Name Key Date Period

Unit 4 Sweet Sheet

The Periodic Table: List what each person contributed to the construction of the Periodic Table.

Johann Dobereiner- model of triads

John Newlands- octaves

Dmitri Mendeleev- predicted 3 elements & they were later disclaimed
organized P.T. w/ respect to atomic mass

Lothar Meyer-

Henry Moseley- x-rays to find atomic number # of protons
organized P.T. by # of protons

Glenn Seaborg- actinides, had an element named after him while still living ☺

What is a group? How many groups are there?

column, valence e⁻ in common, 18

What is a period? How many periods are there?

row, energy level, 7

Periodic Trends

Define the following periodic trends, state why they occur and state whether they increase or decrease as they go across the Periodic Table and down the Periodic Table.

Ionization energy- energy needed to pull an e⁻ away

	Across	Down
	increases	decreases

Fluoride wants full octet - takes a lot of energy to take away e⁻

Atomic Radius- distance from nucleus to outer electron

across decreases
Nucleus gets stronger

down increases
adding energy levels

Electronegativity- ability to attract an e⁻

across increases
Fluorine wants e⁻

down decreases
nucleus is shielded as goes down

1. Look at Period 2 of your periodic table. Of the atoms B, C, N, O or F, which one has the LARGEST atomic radius? Why?

B further left, fewer protons

2. Look at Group 16 of your periodic table. Of the atoms O, S, and Se, which one has the SMALLEST atomic radius? Why?

O less energy levels

3. Look at Period 3 of your periodic table. Of the atoms P, S, Cl, or Ar, which one has the LARGEST first ionization energy? Why?

Ar Noble gas has full octet

4. Look at Group 1 of your periodic table. Of the atoms Li, Na, or K, which one has the SMALLEST ionization energy? Why?

K further out, electron shielding

5. Look at Group 17 of your periodic table. Of the atoms Br, Cl, I, or F which one has the LARGEST electronegativity? Why?

F wants e⁻ badly + has
Strong nucleus

6. Look at Period 5 of your periodic table. Of the atoms Rb, Sn, Te, and Sr, which one has the LARGEST electronegativity? Why?

Te - most left & 6 electrons wants 2 to complete octet

List the 7 diatomic molecules. What does it mean to be diatomic?

H_2, N_2, O_2, F_2, Cl_2, Br_2, I_2

Define cation and anion.

+ ion

− ion

What is the smallest part of a covalent compound? molecule

What is the smallest part of an ionic compound? formula unit

How many valence electrons are in the periodic groups?

A. Group 17 7

B. Group 15 5

C. Group 13 3

D. Group 16 6

E. Group 2 2

F. Groups 3-12 (except Cu and Cr) 2 (1)

G. Group 1 1

H. Group 14 4

I. Group 18 8

You must know where the groups of the Periodic Table are located.

Fill in the chart below.

Element	Atomic Number/ Symbol	Period on the Periodic Table	Group Number on the Periodic Table	Number of Valence Electrons	Lewis Dot Structure	Ion made
Fluorine	$^{19}_{9}F$	2	17	7	:F:	F^{-1}
Carbon	$^{12}_{6}C$	2	14	4	·C·	C^{+4} C^{-4}
Sodium	$^{23}_{11}Na$	3	1	1	Na·	Na^{+1}
Aluminum	$^{27}_{13}Al$	3	13	3	·Al·	Al^{3+}
Oxygen	$^{16}_{8}O$	2	16	6	:O:	O^{2-}

Beryllium	4 9 Be	2	2	2	Be:	Be^{2+}
Phosphorous	15 31 P	3	15	5	:P:	P^{+3} P^{-3} P^{+5}

Bonding

What are the three different types of bonds we talked about?

covalent, ionic, metallic

Give three properties of each type of bond.

ionic
conducts e when dissolved in H_2O
no smell
high melting/boiling pts.

covalent
smell
~~it~~ does not conduct e-
low melting pts.

