AR Chemistry Semester 1 Final: Review Sheet 3

Xa. What seven elements are found in nature at diatomic molecules (two atoms)?
Xb. What element comes in groups of 4? Groups of 8? Groups of 60 in rare cases?
Xc. What two elements are liquids at room temperature?
Xd. What elements are reactive gases at room temperature?

Periodic Table

1. Identify the following terms for the periodic table
    a. the name for the columns in the table
    b. the name for the rows in the table
    c. special name for Group 1
    d. special name for Group 2
    e. special name for Group 7
    f. special name for Group 8
    g. name of the block of elements in the center of the table (10 columns wide)
    h. name of the block of elements at the bottom of the table (14 columns wide)
    i. name for all elements to the left and below the staircase
    j. name for all elements to the right and above the staircase
    k. name for elements that have their sides touching the staircase
    l. special names for the top row of 14 elements at the bottom of the table
    m. special name for the bottom row of 14 elements at the bottom of the table
2. What element looks like a semimetal but is actually a metal?
3. What element looks like a metal but is actually a nonmetal?
4. Concerning ionization energy
    a. What is ionization energy?
    b. What is the trend for increasing ionization energy?
    c. What element has the greatest ionization energy?
5. Concerning electronegativity
    a. What is electronegativity?
    b. What is the trend for increasing electronegativity?
    c. What element has the greatest electronegativity?
6. Concerning atomic radius (size)
    a. How is the size of an atom determined?
    b. Which are larger as neutral atoms: metals or nonmetals
    c. Which are larger as ions: metals or nonmetals
7. Which is larger: a neutral metal atom or its ion?
8. Which is larger: a neutral nonmetal atom or its ion?
9. What 6 ions end up with 10 electrons (after giving and taking)?

Ionic Bonds

10. What are the three properties of ionic compounds?
11. What types of elements make ionic compounds?
12. What physical states are ionic compounds at room temperature?
13. What three things at the beginning of a formula tells that the compound will ionize in water?
14. How many particles are released into water when each of the compounds below are dissolved in water?
    a. NaCl b. HCl c. CH_4 d.$Ca(OH)_2$ e. NH_3 f. NH_4Cl
15. What property does water use to dissolve ionic compounds?
16. Why do ionic compounds have high melting and boiling points?

Covalent Bonds

17. What elements make covalent bonds?
18. How are covalent bonds made?
19. What are valence electrons?
20. How many valence electrons are in each group?
    a. group 1 b. group 4 c. group 7 d. group 8
21. How many total electrons does every atom in a Lewis Structure "want" (except hydrogen)?
22. How many total electrons does hydrogen want in a Lewis Structure?
23. How many electrons are available to build a Lewis Structure for each of the following compounds?
    a. CH_4 b. NH_3 c. CH_3OH d. HCN e. SO_4^{-2}
24. Every line in a Lewis Structure equals ??? electrons?
25. What do you do to make an "unhappy" atom in a Lewis Structure "happy"?
26. What is polarity?
27. Identify the following bonds as polar or nonpolar:
    a. C – C b. H – C c. N = N d. N – O e. N = O
28. What is the shape of molecules that have the following shapes (1^{st} number = electron directions, 2^{nd} = attached atoms)
    a. 4 / 4 b. 4 / 3 c. 4 / 2 d. 3 / 3 e. 3 / 2 f. 2 / 2
29. What two shapes (for this class) are always polar?
30. In the other shapes:
    a. What is true about the outside connected atoms that is needed to make the shape nonpolar?
    b. What is true about the outside connected atoms that is needed to make the shape polar?

