Chemistry
Unit 5

Chemical Nomenclature

POLYATOMIC IONS YOU MUST MEMORIZE

NAME	FORMULA
acetate	$C_2H_3O_2^{-1}$
ammonium	NH_4^{+1}
carbonate	CO_3^{-2}
bicarbonate or hydrogen carbonate	HCO_3^{-1}
chromate	CrO_4^{-2}
chlorate	ClO_3^{-1}
cyanide	CN^{-1}
hydroxide	OH^{-1}
nitrate	NO_3^{-1}
permanganate	MnO_4^{-1}
phosphate	PO_4^{-3}
peroxide	O_2^{-2}
sulfate	SO_4^{-2}

Chemical Nomenclature
Naming and Writing Chemical Formulas

VOCABULARY

Ion — an atom or group of atoms that has gained or lost electrons
Monatomic ion — an atom that has gained or lost electrons and has a charge
Polyatomic ion — a group of covalently bound atoms that has a charge
Anion — a negatively charged ion
Cation — a positively charged ion
Charge — the positive or negative value assigned to an ion as a result having lost or gained electrons
Oxidation number — hypothetical charge a covalently bound atom would have IF its bonds were ionic
Acid — a compound that donates a H^+ ion during a reaction
Ionic compound — a compound made of positively and negatively charged ions
Molecular compound — a compound held together by shared pairs of electrons
Hydrocarbon — a compound composed of carbon and hydrogen

INTRODUCTION

Writing chemical formulas will open your eyes to the chemical world. Once you are able to write correct chemical formulas there are four naming systems you will need to master. The trick lies in recognizing *which* naming system to use! Use the following guidelines when making your decisions about how to name compounds.

- If the chemical formula for the compound starts with H, it is an acid. Use the Naming Acids rules.
- If the chemical formula for the compound starts with C and contains quite a few H's and perhaps some O's, it is organic. Use the Naming Organic Compounds rules.
- If the chemical formula for the compound starts with a metal it is most likely ionic. Use the Naming Binary Ionic Compounds rules.
- If the chemical formula for the compound starts with a nonmetal other than H or C, use the Naming Binary Molecular Compounds rules.

It is *essential* that you memorize at least 9 common polyatomic ions. Polyatomic ions are groups of atoms that behave as a unit and possess an overall charge. *If more than one copy of a polyatomic ion is needed to create a chemical formula, the ion must be enclosed in parentheses before adding the subscripts.* You need to know their names, formulas and charges. If you learn the nine that follow, you can determine the formula and charges for many others from applying two simple patterns.

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Naming Covalent Compounds Worksheet

Write the formulas for the following covalent compounds:

1) diphosphorus trioxide _____

2) carbon tetrabromide _____

3) chlorine dioxide _____

4) nitrogen triiodide _____

5) iodine pentafluoride _____

6) dinitrogen trioxide _____

7) triphosphorus pentanitride _____

8) phosphorus triiodide _____

9) silicon dioxide _____

10) trisulfur dinitride _____

Write the names for the following covalent compounds:

11) P_4S_5 _____

12) NO_2 _____

13) SeF_6 _____

14) PBr_3 _____

15) SCl_4 _____

16) As_2O_5 _____

17) PCl_3 _____

18) NF_3 _____

19) CS_2 _____

20) $GeCl_4$ _____

Name:_____ Period: _____

Covalent Naming Worksheet

1) Name the following covalent compounds:

   a) SiF_4 _____

   b) N_2S_3 _____

   c) HBr _____

   d) Br_2 _____

2) Write the formulas for the following covalent compounds:

   a) diboron hexahydride _____

   b) nitrogen tribromide _____

   c) sulfur hexachloride _____

   d) diphosphorus pentoxide _____

3) What are the chemical formulas for the following?

