CHEM-UP!

DAY 2 – SPRING 2015
Welcome to Chem Up!

An Introduction to Basic Chemistry Concepts

Please sign in.
Course Overview

Day 1
- Foundations
- Course Expectations and Note Taking

Day 2
- Reading Your Text Book
- What is an Atom?
- Acids and Bases

Day 3
- Compounds and Mixtures
- How do Atoms Interact?
- How does Learning Work?

Day 4
- Properties of Water
- Organic vs. Inorganic Molecules
- Molecules of Life
Agenda for Day 2

- Reading the Text - SQ3R
- Parts of an Atom
- Ions and Isotopes
  - Building an atom
- Acids, Bases, and pH scale
How to Read Your Textbook...

SQ3R Method

- An effective method to help you remember what you read.
- It is helpful to read your text before lecture.

1. Survey
2. Question
3. Read
4. Recall
5. Review
How to Read Your Textbook...

SQ3R Method

1. Survey
   - Scan through the introduction.
   - Take note of section headings and learning objectives. Use these to build an outline of the chapter.
     - If your instructor posts class notes online, use them as a tool to help you read the text and determine which material to focus on.
     - Look for typographical elements (bold, or italicized words, charts, graphs and figures, boxed text, subheadings, etc.).

2. Question

3. Read

4. Recall

5. Review
Sample Survey

- Subheadings from text dictate the layout of the notes.
- Diagrams and summary chart from section included in notes.
- Remember: This is an example, not everyone’s notes will look the same. The trick is to find a style that works for you.
**Sample Survey**

- Shorthand is used.

- Definitions of topics are included.

- Space is left to fill in more information as you go.

<table>
<thead>
<tr>
<th>MASS NUMBER = ( Z ) P + ( A ) N</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATOMIC NUMBER = ( Z ) P</td>
</tr>
<tr>
<td>IONS</td>
</tr>
<tr>
<td>( \text{a particle} ) ( \text{N} \neq \text{P} \neq \text{E} )</td>
</tr>
<tr>
<td>ISOTOPES</td>
</tr>
<tr>
<td>( \text{atoms} ) ( \text{N} = \text{P} ), but ( \neq \text{N} )</td>
</tr>
<tr>
<td>ATOMIC WEIGHT</td>
</tr>
</tbody>
</table>
How to Read Your Textbook...

SQ3R Method

1. Survey
2. Question
   - Note any questions you have. These may be questions from your notes, questions that led you to read the material, or questions that you thought of during your survey of the text.
   - Try to anticipate questions your instructor might ask on your test.
3. Read
4. Recall
5. Review
How to Read Your Textbook...

SQ3R Method
1. Survey
2. Question
3. Read
   - Actively read the text by highlighting or underlining main ideas.
   - Make note of anything you do not understand. If the lecture doesn’t cover your questions, be sure to ask your instructor.
4. Recall
5. Review
How to Read Your Textbook...

SQ3R Method

1. Survey
2. Question
3. Read
4. Recall
   - Run material through your mind a few times. Identify main points and try to work out how other information fits around the main points.
   - Go back to your questions from step 2. Try to answer them from memory.
5. Review
   - Re-read the document or your notes.
   - Discuss the material with someone else.
   - Do your best to put the material in your own words.
   - Try to review the material in small doses daily for best retention.
Break

A neutron walks into a bar and asks how much for a drink. The bartender replies “For you, no charge”.

- Dr. Sheldon Cooper
The Big Bang Theory
What is an Atom?

- All matter is composed of atoms. They are the building blocks of everything around us.

- An atom is the smallest particle of an element that retains the element’s properties.
  - All atoms of a given element identical properties to one another and different properties from atoms of other elements.

- Atoms combine to make molecules.
Structure of an Atom

- Atoms are composed of subatomic particles called protons, neutrons, and electrons.
- Protons are positively charged, electrons are negatively charged, and neutrons have zero charge.
- Atoms are electrically neutral.
  - There are an equal number of protons and electrons in an atom.
Structure of an Atom

- In an atom, the protons and neutrons make up almost all the mass of the atom. They are packed into the tiny volume of the nucleus.