Nuclear Chemistry

31. Concerning protons and neutrons
    a. What are the subatomic parts that make up protons and neutrons?
    b. What are the charges of the subatomic parts that make up protons and neutrons?
32. Concerning the 4 forces in nature:
    a. Which force is the strongest, holding the subatomic parts that make up protons and neutrons
    b. Which force is the 2^{nd} strongest, holding the nucleus together?
    c. Which force is the 3^{rd} strongest?
    d. Which force is the weakest?
33. What are the actual particles that make up the types of nuclear radiation in:
    a. alpha radiation
    b. beta radiation
    c. gamma radiation
34. How does:
    a. alpha radiation occur
    b. beta radiation occur
    c. gamma radiation occur
35. You have 20 pounds of a material that has a half life of 1 day. How many pounds do you have after 4 days?
36. What is the process of nuclear fission?

37. What is the process of nuclear fusion?

38. What happens to the atomic number and mass of an element after alpha radiation?
39. What happens to the atomic number and mass of an element after beta radiation?
40. What can be used to stop the following types of radiation:
    a. alpha particles? b. beta particles? c. gamma radiation

AR Chemistry Semester 1 Final: Review Sheet 3 ANSWERS

Xa. What seven elements are found in nature at diatomic molecules (two atoms)? **H O F Br I N Cl**
Xb. What element comes in groups of 4? Groups of 8? Groups of 60 in rare cases? **P, S, C**
Xc. What two elements are liquids at room temperature? **Hg, Br**
Xd. What elements are reactive gases at room temperature? **H O F N Cl**

Periodic Table

1. Identify the following terms for the periodic table
   a. the name for the columns in the table **groups**
   b. the name for the rows in the table **periods**
   c. special name for Group 1 **alkali metals**
   d. special name for Group 2 **alkaline earth metals**
   e. special name for Group 7 **halogens**
   f. special name for Group 8 **noble gases**
   g. name of the block of elements in the center of the table (10 columns wide) **transition metals**
   h. name of the block of elements at the bottom of the table (14 columns wide) **inner transition metals**
   i. name for all elements to the left and below the staircase **metals**
   j. name for all elements to the right and above the staircase **nonmetals**
   k. name for elements that have their sides touching the staircase **semimetals**
   l. special names for the top row of 14 elements at the bottom of the table **lanthanides, rare earth metals**
   m. special name for the bottom row of 14 elements at the bottom of the table **actinides**
2. What element looks like a semimetal but is actually a metal? **aluminum**
3. What element looks like a metal but is actually a nonmetal? **hydrogen**
4. Concerning ionization energy
   a. What is ionization energy? **Amount of energy to knock 1 electron from a mole of atoms**
   b. What is the trend for increasing ionization energy? **From lower left to top right**
   c. What element has the greatest ionization energy? **He**
5. Concerning electronegativity
   a. What is electronegativity? **Measure of attraction to gain another electron in a bond**
   b. What is the trend for increasing electronegativity? **From lower left to top right**
   c. What element has the greatest electronegativity? **Fluorine**
6. Concerning atomic radius (size)
   a. How is the size of an atom determined? **Half the distance between two nuclei**
   b. Which are larger as neutral atoms: metals or nonmetals? **Metals**
   c. Which are larger as ions: metals or nonmetals? **Nonmetals**
7. Which is larger: a neutral metal atom or its ion? **Neutral metal atom (loses electrons as ion)**
8. Which is larger: a neutral nonmetal atom or its ion? **Nonmetal ion (gains an electron)**
9. What 6 ions end up with 10 electrons (after giving and taking)? **N O F Na Mg Al**

Ionic Bonds

10. What are the three properties of ionic compounds? **Have a crystal lattice, conduct electricity molten or aqueous, Have very high melting points**
11. What types of elements make ionic compounds? **Metals and Nonmetals**
12. What physical states are ionic compounds at room temperature?
13. What three things at the beginning of a formula tells that the compound will ionize in water? **Metal, NH_4, H**
14. How many particles are released into water when each of the compounds below are dissolved in water?
    a. NaCl **(2)** b. HCl **(2)** c. CH_4 **(1)** d.$Ca(OH)_2$ **(3)** e. NH_3 **(1)** f. NH_4Cl **(2)**
15. What property does water use to dissolve ionic compounds? **polarity**
16. Why do ionic compounds have high melting and boiling points? **Super strong 3-dimensional IMA**