   a) carbon disulfide _____

   b) boron trifluoride _____

   c) carbon tetrafluoride _____

4) Name the following covalent compounds

   a) P_2O_5 _____

   b) SiO_2 _____

   c) $N_{10}O_4$ _____

5) Write the formulas for the following covalent compounds

   a) diboron tetrabromide _____

   b) carbon nonoxide _____

   c) octaphosphorus heptoxide _____

   d) trinitrogen monosulfide _____

FORMULA WRITING

Naming is the trickiest part! Once you have been given the name, the formula writing is easy *as long as you have memorized the formulas and charges of the polyatomic ions.* The prefixes of a molecular compound make it really easy to write the formula since the prefix tells you how many atoms are present for each element. Roman numerals are your friend; they tell you the charge of the metal ions that can have more than one oxidation state and thus form positive ions with different charges. Remember that Group IA, Group IIA, Al, Ag, Cd, & Zn are usually not written with a Roman numeral; you must know their charges. The most important thing to remember is that, the sum of the charges must add up to zero in order to form a neutral compound. The *crisscross method* is very useful—the charge on one ion becomes the subscript on the other. *If you use this method, you must always check to see that the subscripts are in their lowest whole number ratio!* Here are some examples:

potassium oxide → K^{1+} O^{2-} → $K_2^{1}O_1^{2}$ → K_2O

iron(III) chlorate → Fe^{3+} ClO_3^{1-} → $Fe_1^{3}(ClO_3)_3^{1}$ → $Fe(ClO_3)_3$

tin(IV) sulfite → Sn^{4+} SO_3^{2-} → $Sn_2^{4}(SO_3)_4^{2}$ → $Sn_2(SO_3)_4$ → $Sn(SO_3)_2$

Name: _____
Hour: ____ Date: _____

Chemistry: *Ions in Chemical Compounds*

Complete the following table, being sure that the total charge on the resulting compound is *zero*.

Ions	Chloride Cl^{1-}	Hydroxide OH^{1-}	Nitrate NO_3^{1-}	Sulfate SO_4^{2-}	Sulfide S^{2-}	Carbonate CO_3^{2-}	Phosphate PO_4^{3-}
Hydrogen H^{1+}							
Sodium Na^{1+}							
Ammonium NH_4^{1+}							
Potassium K^{1+}							
Calcium Ca^{2+}							
Magnesium Mg^{2+}							
Aluminum Al^{3+}							
~~Ferrous Fe^{2+}~~							
Iron (II) Fe^{2+}							
~~Ferric Fe^{3+}~~							
Iron (III) Fe^{3+}							
Lead (II) Pb^{2+}							
Stannic Sn^{4+}							
Copper (I) Cu^{1+}							
Cupric Cu^{2+}							

For the following compounds, give the formulas:

Formula

21) sodium phosphide _____

22) magnesium nitrate _____

23) lead (II) sulfate _____

24) calcium phosphate _____

25) ammonium sulfate _____

26) silver cyanide _____

27) aluminum sulfide _____

28) beryllium chromate _____

29) copper (I) arsenide _____

30) iron (III) oxide _____

31) gallium nitride _____

32) iron (II) bromide _____

33) vanadium (V) phosphate _____

34) calcium oxide _____

35) magnesium acetate _____

36) aluminum sulfate _____

37) hydrogen peroxide _____

38) ammonium permanganate _____

39) silver bromide _____

40) lead (IV) bicarbonate _____

NAMING BINARY IONIC COMPOUNDS

How do I know it is ionic? The chemical formula will begin with a metal cation (+ ion) or the ammonium cation. The ending is often a polyatomic anion. If only two elements are present, they are usually from opposite sides of the periodic table, like KCl. If the metal can have more than one oxidation state, be prepared to use a Roman numeral indicating which oxidation state the metal is exhibiting. Group IA alkali metals, Group IIA alkaline earth metals, aluminum (Al), silver (Ag), cadmium (Cd) and zinc (Zn) are exceptions to the Roman numeral rule because their charges are constant. Group IA metals are always +1, Group IIA metals are always +2, Al is always +3, Ag is always +1, and Cd and Zn are always +2 in chemical compounds.

