

- Please **PHYSICALLY PRINT OUT** these pages and **HANDWRITE** the answers directly on the printouts. *Typed work or digitally-produced answers will not be accepted.*
- **Importantly, guided readings are NOT GROUP PROJECTS!!!** You, and you alone, are to answer the questions as you read. You are **not** to share them with another students or work together on filling it out. You are **not** to copy any answers from any other source including the internet. Please report any dishonest behavior to your instructor to be dealt with accordingly.
- **Get in the habit of writing legibly, neatly, and in a NORMAL, MEDIUM-SIZED FONT.** AP essay readers and I will skip grading anything that cannot be easily and quickly read so start perfect your handwriting.
- Please **SCAN** documents properly and upload them to Archie. Avoid taking photographs of or uploading dark, washed out, side ways, or upside down homework. Please use the scanner in the school's media lab if one is not at your disposal and keep completed guides organized in your binder to use as study and review tools.
- **READ FOR UNDERSTANDING** and not merely to complete an assignment. Though all the answers are in your textbook, you should try to put answers in your own words, maintaining accuracy and the proper use of terminology, rather than blindly copying the textbook whenever possible.

1. a. What are **chemical reactions**?

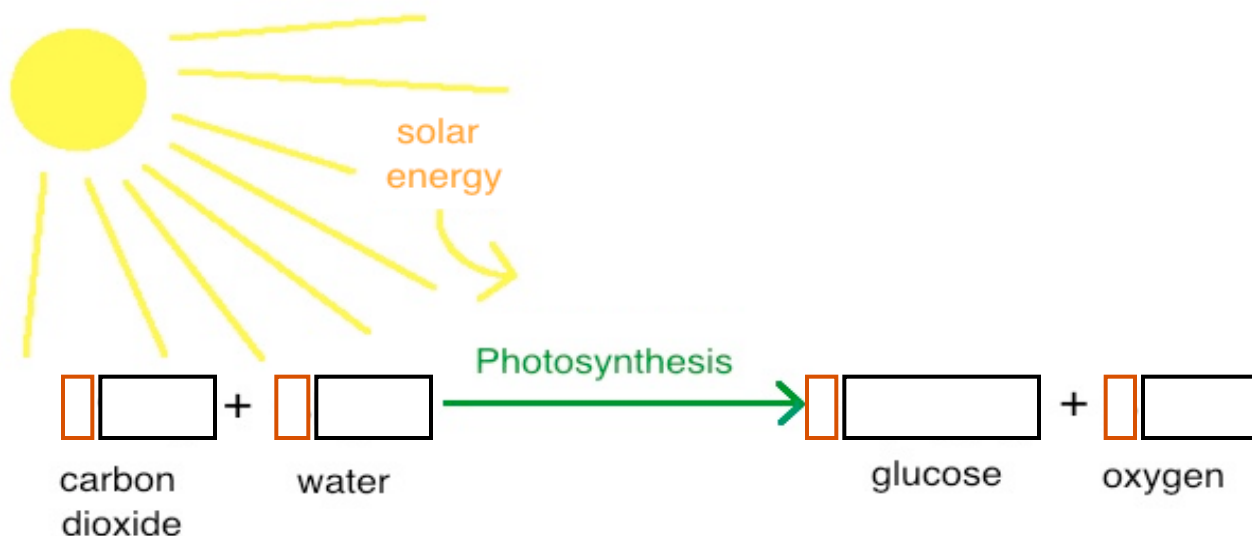
b. What are the **reactants** in chemical reactions?

c. What are the **products** in chemical reactions?

d. In front of the molecular formulas for each of the reactants and products in a chemical reactions, one may find numbers or **coefficients** written. What do these tell us?

2. What is meant by **matter is conserved in chemical reactions**?

3. In the important process known as photosynthesis (which involves the completion of a series of chemical reactions performed in sequence, a.k.a. a **biochemical pathway**), plants convert molecules of carbon dioxide gas and water into the sugar (carbohydrate) glucose and molecular oxygen (oxygen gas). Fill in the boxes with the missing details for the chemical reaction for photosynthesis shown below. *It is important that you memorize this chemical reaction.*



4. a. From where does the land plant obtain CO_2 ?

b. From where does the land plant obtain H_2O ?

c. Bubbles can often be seen being produced by underwater plants in the daylight. What are these **underwater plant-produced bubbles of gas** often composed?