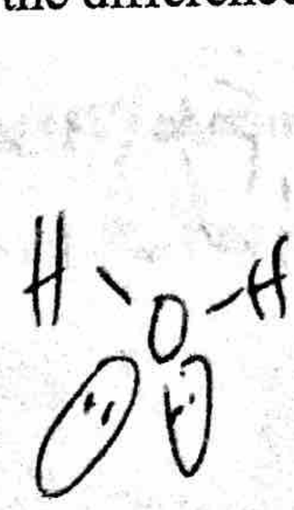
metallic
high melting pts.
Sea of ~~electrons~~ electrons
conducts heat + energy

What is the difference between ionic and covalent bonds?

↙ give or take e- ↘ share

What is the difference between polar and non-polar bonds?

↓ doesn't share equally ↓ shares equally



nonpolar .3 | polar 1.7 ionic
covalent | covalent | 4.0

Using the electronegativity values given, and the table from your notes, determine what type of bond will form between the following pairs of atoms.

1. Mg (1.31) and N (3.04) 3.04 − 1.31 = 1.73 ionic
2. Ge (2.01) and O (3.44) 1.43 polar covalent
3. Br (2.96) and Cl (3.16) .2 – non polar covalent
4. Fe (1.83) and O (3.44) 1.61 polar covalent / ionic

metal / nonmetal
ionic

Lewis Dot Structures

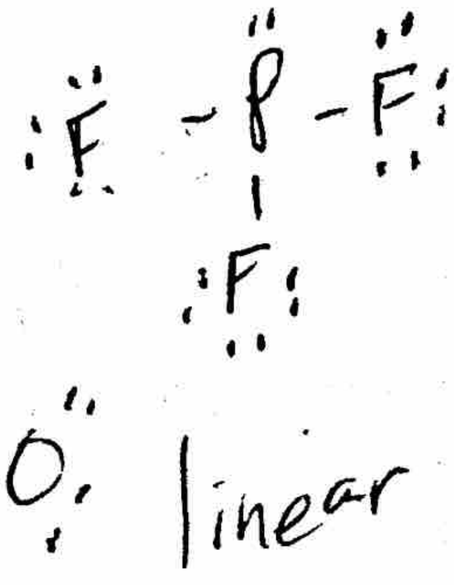
Draw the Lewis Structures for the following covalent compounds. State the VSEPR molecular shape.