In order to name these compounds, first name the ions.

Naming positive ions: Metals commonly form cations.

- Monatomic positive ions in Group A are named by simply writing the name of the metal from which it is derived. Al^{3+} is the aluminum ion.
- Metals often form more than one type of positive ion so Roman numerals (in parentheses) follow the ion's name. Cu^{2+} is the copper(II) ion. Remember the exceptions — IA, IIA, Al, Ag, Cd, Zn.
- NH_4^+ is the ammonium ion. It is the only positive polyatomic ion that you will encounter.

Naming negative ions: Nonmetals commonly form anions (− ions). Most of the polyatomic ions are also negatively-charged.

- Monatomic negative ions are named by adding the suffix -ide to the stem of the nonmetal's name. Group VII A, the Halogens are called the halides. Cl^- is the chloride ion.
- Polyatomic anions are given the names of the polyatomic ion. You must memorize these as instructed. NO_2^- is the nitrite ion.

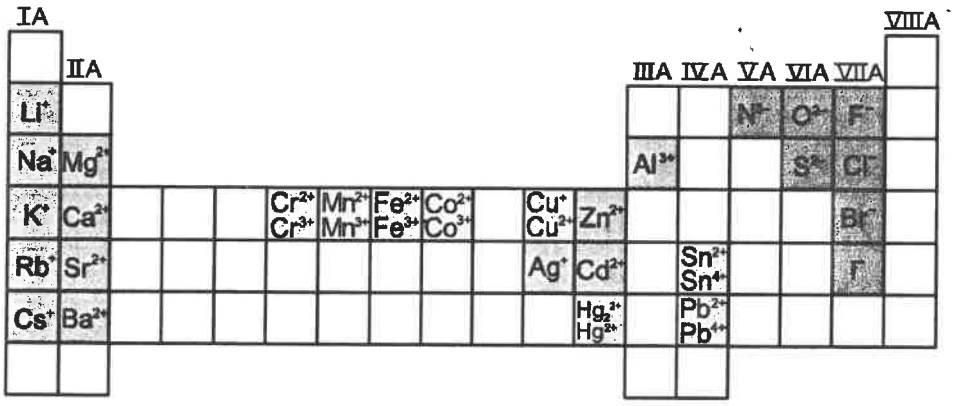
Naming the Compound: The + ion (cation) name is given *first* followed by the name of the negative ion (anion). Remember, to include the Roman numeral that indicates a metal's charge for the many metals that have more than one oxidation state. **No prefixes are used in naming ionic compounds.**

Name of Polyatomic Ion:	Formula & Charge:
Ammonium ion	NH_4^+
Acetate ion	$C_2H_3O_2^-$
Cyanide ion	CN^-
Hydroxide ion	OH^-
Nitrate ion	NO_3^-
Chlorate ion	ClO_3^-
Sulfate ion	SO_4^{2-}
Carbonate ion	CO_3^{2-}
Phosphate ion	PO_4^{3-}

Pattern 1: The -ates "*ate*" one more oxygen than the -ites **however,** their charge does not change as a result. For instance, if you know nitrate is NO_3^-, then nitrite must be NO_2^-. If you know phosphate is PO_4^{3-}, then phosphite must be PO_3^{3-}. You can also use the prefixes *hypo-* and *per-* with the chlorate series. Perchlorate, ClO_4^-, was really "***hyper** and -ate yet another oxygen*" when compared to chlorate, ClO_3^-. Hypochlorite is a double whammy. It is -ite and therefore "*ate*" one less oxygen than chlorate **and** it is hypo- which means "below" so it "*ate*" even one less oxygen than plain chlorite so its formula must be ClO^-. You can substitute the other halogens for chlorine and make similar sets of this series.

