Mark the correct answer on your scantron. Most questions only have one answer, but if more than one answer is required it will be stated in the directions.

CHP 3

1. Which of the following categories contains the most elements?
   a) metals b) nonmetals c) metalloids d) noble gases e) representative elements

2. Which of the following is NOT a metal?
   a) Al b) Bi c) Br d) Mn e) Pb

Complete the following table.

Name	Symbol	Group number	Metal, nonmetal, or metalloid?	Representative element, transition metal,	Number for period
	Al				
silicon					
	Ni				
sulfur					

(3.4) (10 pt) Fill in the following table for these elements.

ISOTOPE NAME	ISOTOPE SYMBOL	ATOMIC #	MASS #	# PROT	# ELEC	# NEUT	CHARGE #
	$^{27}_{13}Al$						0
Chlorine-37				17	18		

(2 pt bonus question) What do you do with a dead chemist?_____NAME THE ELEMENT

3. Atomic emission spectra in the visible region produces discrete colored line spectra for every element. Which of the following are true regarding these line spectra
   a) The line spectra occur when electrons in the atoms undergo quantum jumps from higher energy to lower energy orbitals and emit light in the process.
   b) Atomic emission spectra are used to identify elements.
   c) All elements give the same atomic emission line spectra.
   d) a and b
   e) none are true

4. Which of the following is a TRUE statement concerning the quantum model of the atom.
   a) atomic orbitals exist in discrete energy levels
   b) the subenergy levels are designated as s, p, d, f
   c) the ground state exists when the electrons occupy the lowest energy orbitals.
   d) electrons in atoms exist at specific (discrete) energies.
   e) ALLof the above are TRUE statements

5.

6. The maximum number of electrons that can occupy one p sublevel orbital
   a) 2 b) 4 c) 6 d) 8 e) 10

7. What is the maximum number of electrons that can occupy the 3rd principal energy level?
   (a) 2 (b) 8 (c) 18 (d) 32 (e) 50

8. What are all the sublevels that exist in principal energy level 2?
   a) s b) s, p c) s, p, d d) s, p, d, f e) s, p ,d, f, g

9. Which of the following sublevel (subshell) is filled first?
   A) 3s B) 3p C) 3d D) 4s E) 4p

10. Which element has 4 valence electrons in the 5^{th} energy level?
    A) Zr B) V C) Sn D) Mo E) Sb

(4 pt) Draw a picture that depicts the shapes and relative sizes of a 2p and a 3p orbital. Be sure to label your pictures either 2p or 3p.

(12 pts) Write the electron configuration and the orbital energy diagram for phosphorus. For example, Li is

$2s^1$ ↑

$1s^2$ ↑↓

CHP 4 (Chemical Bonding and Molecular Shapes)

11. The electrons that occupy the highest energy orbitals in a ground state atom are called:
    a) a complete octet
    b) valence electrons
    c) the d orbital electrons
    d) the s electrons
    e) None of the above are correct

12. In the periodic table the number assigned to each period corresponds to the
    a) number of valence electrons
    b) the highest occupied principle energy level (shell)
    c) the total number of electrons in the s and p orbitals
    d) the atomic weights of the elements
    e) properties of the elements

13. Which of the following is a statement of the rule of eight (octet rule)?
    a) bond with eight other electrons.
    b) a stable configuration of eight valence electrons.
    c) form eight variations of molecules.
    d) follow the Eight Rules of Bonding.
    e) four bonding pair of electrons.

14. Which of the following is a covalent compound?
    A) Cu^{2+} B) P_2O_5 C) SnF_2 D) SO_3^{2-}

15 Which of the following **is not** isoelectronic with Ar?

A) Cu^{+} B) S^{2-} C) Ca^{2+} D) Sc^{3+} E) all are isoelectronic with Ar

16. Which of the following is common between metal and non-metal elements? Both
    a) form cations
    b) form anions
    c) are found in p block elements
    d) conduct electricity
    e) are gases at room temp.

(12 pt) Write the name, symbol or formula for each of the following:

Ge	Name:
calcium	Symbol:
KCl	Name:
Magnesium fluoride	Formula:
NO_3	Name:
Dihydrogen sulfide	Formula:

Lewis structures and shapes:

17. A Lewis formula or Lewis diagram is used to show what?

A. The physical properties of the compound
B. How Lewisite can be made in the laboratory
C. Whether a bond is polar or nonpolar
D. How metals form alloys
E. The arrangement of atoms and electrons in a molecule

18. Which of the following is another term for *unshared electron pairs*?

A. Covalent pairs B. Ionic pairs C. Valence pairs D. Lone pairs E. Bonding electron pairs

Draw the Lewis structure for N_2O and fill in the blanks in the table (14 pt total)

Lewis structure (6 pt)		
	Valence Electrons (2 pt)	
	Electron group geometry (2 pt)	
	Bond Angle (2 pt)	
	Molecular geometry (2 pt)	
How many resonance structures?_____	Polar or Non-polar (use the table at the end)	