1. PF_3 trigonal pyramidal $32-26=\frac{6}{2}=3$ bonds

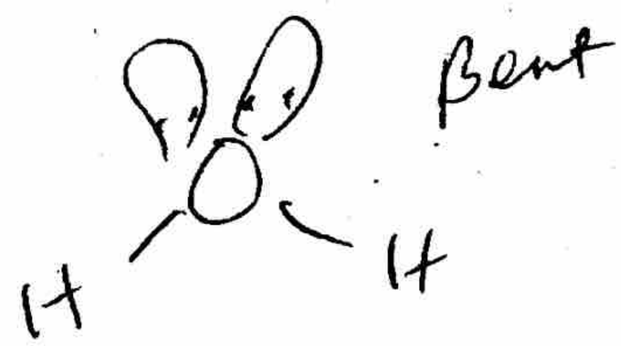
P 3F

have $5 + 3(7) = 26e^-$

need $8 + 3(8) = 32e^-$

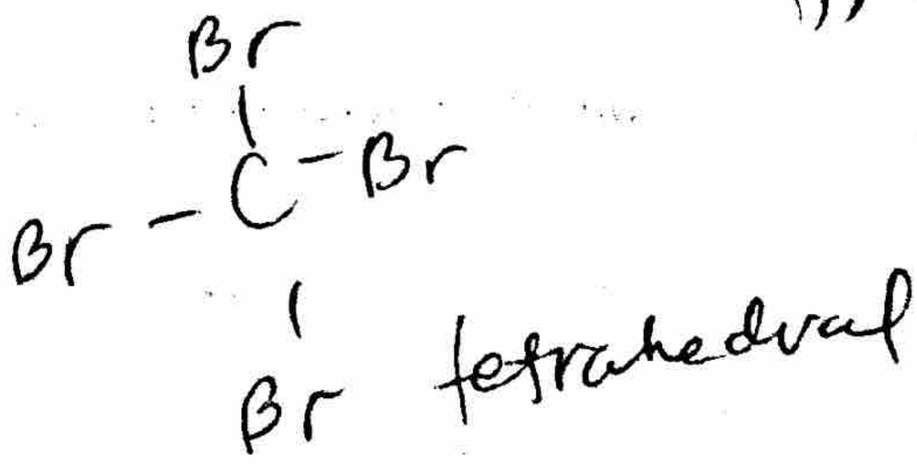


2. H_2O



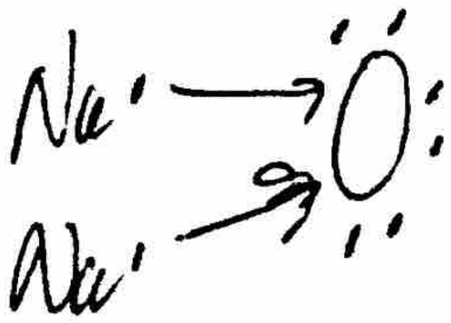
3. O_2

4. CBr_4

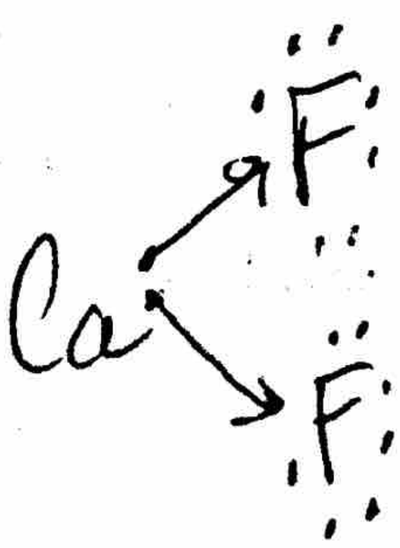


Draw the Lewis Dot structures for the following ionic compounds.

1. Na_2O



2. CaF_2



Naming and Writing Chemical Compounds

When naming compounds, how do we know when to use the Greek or Roman system?

Greek 2 non metals Roman metal / non-metal

What is the reason it is necessary to use Roman numerals when using the Roman system?

multiple oxidation states

Name the following ionic or covalent compounds.

1. N_2O_5 dinitrogen pentoxide
2. SiO_2 silicon dioxide
3. OF_2 oxygen difluoride
4. PBr_3 phosphorus tribromide
5. CO carbon monoxide
6. $CaCO_3$ calcium carbonate
7. Fe_2O_3 iron (III) oxide
8. $Mg(NO_2)_2$ magnesium nitrite
9. $CuSO_4$ copper (II) sulfate
10. $Al(OH)_3$ aluminum hydroxide
11. $NaHCO_3$ sodium bicarbonate
12. $KMnO_4$ potassium permanganate
13. $(NH_4)_3PO4$ ammonium phosphate
14. PbO lead (II) oxide
15. $ZnCO_3$ zinc carbonate

Write the chemical formulas for the following compounds.

1. aluminum sulfate $Al_2(SO_4)_3$
2. magnesium hydroxide $Mg(OH)_2$
3. carbon dioxide CO_2
4. lead (IV) chromate $Pb(CrO_4)_2$
5. diphosphorous pentoxide P_2O_5

6. selenium dichloride $SeCl_2$

7. calcium carbonide Ca_2C

8. manganese (VII) arsenide Mn_3As_7

9. titanium (II) selenide $TiSe$

10. ammonium oxide $(NH_4)_2O$

11. strontium acetate $Sr(C_2H_3O_2)_2$

12. gallium chloride $GaCl_3$

What are the five acids you were told to memorize?

HCl hydrochloric acid

H_3PO_4 phosphoric acid

$HC_2H_3O_2$ acetic acid

H_2SO_4 sulfuric acid

H_2CO_3 carbonic acid

Do you remember how to calculate the number of protons, electrons and neutrons in a neutral atom and in an ion?

Ca^{2+} protons: 20

electrons: 18