5. a. What is meant by **chemical reactions are reversible**?

b. Why does a chemical reaction proceed in the forwards direction?

c. Why does a chemical reaction proceed in the reverse direction?

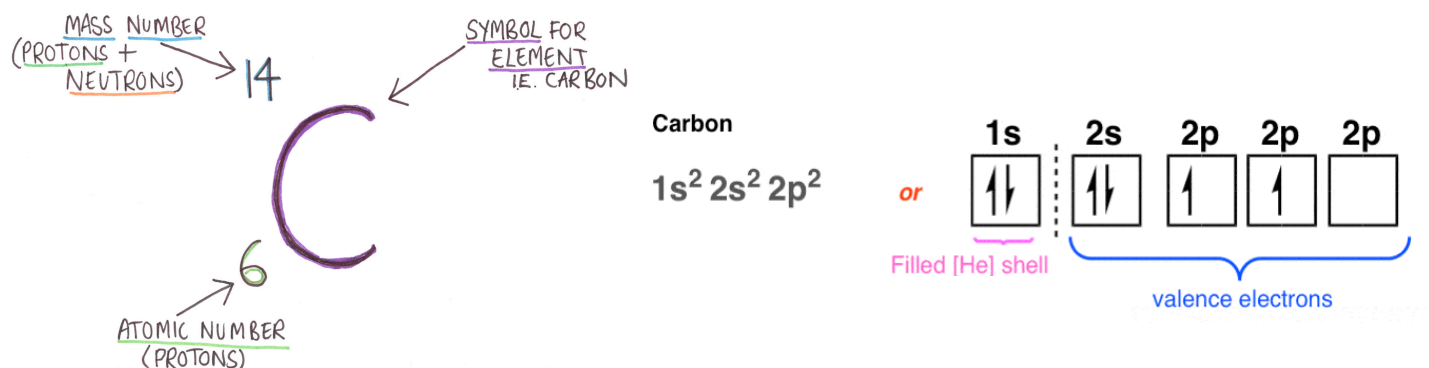
6. a. Explain what is meant by **dynamic chemical equilibrium** in terms of **BOTH** **1.** the concentration (not number of) of reactants and products in solution and **2.** the rates of forward and reverse reactions. *This is a critical concept!*

b. Does dynamic equilibrium imply that we reach a state where the reactions and products occur in equal concentrations? **Explain** why or why not.

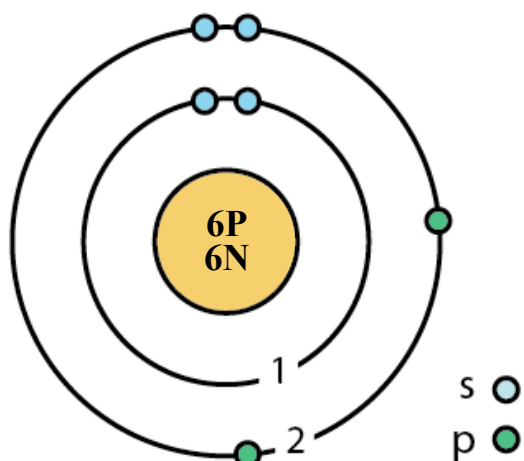
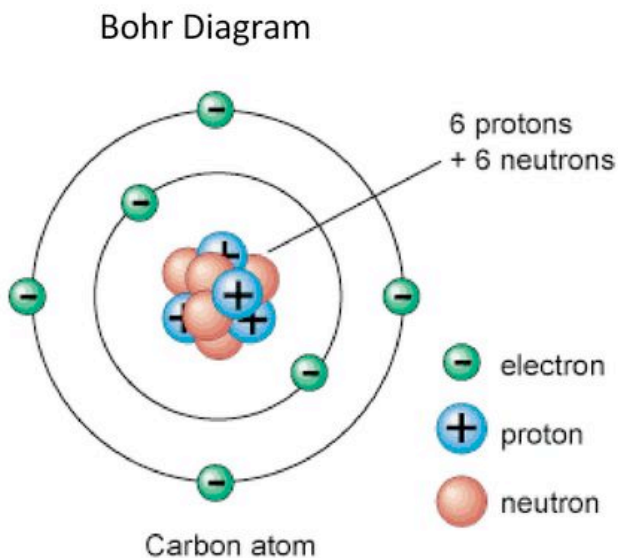
Remember, when analyzing a period table of elements (uploaded for you in Archie), **the atomic number listed for each element equals the number of protons** in the nucleus of atoms of that element. **Every proton attracts an electron and so a neutral atom of that element will have the same number of electrons as protons, though that does mean that the atom is stable in this neutral form.**

