

UNIT 4 TEST REVIEW – COVALENT BONDS - I

Key

Electronegativity Chart

H 2.1																				
Li 1.0	Be 1.5															B 2.0	C 2.5	N 3.0	O 3.5	F 4.0
Na 0.9	Mg 1.2															Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0
K 0.8	Ca 1.0	Sc 1.3	Ti 1.5	V 1.6	Cr 1.6	Mn 1.5	Fe 1.8	Co 1.9	Ni 1.9	Cu 1.9	Zn 1.6	Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8				
Rb 0.8	Sr 1.0	Y 1.2	Zr 1.4	Nb 1.6	Mo 1.8	Tc 1.9	Ru 2.2	Rh 2.2	Pd 2.2	Ag 1.9	Cd 1.7	In 1.7	Sn 1.8	Sb 1.9	Te 2.1	I 2.5				
Cs 0.7	Ba 0.9	La-Lu 1.0-1.2	Hf 1.3	Ta 1.5	W 1.7	Re 1.9	Os 2.2	Ir 2.2	Pt 2.2	Au 2.4	Hg 1.9	Tl 1.8	Pb 1.9	Bi 1.9	Po 2.0	At 2.2				
Fr 0.7	Ra 0.9	Ac 1.1	Th 1.3	Pa 1.4	U 1.4	Np-No 1.4-1.3														

1. What is the electronegativity difference for the following compounds? Are they Ionic, Non-Polar Covalent, or Polar Covalent? Show work in big box, Write I, PC, NPC in small box.

71.07 - 0.04

.5 - 1.6

a. Sodium and Flourine

Na - 0.9
F - 4.0 $4.0 - 0.9 = 3.1$

I

b. Sodium and Chlorine

Na - 0.9
Cl - 3.0 $3.0 - 0.9 = 2.1$

I

c. Carbon and Oxygen

C - 2.5
O - 3.5 $3.5 - 2.5 = 1$

PC

d. Nitrogen and Chlorine

N - 3.0
Cl - 3.0 $3.0 - 3.0 = 0$

NPC

e. Phosphorus and Iodine

P - 2.1
I - 2.4 $2.4 - 2.1 = 0.3$

NPC

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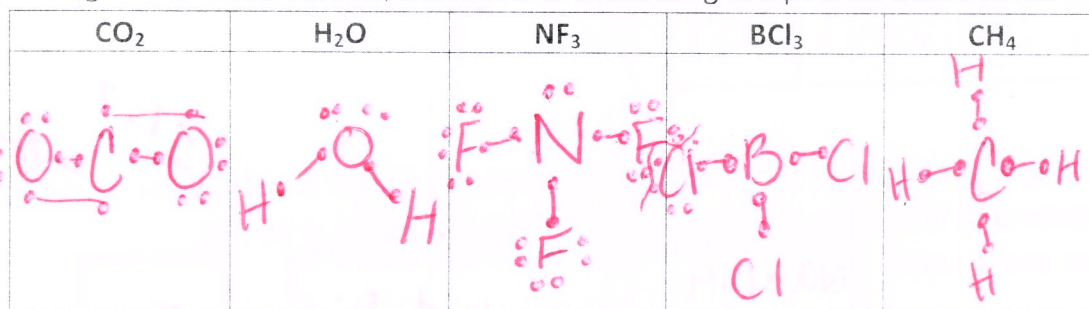
2. List the properties of a covalent bond

- a. LOW melting & boiling point
- b. DO NOT DISSOLVE in water
- c. DO NOT CONDUCT electricity
- d. usually a gas @ room TEMP
- e. LOW EN Difference
- f. Flammable
- g. molecule
- h. share electrons

