

**SBI 4UI**  
**Chemistry Review Note Outline**

Use your text and the questions below to create a basic review of chemistry concepts needed for this unit. *Reference: Text Ch. 1 (p. 4-33) & Appendix 6 (p. 563-567)*

**Atoms and Bonding:**

1. Distinguish between *atoms, elements, molecules and isotopes.*

*Atoms - smallest unit of matter involve in chemical reactions*

*Elements - substances that can't be broken down into simpler substances by chemical means*

*Molecules - groups of atoms bonded together that make a single unit*

*Isotopes - atoms of the same element that have different numbers of neutrons*

2. Compare, in chart form, *protons, neutrons, and electrons.*

Protons	Neutrons	Electrons
Positively charged	No charge	Negatively charged
In the nucleus	In the nucleus	Orbits the atom
Number of protons determine the identity of the atom		

3. (a) Explain the difference between *atomic mass* and *mass number.*

*Atomic mass - the average mass of all the naturally occurring isotopes of an element*

*Mass number - the total number of protons and neutrons in the nucleus of one atom of an element*

(b) Which is different for isotopes? Explain.

*The mass number would be different for isotopes because they have a different number of neutrons in their nuclei.*

(c) In what properties do isotopes differ from each other?

*Isotopes differ in their stability. Some isotopes are stable and others are unstable and break down.*

4. (a) What is an ion?

*An ion is a charged particle formed when an atom loses or gains electrons. The atoms do not have an equal number of protons and electrons.*

(b) What is an anion?

*An ion is a negatively charged ion.*

(c) What is a cation?

*A cation is a positively charged ion.*

5. What are *valence electrons* and why are they important?

*Valence electrons are the electrons in the outermost occupied shell of an atom in its lowest energy state.*

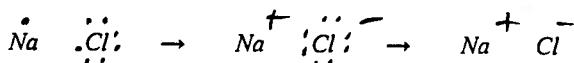
*They are important because they dictate the chemical properties of the element.*

6. What are the two types of chemical bonds? What determines the type of bond that will form?

*The two types of chemical bonds are covalent and ionic. To determine the type of bond, the electrons are shared (covalent) or transferred between atoms (ionic).*

7. What type of chemical bond is represented by sodium chloride (NaCl)? Draw a diagram showing how bonding is likely to occur in this compound.

*An ionic bond is represented by NaCl.*



8. (a) What is *electronegativity*?

*Electronegativity is a measure of the relative abilities of bonding atoms to attract electrons.*

(b) Distinguish between *polar covalent* and *non-polar covalent* bonds.

*Polar covalent bond - a chemical bond in which electrons are shared unequally between two bonded atoms with different electronegativities.*

9. What is a hydrogen bond? How does it differ from a covalent or ionic bond?

*A hydrogen bond is an attraction between water molecules. It is a force between molecules, not a chemical bond within a molecule. It is weaker than a chemical bond.*

10. Distinguish between hydrophobic and hydrophilic compounds.

*Hydrophobic - "water hating" describes molecules that do not interact with water.*

*Hydrophilic - "water loving" describes molecules that interact with water.*

#### **Biological Macromolecules:**

11. What are organic compounds? How do these differ from inorganic compounds?

*Organic compounds are compounds that contain carbon atoms. These are different from inorganic compounds because inorganic compounds do not contain carbon.*

12. (a) What are isomers?

*Isomers are two or more molecules with the same molecular formula but different structures.*

(b) Distinguish between structural isomers and stereoisomer, and give examples of each.

*Structural isomers - two or more compounds with the same atoms bonded differently (glucose and fructose)*

*Stereoisomer - two molecules that have the same types of bonds but a different arrangement in space. (glucose and galactose)*

13. (a) What is a functional group?

*A functional group is a specific group of bonded atoms attached to a molecule. They have characteristic chemical properties.*

(b) List the basic functional groups found in organic molecules and draw the structural formula of each.

*See Figure 1.13 on p. 16*

14. (a) What is a monomer?

*A monomer is a small molecular subunit that make up larger structures called macromolecules.*

(b) What is a polymer?

