are added.

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Scientific Notation (p. 62-63)

Scientific Notation in Calculations, *continued*

4. In division problems, the first factors of the numbers are divided and the exponent of 10 in the denominator is subtracted from the exponent of 10 in the numerator.

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