Covalent Bonds

17. What elements make covalent bonds? **Nonmetals and semimetals**
18. How are covalent bonds made? **Overlap of half-filled orbitals**
19. What are valence electrons? **Outermost 's' and 'p' electrons**
20. How many valence electrons are in each group?
    a. group 1 **(1)** b. group 4 **(4)** c. group 7 **(7)** d. group 8 **(8)**
21. How many total electrons does every atom in a Lewis Structure "want" (except hydrogen)? **8**
22. How many total electrons does hydrogen want in a Lewis Structure? **2**
23. How many electrons are available to build a Lewis Structure for each of the following compounds?
    a. CH_4 **(8)** b. NH_3 **(8)** c. CH_3OH **(14)** d. HCN **(10)** e. SO_4^{-2} **(32)**
24. Every line in a Lewis Structure equals ??? electrons? **2**
25. What do you do to make an "unhappy" atom in a Lewis Structure "happy"? **move xx into a bonded pair --**
26. What is polarity? **A material that is neutral but has + and - ends**
27. Identify the following bonds as polar or nonpolar:
    a. C – C **(NP)** b. H – C **(P)** c. N = N **(NP)** d. N – O **(P)** e. N = O **(P)**
28. What is the shape of molecules that have the following shapes (1st number = electron directions, 2nd = attached atoms)
    a. 4 / 4 b. 4 / 3 c. 4 / 2 d. 3 / 3 e. 3 / 2 f. 2 / 2
    tetrahedral pyramidal bent trigonal planar bent linear
29. What two shapes (for this class) are always polar? **Pyramidal, bent**
30. In the other shapes:
    a. What is true about the outside connected atoms that is needed to make the shape nonpolar? **All same elements**
    b. What is true about the outside connected atoms that is needed to make the shape polar? **2 or more different**

Nuclear Chemistry

31. Concerning protons and neutrons
    a. What are the subatomic parts that make up protons and neutrons? **quarks**
    b. What are the charges of the subatomic parts that make up protons and neutrons? **+2/3, -1/3**
32. Concerning the 4 forces in nature:
    a. Which force is the strongest, holding the subatomic parts that make up protons and neutrons **strong nuclear**
    b. Which force is the 2nd strongest, holding the nucleus together? **Weak nuclear**
    c. Which force is the 3rd strongest? **electromagnetic**
    d. Which force is the weakest? **gravity**
33. What are the actual particles that make up the types of nuclear radiation in:
    a. alpha radiation **a Helium nucleus** $_2^4He^{+2}$
    b. beta radiation **an electron** e^{-1}
    c. gamma radiation **a high energy form of light (EMR)**
34. How does:
    a. alpha radiation occur **ejection of a helium nucleus from the nucleus**
    b. beta radiation occur **explosion of a neutron in the nucleus, ejecting an electron**
    c. gamma radiation occur **created by the vibration of the new proton after beta radiation**
35. You have 20 pounds of a material that has a half life of 1 day. How many pounds do you have after 4 days? **1.25 lbs**
36. What is the process of nuclear fission?
    U breaks into two smaller elements, releasing 2 neutrons, that break apart two Uraniums, etc.
37. What is the process of nuclear fusion?
    Heavy isotopes of hydrogen fuse to create Helium, a neutron, and a loss of mass into energy ($E = mc^2$)
38. What happens to the atomic number and mass of an element after alpha radiation? **Atomic # down 2, mass down 4**
39. What happens to the atomic number and mass of an element after beta radiation? **Atomic # up 1, mass stays same**
40. What can be used to stop the following types of radiation:
    a. alpha particles? b. beta particles? c. gamma radiation
    paper lead nothing