*Polymers are long chains of monomers that make up macromolecules.*

(c) For carbohydrates, proteins, lipids, and nucleic acids list the "subunits" that make up the molecule? Do all of these compounds consist of polymers?

*See Table 1.2 on p. 17*

#### **Making and Breaking Macromolecules:**

15. Define the following terms: organic acid, organic base, neutralization, buffers.

*Organic acid - carbon based molecules that are acidic*

*Organic bases - carbon based molecules that are basic*

*Neutralization - a chemical process in which an acid reacts with a base to produce water and a salt. The acid no longer acts like an acid and the base no longer acts like a base.*

*Buffers - chemicals or combination of chemicals that resist changes in pH by taking up extra hydrogen ions or hydroxide ions in solution.*

16. What is pH?

*pH is the acidity scale for substances*

17. Briefly define the four main types of chemical reactions that occur in biological systems.

*Neutralization - an acid reacts with a base to produce a salt and water*

*Redox reactions - a reaction in which one atom gains electrons (reduced) and another loses electrons (oxidized)*

*Hydrolysis - a water molecule is added to break up a larger molecule*

*Condensation - a water molecule is removed bond two molecules together.*

**SBI OAI**  
**More Chemistry Review (or "Chemistry 101")**

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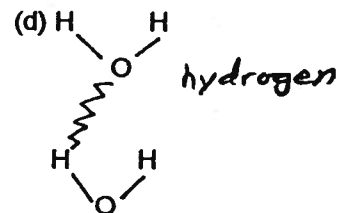
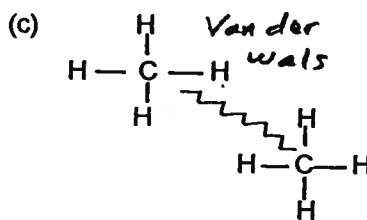
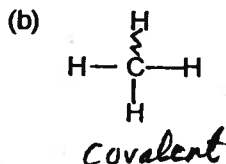
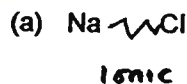
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- Know the element names and symbols for elements with atomic #'s 1-20 of the periodic table, plus Fe, Cu, Zn, Hg, Pb, I
- What three facts can be determined about elements from the periodic table?
- Fill in the following chart.

Element	Atomic number	Mass number	# of protons	# of neutrons	# of electrons
S	16	32	16	16	16
Cl	17	35	17	18	17
Ca	20	40	20	20	20
K	19	39	19	20	19

\*\* Due to the existence of isotopes for each element the mass number will be a decimal number. Round to the nearest whole number to complete this chart. Periodic tables will vary somewhat in their location of atomic number and mass number HOWEVER... Mass number is ALWAYS the larger number!

- Explain how the chemical activity of an element can be determined from its location on the periodic table.
- Draw Bohr-Rutherford diagrams for the following elements: C, N, Na,
- How is the valence of an element determined? *E in outermost shell.*
- What is the valence of the following elements: K, S, C, O, Li, H? *Same as group #*
- Explain the octet rule. *stable "8"*
- Draw Lewis electron dot diagrams for the following elements: C, N, S, O, H, K, Na, P.
- What is an orbital? *Region of space in which there is a prob. of finding an e<sup>-</sup>*
- Complete electron configurations and orbital diagrams for the following elements: C, N, O, Fe, Na, P
- Determine the name and number of atoms of each element in each of the following compounds:  
*Sodium Chloride*  
 (a) NaCl (b) HCl (c) *hydrogen phosphate* H<sub>3</sub>PO<sub>4</sub> (d) *Glucose* C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>
- Determine the atomic mass of each of the compounds in question (10)  
*58.44*    *36.46*    *97.99*    *342.29*
- How can one determine the electronegativity of an element using the periodic table? *↑ L → R*  
*↓ down*
- Which element joined by each of the following bonds is the more electronegative element?  
 (a) C—O (b) C—S (c) C—Mg (d) N—H
- What type of bond is represented by the wavy line in each of the following diagrams?



metals  
 ↑ Down  
 ↓ L → R  
 non-metal  
 ↓ Down  
 ↑ L → R