If the outer most energy level (valence shell) is not filled with the maximum number of electrons (if the outermost s and p orbitals are not filled with two electrons each), **most atoms (with a few exceptions) are reactive and will interact with other atoms in such a way to end up with a fully filled outermost valence shell** that has eight valence electrons (except for hydrogen, helium, and lithium that are stable with a maximum of two valence electrons in the 1s orbital (an orbital holding no more than two electrons and the existence of a p orbital being impossible in the first energy level so close to the nucleus)).

We can represent atoms visually in various ways. We can use a **symbol** to represent an atom of an element or write out an atom's electron configuration to indicate in which types of orbitals and which energy levels all the electrons in its electron cloud are located. For carbon, we can use the symbol **C** and write out its electron configuration as $C\ 1s^2\ 2s^2\ 2p^2$

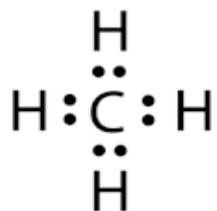


We can also draw the **Bohr Model** that shows which energy level every electron is found in within the electron cloud of an atom or we can draw an atom's **Lewis Dot Structure**, which highlights only the valence electrons of that atom, the electrons that determine the stability or reactivity of that atom. A short cut exists to knowing the number of valence electrons an atom. **The number of valence electrons is equal to the group A number at the top of the periodic table.** **Carbon is in column, 4A, so it has 4 valence electrons.** **Atoms with the same number of valence electrons, so in the same row, exhibit similar chemical behaviors.**

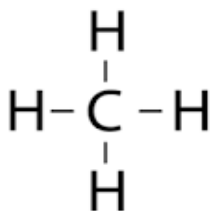


Lewis Dot Structures of atoms allow you to visually represent the status of the valence shell of that electron. **You can also draw Lewis Dot Diagram for molecules**, indicating where electrons are being shared between two atoms to form a single, double, or even triple bond. In **Structural Formulas** each pair of electrons in a covalent bond is represented by a line between atoms.

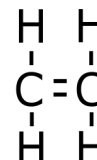
Electron Dot Diagram



Structural Formula



Ethylene



Acetylene



Remember, atoms will react together in such a way that they fill their valence shell. **When a metal atom meets a nonmetal atom, the nonmetal's electronegativity may be so strong in comparison to that of the metal that the nonmetal steals the metal's electron entirely, resulting in the creation of two ions of opposite charge.** These will attract each other through an **ionic bond** and form an **ionic compound**.



When two nonmetals interact, they share electrons to fill their valence shells because neither has a strong enough electronegativity in comparison to the other to steal an electron permanently from the other. The sharing of electrons may or may not be equal, forming a **non-polar or a polar covalent bond**, respectively. Atoms held together by covalent bonds form **molecules**. Within the molecule, each atom can now be seen to have access to the number of valence electrons they needed to fill their valence shell.

In the example below, oxygen has 6 valence electrons but wants 8. Hydrogens have 1 but want 2. If these atoms are allowed to interact, they can arrange themselves in such a way so as to share their valence electrons. In the molecule of water that results, the oxygen now has access to a total of 8 valence electrons and each hydrogen now has access to 2 valence electrons. The atoms are now more stable in this close association together together than they were on their own.



7. Test your knowledge by taking the **Self Quiz** located at the end of your chapter. Place your answers here:

1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____ 7. _____ 8. _____

9. _____

10.

11. a.

b.

c.

12.