Pattern 2: The *-ates* with charges less than negative one, meaning ions with charges of −2, −3, etc., can have an H added to them to form new polyatomic ions. For each H added the charge is increased by a +1. For instance, CO_3^{2-} can have an H added and become HCO_3^-. HCO_3^- is called either the bicarbonate ion or the hydrogen carbonate ion. Since phosphate is negative three, you can add one or two hydrogens to make new polyatomic ions, HPO_4^{2-} and $H_2PO_4^-$. The names are hydrogen phosphate and dihydrogen phosphate, respectively. If you continue adding hydrogen ions until you reach neutral, you've made an acid! That means you need to see the Naming Acids rules.

Pattern 3: Use of the following periodic table will also come in handy. Notice the simple patterns for determining the most common oxidation states of the elements based on their family's position on the periodic table. Notice the IA family is +1 while the IIA family is +2. Skip across to the IIIA family, and notice that aluminum is +3. Working backwards from the halogens, or VIIA family, they are most commonly −1 while the VIA family is −2 and the VA family is −3. The IV A family is "wishy-washy," and can be several oxidation states, the most common being ± 4.



Name: _____

Naming Ionic Compounds

Give the name of the following ionic compounds:

1) Na_2CO_3 _____

2) $NaOH$ _____

3) $MgBr_2$ _____

4) $KHCO_3$ _____

5) $FeCl_2$ _____

6) $FeCl_3$ _____

7) $Zn(OH)_2$ _____

8) $BeCrO_4$ _____

9) CrF_2 _____

10) Al_2S_3 _____

11) PbO _____

12) Li_3PO_4 _____

13) TiI_4 _____

14) Co_3N_2 _____

15) Mg_3P_2 _____

16) $Ga(NO_2)_3$ _____

17) Ag_2SO_3 _____

18) NH_4OH _____

19) $Al(CN)_3$ _____

20) $Be(C_2H_3O_2)_2$ _____

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Naming Ionic Compounds Practice Worksheet

Name the following ionic compounds:

1) NH_4Cl _____

2) $Fe(NO_3)_3$ _____

3) $TiBr_3$ _____

4) Cu_3P _____

5) $SnSe_2$ _____

6) GaAs _____

7) $Pb(SO_4)_2$ _____

8) $Be(HCO_3)_2$ _____

9) $Mn_2(SO_3)_3$ _____

10) $Al(CN)_3$ _____

Write the formulas for the following compounds:

11) chromium (VI) phosphate _____

12) vanadium (IV) carbonate _____

13) tin (II) nitrite _____

14) cobalt (III) oxide _____

15) titanium (II) acetate _____

16) vanadium (V) sulfide _____

17) chromium (III) hydroxide _____

18) lithium iodide_____

19) lead (II) nitride _____

20 silver bromide _____

Mixed Naming Practice

Write the names of the following chemical compounds:

1) BBr_3 _____

2) $CaSO_4$ _____

3) C_2Br_6 _____

4) $Cr(CO_3)_3$ _____

5) Ag_3P _____

6) $Mg(MnO_4)_2$ _____

7) VO_2 _____

8) PbS _____

9) K_3PO_3 _____

10) N_2O_3 _____

Write the formulas of the following chemical compounds:

11) tetraphosphorus triselenide _____

12) potassium acetate _____

13) iron (II) phosphide _____

14) disilicon hexabromide _____

15) titanium (IV) nitrate _____

16) diselenium diiodide _____

17) copper (I) phosphate _____

18) gallium oxide _____

19) tetrasulfur dinitride _____

20) aluminum bicarbonate _____

NAMING ACIDS

How do I know it is an acid? The compound's formula begins with a hydrogen, H, and water doesn't count. Naming acids is extremely easy, if you know your polyatomic ions. There are three rules to follow:

- H + *element*: If the acid has only one element following the H, then use the prefix hydro- followed by the element's root name and an -ic ending. HCl is hydrochloric acid. H_2S is hydrosulfuric acid. When you see an acid name beginning with "hydro", think "Caution, element approaching!" (HCN is an exception since it is a polyatomic ion without oxygen, and it is named hydrocyanic acid.)
- H + *-ate polyatomic ion*: If the acid has an "-ate" polyatomic ion after the H, then it makes an "-ic" acid. H_2SO_4 is sulfuric acid.
- H + *-ite polyatomic ion*: If the acid has an "-ite" polyatomic ion after the H, then it makes an "-ous" acid. H_2SO_3 is sulfurous acid.