*Remind them of CARD SORT

3. Using Lewis Dot Structures, show how the following compounds would bond.

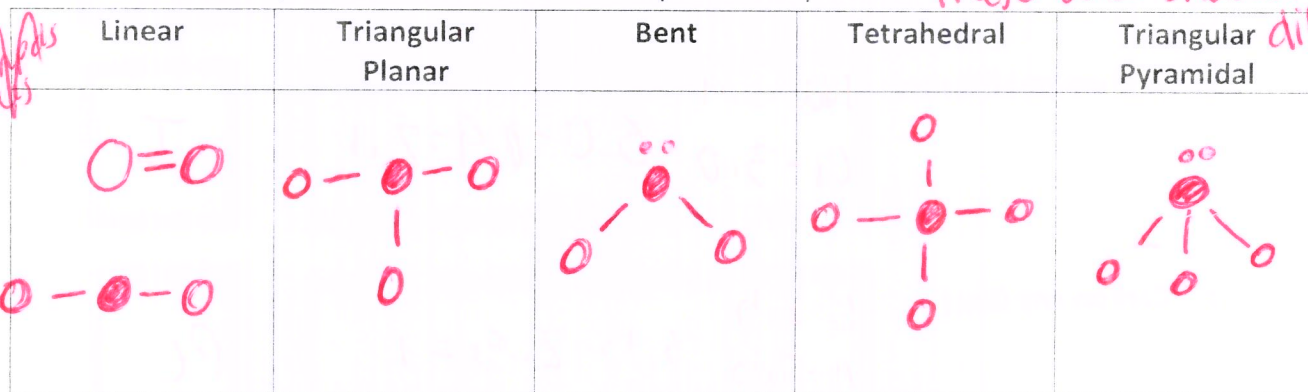
None of these are K. attached on



4. In the boxes below, illustrate the molecular shapes of compounds.

These are shaded for dif. elements

None of these are dif. elements (if shaded)



5. Using the VSEPR Theory, fill in the empty boxes for determining the shapes molecules.

Electron Domains	BONDED Pairs	LONE Pairs	Molecular Shape
2	2	0	Linear
3	3	0	Triangular Planar
3	2	1	Bent
4	4	0	Tetrahedral
4	3	1	Triangular Pyramidal

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6. Write the name for the following compounds. There are IONIC and COVALENT Compounds listed.

- a. N_2O_5 Dinitrogen Pentoxide
- b. BCl_3 Boron trichloride
- c. H_2O Water
- d. $MgCl_2$ Magnesium chloride
- e. CCl_4 Carbon tetrachloride
- f. KBr Potassium Bromide
- g. HCl Hydrochloric acid
- h. $HClO_3$ Chloric acid
- i. XeF_4 Xenon tetrafluoride
- j. PCl_5 Phosphorous Pentachloride
- k. NI_3 Nitrogen triiodide

ACIDS [

7. Write the formula's for the following compounds. There are IONIC and COVALENT compounds listed.

- a. Chlorine monoxide ClO
- b. Oxygen difluoride OF_2
- c. Water H_2O
- d. Methane CH_4
- e. Glucose $C_6H_{12}O_6$
- f. Carbon Dioxide CO_2
- g. Carbon Monoxide CO
- h. Carbon Tetrachloride CCl_4

8. What does VSEPR stand for?

Valence shell electron pair repulsion

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9. List the elements that are considered DIATOMIC ELEMENTS. (There's 7 of them.)

H O F Br I N Cl

10. If an atom has a charge, what is it called?

ION

11. List the prefixes and the number the prefix corresponds to

Mono	1
DI	2
TRI	3
TETRA	4
PENTA	5
HEXA	6
HEPTA	7
OCTA	8
NON	9
NON DECA	10

12. What range of electronegativity differences do Polar covalent and Non-Polar covalent bonds fall in?

a. Polar – 0.5-1.6

b. Non-Polar – 0.0-0.4

13. If an atom is Polar, how do you know which atom the electron spends more time with?

higher electronegativity value

14. If IONIC is to FORMULA UNIT, COVALENT is to MOLECULE

15. When atoms bond, which particle is involved in the bonding? electrons

16. Explain the OCTET RULE.

The central atom will have 8 valence electrons around it.

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17. List the octet exceptions, and the valence electrons the elements have.

Boron - 6 valence electrons
 Beryllium - 4 valence electrons
 Aluminum - 6 valence electrons

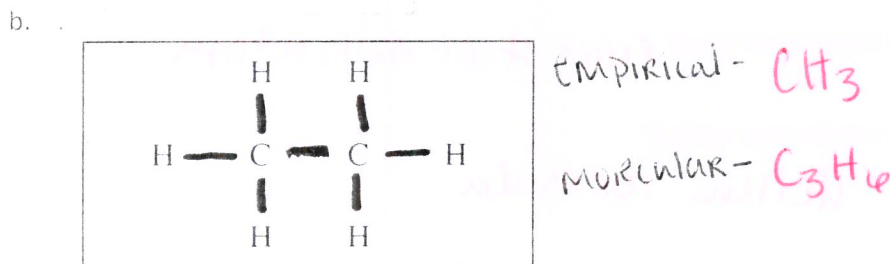
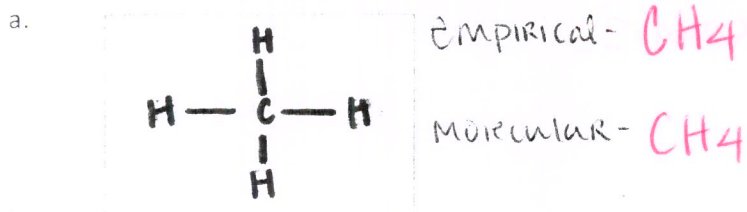
18. List the properties of IONIC bonds.