19. Which element will act as the positive pole in each of the following bonds O-F and O-Cl:
a. F in O–F and O in O–Cl
b. O in O–F and O in O–Cl
c. F in O–F and Cl in O–Cl
d. O in O–F and Cl in O–Cl
e. O, F, and Cl are all highly electronegative so there can be no positive pole

20. Arrange the following bonds (H–N, H–O, H–S, H–P) in order of increasing polarity (lowest polarity < highest polarity).
a. H–O < H–N < H–S < H–P
b. H–P < H–S < H–N < H–O
c. H–N < H–O < H–S < H–P
d. H–S < H–P < H–O < H–N

(6 pt) Calculate ΔEN and classify each of the covalent bonds according to its polarity.
Using a $\overset{+}{\longrightarrow}$ show the dipole in those bonds that are polar.

O-Br F-H

ΔEN_____ ΔEN_____

Classification: _____ _____
(Polar or Non-polar) (Polar or Non-polar)

21. Which of the following statements is *incorrect*?
    A. A molecule is polar if it contains polar bonds.
    B. A molecule is polar if there is an uneven distribution of charge.
    C. A molecule is nonpolar if the central atom has no lone pairs and all the atoms bonded to it are identical.
    D. A molecule is non-polar if it contains only non-polar bonds.

22. Which one of the following molecules is *polar*?
    a. CO_2 b. CH_2F_2 c. CF_4 d. C_2H_6 f. NCl_3

23. What is the mass percent oxygen in the compound NO?
    A) .875% B) 87.5% C) 16.00% D) 46.68 % E) 53.32%

(5 pt) Calculate the mass of silver in a 1.50 g sample of silver sulfide (Ag_2S, molar mass = 247.78 g)

Fill in the blank.
The simplest or smallest whole number ratio of the atoms in a compound formula is known as the

_____

An extremely explosive ionic compound is made from the reactions of silver compounds with ammonia. A sample of this compound is found to contain 17.261 g silver and 0.743 g nitrogen. What is the empirical formula for this compound. *Show all work for complete credit.*

	Silver	Nitrogen
Grams		
Molar mass		
Moles		
Mole ratio		
Whole number mole ratio		

TOTAL ELECTRON GROUPS ***(Electron Group Geometry)***	**BONDING ELECTRON GROUPS** ***(Molecular Geometry)***		
	2 bonding groups	3 bonding groups	4 bonding groups
2 linear Bond angle: 180°	2 linear 180° CO_2		
3 trigonal planar Bond angle: 120°	2 bent 120° NO_2^-	3 trigonal planar 120° BF_3	
4 tetrahedral Bond angle: 109.5°	2 bent 109.5° H_2O	3 trigonal pyramid 109.5° NH_3	4 tetrahedral 109.5° CH_4

Electronegativity Chart of the Elements

H 2.1																H 2.1	He --
Li 1.0	Be 1.5											B 2.0	C 2.5	N 3.0	O 3.5	F 4.0	Ne --
Na 0.9	Mg 1.2											Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0	Ar --
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 1.8	Ni 1.8	Cu 1.9	Zn 1.6	Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8	Kr --
Rb 0.8	Sr 1.0	Y 1.3	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	Xe --
Cs 0.7	Ba 0.9	La* 1.1	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	Ti 1.8	Pb 1.8	Bi 1.9	Po 2.0	At 2.2	Rn --
Fr 0.7	Ra 0.9	Ac† 1.1	Rf	Db	Sg	Bh	Hs	Mt	‡	‡	‡						

* Lanthanide Series
† Actinide Series

PERIODIC CHART OF THE ELEMENTS

1 H 1.00797																1 H 1.00797	2 He 4.0026
3 Li 6.939	4 Be 9.0122											5 B 10.811	6 C 12.0112	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.183
11 Na 22.9898	12 Mg 24.312											13 Al 26.9815	14 Si 28.086	15 P 30.9738	16 S 32.064	17 Cl 35.453	18 Ar 39.948
19 K 39.102	20 Ca 40.08	21 Sc 44.956	22 Ti 47.90	23 V 50.942	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.71	29 Cu 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.909	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.905	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc (99)	44 Ru 101.07	45 Rh 102.905	46 Pd 106.4	47 Ag 107.870	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.904	54 Xe 131.30
55 Cs 132.905	56 Ba 137.34	*57 La 138.91	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.967	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.980	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	‡89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 ? (271)	111 ? (272)	112 ? (277)						

* Lanthanide Series

58 Ce 140.12	59 Pr 140.907	60 Nd 144.24	61 Pm (147)	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.924	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.97

‡ Actinide Series

90 Th 232.038	91 Pa (231)	92 U 238.03	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (249)	99 Es (254)	100 Fm (253)	101 Md (256)	102 No (256)	103 Lr (257)