When writing formulas for acids you must have enough H^+ added to the anion to make the compound neutral. Also note that *-ate* and *-ite* polyatomic ions contain oxygen so, their acids are often referred to as *oxyacids*.

Naming Acids			
Anion ending	Example	Acid name	Example
–ide	S^{2-} sulfide	Hydro-(stem)-ic acid	hydrosulfuric acid
–ite	SO_3^{2-} sulfite	(stem)-*ous* acid	sulfurous acid
–ate	SO_4^{2-} sulfate	(stem)-*ic* acid	sulfuric acid

CONCLUSION QUESTIONS

Table A	
Acid Formula	**Acid Name**
HCl	
	hypochlorous acid
	chlorous acid
	chloric acid
	perchloric acid ("hyperchloric" acid)
HNO_3	
	hydrobromic acid
H_3PO_4	
H_3PO_3	
	hydrocyanic acid
$HC_2H_3O_2$	
	carbonic acid
	hydroiodic acid
HF	

Acid Nomenclature Worksheet Name _____

Write the formula for each of the acids listed below:

1. Nitric acid	
2. Chloric acid	
3. Acetic acid	
4. Hydrobromic acid	
5. Sulfurous acid	
6. Chlorous acid	
7. Hydrochloric acid	
8. Phosphoric acid	
9. Nitrous acid	
10. Hydrofluoric acid	
11. Perchloric acid	
12. Hydroiodic acid	
13. Phosphorous acid	
14. Carbonic acid	
15. Sulfuric acid	

Name each of the following acids:

16. $HClO_4$	
17. H_3PO_4	
18. HCl	
19. H_2SO_4	
20. HNO_2	
21. HI	
22. $HC_2H_3O_2$	
23. HF	
24. H_3PO_3	
25. $HClO_3$	
26. H_2CO_3	
27. H_2SO_3	
28. $HClO_2$	
29. HNO_3	
30. HBr	

Name _____ Period _____ Date _____

Chemical Nomenclature

Name the following compounds.

1. Na_2SO_4
2. HI
3. $AsCl_3$
4. P_4O_{10}
5. $HC_2H_3O_2$
6. N_2F_4
7. HCl
8. P_2O_5
9. H_2SO_4
10. $LiNO_3$
11. Mn_2O_3
12. $HClO_4$
13. SiF_4
14. $Cu(NO_3)_2$
15. Cl_2O_7
16. CaO
17. H_3PO_3
18. CuCl
19. Cr_2O_3
20. Na_2O
21. SeF_4
22. HNO_3
23. $KClO_3$
24. $AuCl_3$
25. H_2CO_3
26. Si_2Br_6

Write the following chemical formula from the name given:

27. Iron (II) acetate

28. Pernitric acid

29. Tin (II) fluoride

30. Dichlorine pentoxide

31. Hydrofluoric acid

32. Tin (IV) oxide

33. Oxygen difluoride

34. Zinc (II) carbonate

35. Chlorine trifluoride

36. Dichlorine monoxide

37. Acetic acid

38. Xenon tetraoxide

39. Carbonic acid

40. Magnesium hydroxide

41. Aluminum phosphate

42. Chloric acid

43. Sulfurous acid

44. Copper (I) oxide

45. Phosphoric acid

46. Dinitrogen tetrafluoride

47. Lead(II) nitrate

48. Cesium oxide

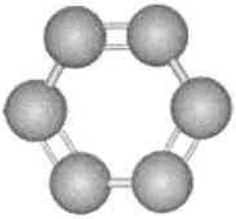
49. Nitrous acid

50. Nitrogen tribromide

51. Phosphorus pentafluoride

52. Phosphorous acid

Basic Organic Nomenclature



Benzene
C_6H_6

Name:_____

Period:_____

Use this packet and your book to answer the questions throughout this packet.