- The rapidly moving electrons surround the nucleus and account for the large volume of the atom. The outermost electrons are called valence electrons.
Mass of an Atom

- The protons and neutrons located in the nucleus account for most of the mass of the atom.
- The mass of electrons are much smaller and is often considered negligible.
- The mass of an atom is measured using a unit called atomic mass unit (amu).
- 1 amu = 1.6605 x 10^{-27} kg

<table>
<thead>
<tr>
<th>Particle</th>
<th>Symbol</th>
<th>Electrical Charge</th>
<th>Mass (g)</th>
<th>Mass (amu)</th>
<th>Location in Atom</th>
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</thead>
<tbody>
<tr>
<td>Proton</td>
<td>$p$ or $p^+$</td>
<td>1+</td>
<td>$1.673 \times 10^{-24}$</td>
<td>1.007</td>
<td>Nucleus</td>
</tr>
<tr>
<td>Neutron</td>
<td>$n$ or $n^0$</td>
<td>0</td>
<td>$1.675 \times 10^{-24}$</td>
<td>1.008</td>
<td>Nucleus</td>
</tr>
<tr>
<td>Electron</td>
<td>$e^-$</td>
<td>1−</td>
<td>$9.110 \times 10^{-28}$</td>
<td>0.00055</td>
<td>Outside nucleus</td>
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</table>
Atomic Number

- Is specific for each element and the same for all atoms of that element.
- Is equal to the number of protons in an atom.
- Appears above the symbol of an element on the periodic table.
Mass Number and Atomic Symbols

Mass Number

- Represents the number of particles in the nucleus.
- Mass Number = number of protons + number of neutrons
- Does not appear on the periodic table because it applies to a single atom only.

Atomic (Nuclear) Symbols

- Represents a particular isotope of an element.
- Gives the mass number in the upper left corner and the atomic number in the lower left corner.
Isotopes

- Atoms of the same element that have a differing number of neutrons are called isotopes.
- They have the same atomic number (number of protons) but different mass numbers.
- Most elements have two or more isotopes.

Mass Number

Atomic Number

Notation for the different isotopes of the chemical element carbon.
Ions

- When an atom loses or gains an electron, it is no longer neutral. It becomes an ion.
- Atoms will lose or gain electron(s) to become stable.
- An atom of a certain element can lose or gain electron(s) without changing to a different element.
- An atom that loses electron(s) will have a positive charge (cation).
- An atom that gains electron(s) will have a negative charge (anion).
Review
Atom Art

- Fold a piece of paper in quarters.
- Draw the 3 isotopes of carbon shown below.
- Draw another atom of your choice.
- Label each drawing with proper atomic symbol.
pH Scale

- pH scale measures how acidic or basic a substance is
- Ranges from 0 to 14
- 7 is neutral, less than 7 is acidic, more than 7 is basic
- The scale is logarithmic. Each whole value change represents a tenfold change in hydrogen ion concentration.
- Both hydrogen and hydroxide ions are present in any solution - a solution is acidic if the $H^+$ is in excess and basic if $OH^-$ is in excess.
Acids and Bases

- Proton donors (H\(^+\) ions) are acids and usually have prefix of “hydro” and suffix of “ic” in the name.
- Proton acceptors (OH\(^-\) ions) are bases and are named hydroxides.
- When water is ionized, it produces H\(^+\) ions and OH\(^-\) ions; therefore, it behaves both like an acid and a base.
Acids and Bases

**Acid Properties**
When dissolved in water, acids:
1. Conduct electricity
2. Change blue litmus to red
3. Have a sour taste
4. React with bases to neutralize their properties
5. React with metals to liberate hydrogen

**Base Properties**
When dissolved in water, bases:
1. Conduct electricity
2. Change red litmus to blue
3. Have a slippery feeling
4. React with acids to neutralize their properties
Common Acids and Bases

Is it an Acid or a Base?

- Vinegar
  - Acid
- Baking Soda
  - Base
- Lemon Juice
  - Acid
- Soda
  - Acid
- Borax
  - Base
- Laundry detergent
  - Base
- Ammonia
  - Base
- White bread
  - Acid
- Yogurt
  - Acid
- Aspirin
  - Acid
- Cream of tartar
  - Acid
- Bleach
  - Base
- Nail polish remover
  - Acid
- Lye
  - Base
- Eggs
  - Base
- Saliva
  - Mildly basic
- Beer
  - Acid
- Milk
  - Mildly acidic

The Academic Support Center @ Daytona State College (Chem-Up 2, Page 26 of 27)
Questions?

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http://www.daytonastate.edu/asc/ascsencehandouts.html