- a. BRITTLE - CRYSTAL SHAPE
- b. CONDUCTS ELECTRICITY
- c. DISSOLVES IN WATER
- d. FORMULA UNIT
- e. HIGH EN DIFFERENCE (>1.7)
- f. SOLIDS AT ROOM TEMP.
- g. METAL - NONMETAL
- h. TRANSFERS ELECTRONS $\text{Na}[\overset{\ominus}{\underset{\cdot\cdot}{\text{Cl}}}]^-$

19. Explain how to name covalent bonds, and pretend you are explaining it to someone who has never heard of how to name covalent bonds. (BE VERY VERY VERY DETAILED)

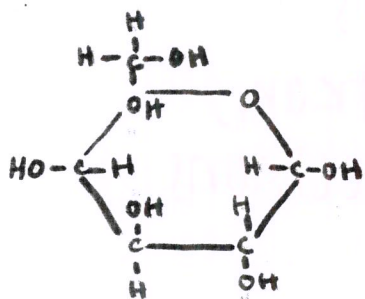
1. Figure out how many atoms of each element you have
2. LOOK at PREFIXES for that number
3. Name first element, put prefix in front except for MONO
4. Name second element, drop the end & add -ide- then add prefix in front

20. Give the empirical and molecular formulas for the following pictures



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c.



empirical - $C_6H_{12}O_6$

Molecular - $C_6H_{12}O_6$

21. Explain how to find the Empirical Formula from Mole Ratio

- STEP 1 Divide each mole quantity by smallest quantity
- STEP 2 Assign ratios as subscripts
- STEP 3 make sure ratios are whole numbers

22. Explain how to find the Empirical Formula from Grams.

- STEP 1 convert grams to moles (divide by molar mass)
 - STEP 2
 - STEP 3
 - STEP 4
- 1-3 from above (21)

23. Explain how to find the Empirical Formula from Percents.

- STEP 1 change % sign to grams
 - STEP 2
 - STEP 3
 - STEP 4
 - STEP 5
- 1-4 from 22

24. What does a Molecular formula tell you? exact # of each atom

25. What is the Molecular Formula also called?

actual formula

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26. The molecular formula for a compound is always a whole -- number multiple of the empirical formula.

27. Explain how to determine the Molecular Formula.

- a. STEP 1 *determine the empirical formula*
- b. STEP 2 *find empirical formula mass (P.T. mass)*
- c. STEP 3 *Divide molecular mass by empirical formula mass = multiplier*
- d. STEP 4 *multiply the subscripts by the multiplier*

28. What is the empirical and molecular formula that has a carbon to hydrogen ratio of 3 to 6? SHOW

STEPS

a. Empirical $C_1 H_2 = CH_2$

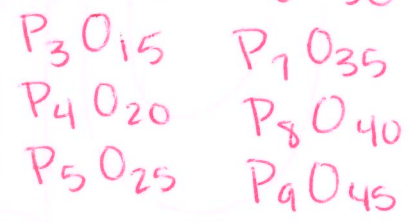
b. Molecular $C_3 H_6$
 $\frac{3}{3} \quad \frac{6}{3}$

29. Calculate the empirical formula for a compound composed of 1 mole phosphorus and 5 moles of oxygen.



30. Write a possible molecular formula for the above empirical formula. P_2O_{10} P_6O_{30}

a. BE SURE TO SHOW YOUR STEPS BELOW!!!!!!



31. Circle the choice(s) that have the same empirical formula.

A. NO_2 and SO_2

C. P_2O_5 and P_4O_{10}

B. C_3H_6 and C_7H_{14}

D. CO and CO_2

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32. As elements bond they _____ heat, as the elements go through fission they _____ heat.

33. The effect of polar bonds on the entire molecule depends on the molecular shape.

34. Polar molecules will have:

a. $\delta+$ and $\delta-$ charge

b. have an asymmetrical shape.

35. What are reasons for an asymmetrical shape?

Different elements

valence electrons = LONE PAIRS on central atom

36. POLAR MOLECULES AND POLAR BONDS ARE DIFFERENT !!!!

STUDY
SHAPES!