Organic Nomenclature - Alkanes, Alkenes, Alkynes

Naming organic compounds can be a challenge to any chemist at any level. Historically, chemists developed names for new compounds without any systematic guidelines. In this century, the need for standardization was recognized. For simple molecules, the nomenclature system worked out by the International Union of Pure and Applied Chemists (IUPAC) works well. For complex molecules, the IUPAC names are so long that no one in their right mind would use them. The net result is that a hodgepodge of IUPAC names and historic or common names is used. Any one compound may have five or six different names.

So, what we want to accomplish in this module is simply to establish the fundamentals of the IUPAC system and apply them to naming **alkanes, alkenes and alkynes**. These groups are **hydrocarbons**, compounds made of the elements carbon and hydrogen.

Numerical Prefixes = Number of Backbone Carbon Atoms

The prefix in the name of an organic molecule indicates the number of carbon atoms found in the longest continuous chain of carbon atoms in the molecule. You need to memorize the following prefixes:

Prefix	# C atoms
meth-	1
eth-	2
prop-	3
but-	4
pent-	5
hex-	6
hept-	7
oct-	8
non-	9
dec-	10

Alkanes = -ane ending

The alkanes are the least complex hydrocarbons. The alkane family uses the *prefix for the number of carbons* and an *-ane ending*. An alkane can be recognized by its general formula, C_nH_{2n+2}, where n is the number of carbon atoms in the compound. For example, C_5H_{12} has five carbon atoms pentane. Each member of the alkane family differs from the next by a $—CH_2—$ group, and all the carbons are connected by single bonds.

Example 1:

Name the following compounds:

a. CH_4
b. C_2H_6 or CH_3CH_3
c. C_3H_8 or $CH_3CH_2CH_3$
d. C_4H_{10} or $CH_3\ CH_2CH_2CH_3$

Solution 1:

All of the formulas fit into general formula, C_nH_{2n+2}, therefore the bonds in these compounds are single bonds; they are alkanes. Use the numerical prefix for the number of carbon atoms with the -ane ending.

a. one C atom = methane
b. two C atoms = ethane
c. three C atoms = propane
d. four C atoms = butane

Alkenes = -ene ending

Hydrocarbons that contain multiple bonds are called **unsaturated hydrocarbons**. If the hydrocarbon has **one double bond**, its general formula will be C_nH_{2n}, where *n* is the number of carbon atoms in the compound. The alkene family uses the *-ene ending.* The double bond is stronger than a single bond, and the bond length between the carbon atoms is shorter in the double bond. It is also more reactive than a single bond since the π bond (the second pair of electrons) is farther from the nuclei.

Naming is a little bit more complex for alkenes than alkanes. Since the double bond could appear at various sites in a typical molecule, we have to specify where it is. To do so, number the carbon backbone so that the **lowest possible number** is used to describe the double bond position. The lowest number of the two C atoms involved in the double bond is used in front of the name to indicate the C=C position. The number is place at the beginning of the name and is separated with a dash.

In the expanded structure formulas shown below, it is understood that since H only forms one bond, any double bonds are between carbon atoms. The expanded structures give a bit more information about how many H atoms are attached to each C atom.

Example 2:

Name the following compounds.

a. C_2H_4 or $H_2C{=}CH_2$

b. C_3H_6 or $CH_3CH{=}CH_2$

c. C_4H_8 or $H_2C{=}CHCH_2CH_3$

d. C_4H_8 or $CH_3CH_2{=}CH_2CH_3$

e. C_5H_{10} or $CH_3CH_2CH_2CH{=}CH_2$

Solution 2:

a. 2 C atoms = ethene (since there are no options for the position of the C=C, we do not need to specify the position, as in 1-ethene)

b. 3 C atoms = propene (again, since there are no options for the position of the C=C, we do not need to specify 1-propene. Convince yourself that 1-propene and 2-propene are really the same molecule.)

c. 4 C atoms with the C=C after the #1 C atom = 1-butene

d. 4 C atoms with the C=C after the #2 C atom = 2-butene

e. 5 C atoms with the C=C after the #1 C atom = 1-pentene (Did you say 4-pentene? Remember that we want to number the backbone of C atoms so that the lowest numbers are used in the name. In this case, you want to number the C backbone from right to left. This same molecule could also be written $H_2C{=}CHCH_2CH_2CH_3$).

Alkynes = -yne ending

The alkyne family contains a **triple bond** between two C atoms. If the hydrocarbon has one triple bond, its general formula will be C_nH_{2n-2}, where n is the number of carbon atoms in the compound. The alkyne family uses the -yne ending. The triple bond is stronger than either the double or single bond, therefore it is also shorter and more reactive than the single or double bond.

Just as in the alkene family, the position of the triple bond is specified with a number at the beginning of the name.

Example 3:

Name the following compounds.

a. $CH{\equiv}CH$

b. $CH{\equiv}CCH_2CH_2CH_2CH_3$

c. $CH_3C{\equiv}CCH_2CH_2CH_3$

d. $CH_3CH_2C{\equiv}CCH_2CH_3$

e. $CH_3CH_2CH_2C{\equiv}CCH_3$

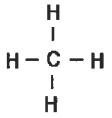
f. $CH_3CH_2CH_2CH_2C{\equiv}CH$

Solution 3:

a. 2 C atoms = ethyne (this compound is commonly known as acetylene)
b. 6 C atoms, triple bond after the #1 C atom = 1-hexyne
c. 6 C atoms, triple bond after the #2 C atom = 2-hexyne
d. 6 C atoms, triple bond after the #3 C atom = 3-hexyne
e. 6 C atoms, triple bond after the #2 C atom = 2-hexyne (number the backbone from right to left)
f. 6 C atoms, triple bond after the #1 C atom = 1-hexyne (number the backbone from right to left)

NOMENCLATURE Worksheet

Draw the following organic molecules like the example.

Methane: 

1. Ethane

2. Propane

3. Decane

4. Propyne

5. 3-Octyne

6. 1-Propene

7. 2-Nonene

8. Nonane

9. 4-Nonyne

10. 3-Hexene

11. How many ways can you write butene? Draw them.

12. Why is 6-decene not possible? What would it be called? Draw it.

Name the following compounds.

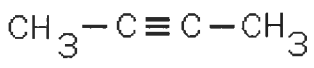
13. CH_3-CH_2-CH=CH-CH_2-CH_2-CH_3

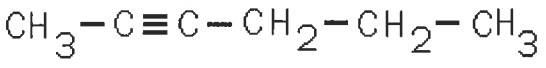
14. CH_3-CH=CH-CH_2-CH_2-CH_3

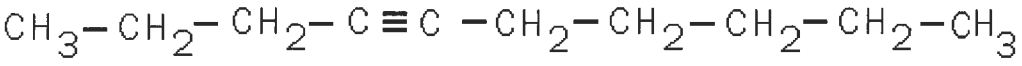
15. CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_3

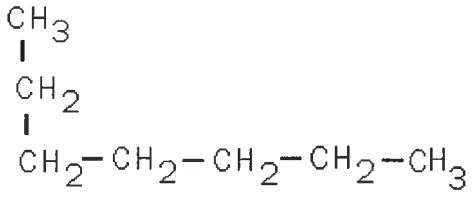
16. CH_3-CH_2-CH=CH-CH_2-CH_2-CH_2-CH_3

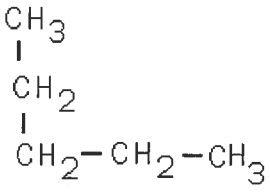
17. CH_3-CH_3

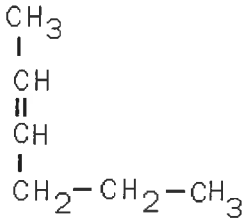
18. 

19. 

20. 

21. 

22. 

23. 

23

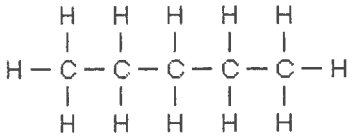
Naming Alcohols (-OH group) = -ol ending

Alcohols are named just like alkanes, but with an **-ol ending.** You also need to put a number in front of the name, separated with a dash, to indicate which carbon atom the **-OH group** is attached to.

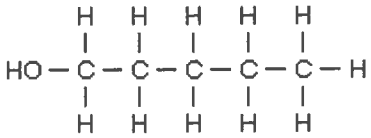
Example 1:

Name the following compounds.

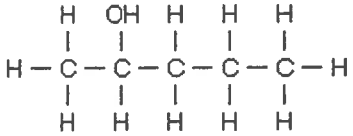
a.



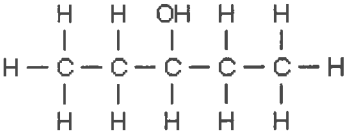
b.



c.



d.



Solution 1:

a. It contains only C and H with all single bonds => alkane. It contains 5 C atoms => pentane

b. It is pentane with one H on the #1 C replaced by -OH => 1-pentanol

(Since the -OH functional group bonds to the rest of the molecule through the oxygen atom, you will frequently see the alcohol functional group written backwards HO- to indicate the attachment through the O atom.)

c. It is pentane with the H on the #2 C replaced by -OH => 2-pentanol

d. It is pentane with the H on the #3 C replaced by -OH => 3-pentanol

Unit 5 Nomenclature Study guide Name: _____

Due: Test day

1. What type of atoms form a covalent bond?

2. What are the prefixes associated with covalent bonds?

3. What type of atoms form an ionic bond?

4. What type of ion is always first in an ionic bond?

5. What method do you use to write the formula for an ionic bond?

6. When do you need roman numerals when writing the name of an ionic compound?

7. Fill in the following chart that references polyatomic ions:

Number of Oxygens	How does polyatomic ion change?
Add one oxygen	
Normal oxygen	
Subtract one oxygen	
Subtract two oxygens	

8. Using the chart you completed, pick a polyatomic ion and provide an example of how the formulas and name changes.

9. How do you recognize an acidic compounds?

10. Explain how the endings on acidic compounds change:

H + element	
H + ate polyatomic ion	
H + ite polyatomic ion	

11. How do you recognize an organic compound?

12. Explain the relationship between the number of bonds between the carbon atoms of an organic compound and the ending. Also provide the formulas used to calculate the number of hydrogen atoms.

Number of bonds	Ending	Formula

13. List the prefixes associated with organic compounds.

Instructions: Using the correct naming system, write the names of the following compounds.

14. P_4S_5 _____
15. BrCl _____
16. IF_7 _____
17. $NiPO_4$ _____
18. Li_2SO_3 _____
19. HCl _____
20. $CoCO_3$ _____

21. NH_4F _____

22. PbO_2 _____

23. SO_4 _____

24. $HClO_3$ _____

25. $HClO_2$ _____

26. TeO_3 _____

27. $V2(SO_4)_3$ _____

Instructions: Using the proper naming system, write the formulas for the following compounds.

28. Strontium hydroxide _____
29. Cobalt (III) phosphate _____
30. Iodine pentafluoride _____
31. Hexaboron monoxide _____
32. Nitric acid _____
33. nitrous acid _____
34. titanium (IV) acetate _____
35. potassium cyanide _____
36. dihydrogen monoxide _____
37. tin (IV) sulfide _____

Draw the following organic compounds

38. pentane

39. 2-pentanol

40. 2-heptene

41. 1- butanol

42. List the 4 naturally occurring polymers and the associated monomers.

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