

Use the Scantron for Questions 1-25. Mark only one answer unless instructed otherwise.

CHP 3.1-3.4 (Atomic structure and isotopes)

ANSWERS FOR QUESTIONS 1 and 2:

A) protons      B) neutrons      C) *electrons*      D) nucleus      E) atomic number      AB) mass

1. What does the nucleus of an atom contain? **Mark more than one answer.**
2. Atoms are neutral because the number of \_\_\_\_\_ equal the number of \_\_\_\_\_? **Mark two answers.**

(14 pt) Fill in this table with the missing values, isotope formulas or names.

Isotope name	Isotope symbol	Atomic number	Mass number	Protons	Neutrons	Electrons	Charge	(C)ation (A)nion (N)eutral
	$^{15}_7\text{N}^{-3}$							
			27	13			0	

CHP 3.5-3.10 (Periodic Table)

Mark the letters of the chemical symbol on your scantron that correspond to each of the following names. *There are more symbols than names.*

ELEMENT NAME
3. Manganese
4. Copper
5. Calcium
6. Nickel
7. Beryllium

ELEMENT SYMBOLS		
A. B	AC. Ca	CD. Nk
B. Ba	AD. Cd	CE. M
C. Be	AE. Co	ABC. Ma
D. Bm	BC. Cu	ABD. Me
E. Br	BD. N	ABE. Mg
AB. C	BE. Ni	ACD. Mn

(11 pt) Complete the following table.

Name	Symbol	Metal (M) Nonmetal (N) Metalloid (D)	Representative (R) or Transition (T) Element	Period Number	Group Number
Zinc					2B
	F			2	
		D		3	4A

8. Which elements have similar properties according to periodic law and the table? **Mark more than one answer.**  
A) Manganese      B) Copper      C) Calcium      D) Nickel      E) Beryllium

**39 pt**

9. The alkaline earth metals are in which group of the periodic table?  
 a) IA    b) IIA    c) VIA    d) VIIA    e) VIIIA

ANSWERS FOR QUESTIONS 11 and 12:

A) Hydrogen    B) Helium    C) Oxygen    D) Nitrogen    E) Carbon    AB) Silicon    AC) Aluminum

10. What is the most common element in the human body?

11. What is the most common element the air that we breathe?

BONUS (2 pt) Someone who likes to start fires is an \_\_\_\_\_ **NAME THE ELEMENT**

CHP 3.11-3.17 (Electron configurations)

12. Which of the following statements is/are correct?

- i. Principal energy levels are identified by the letters *s*, *p*, *d*, and *f*
- ii. Principal energy levels appear in both the quantum mechanical model of the atom and the Bohr model of the atom
- iii. In general,  $n = 1$  is at lower energy than  $n = 2$ , and  $n = 2$  is lower than  $n = 3$ , and so on
- iv. The principal energy level is related to electron spin

A. i only    B. iv only    C. i and ii    D. ii and iii    E. iii and iv

13. What is the electron configuration for Br

- A.  $[\text{Ar}] 4s^2 4p^5$
- B.  $[\text{Ar}] 4s^2 4p^6$
- C.  $[\text{Ar}] 3d^{10} 4s^2 4p^5$
- D.  $[\text{Ar}] 3d^{10} 4s^2 4p^6$

14. Mark your scantron for the following elements or ions that have this electron configuration  $1s^2 2s^2 2p^6 3s^2 3p^6$

A) Ne    B)  $\text{Na}^+$     C)  $\text{K}^+$     D) S    E)  $\text{P}^{3-}$

15. How many total electrons can fit into principal energy level 3?    A) 2    B) 8    C) 18    D) 32

16. In the third principal energy level, what is the order of energies of the sublevels, from lowest to highest?

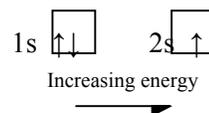
A)  $1s < 2s < 3s$     B)  $3d < 3p < 3s$     C)  $3p < 3s < 3d$     D)  $3p < 3d < 3s$     E)  $3s < 3p < 3d$

17. Which of the following pairs of atomic numbers belong to elements whose atoms have the highest occupied energy level electron configuration of the form  $ns^2, np^4$  ?

A) 16 and 52    B) 40 and 72    C) 24 and 42    D) 9 and 17    E) 14 and 32

(9 pts) Draw the orbital energy diagram for the ground state electron configuration of silicon. The orbital energy diagram for the ground state electron configuration of lithium is given as an example.

EXAMPLE: Li (atomic number: 3 = 3 electrons) electron configuration:  $1s^2 2s^1$



CHP 4 (Chemical bonding, chemical naming and chemical formula calculations)

18. Which of the following is true regarding an ion? (circle all that are correct)

- A) all ions have noble gas electron configuration
- B) an ion is an atom that has gained or lost electrons
- C) an ion is an atom that carries either a positive or negative charge
- D) salts are made up of ions

**(16 pt) Fill in the table with the missing names or symbols**

Name of compound or ion	Formula
	HCl
	BrO <sub>2</sub>
aluminum chloride	
magnesium hydride	
	Cu <sup>2+</sup>
iron (III) oxide	
Dinitrogen tetroxide	
	S <sup>2-</sup>

19. Which of the following is the best classification for a bond in which bonding electrons are shared equally?

- A. Nonpolar
- B. Polar covalent
- C. Primarily ionic
- D. Very strongly polar covalent
- E. Slightly ionic

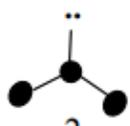
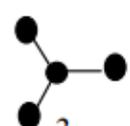
20. Which of the following chemical bonds is best described as nonpolar covalent?

- A) H-H    B) H-C    C) H-N    D) H-O    E) H-F

21. The ratio of anions to cations in an ionic compound is always such that...

- A. the compound is reduced in size when compared to the parent atoms
- B. there are as many anions as there are cations
- C. the anions outnumber the cations
- D. the cations outnumber the anions
- E. the compound is electrically neutral



TOTAL ELECTRON GROUPS ( <i>Electron Group Geometry</i> )				
 2 linear Bond angle: $180^\circ$	 2 linear $180^\circ$ CO <sub>2</sub>			
	 2 bent $120^\circ$ NO <sub>2</sub> <sup>-</sup>	 3 trigonal planar $120^\circ$ BF <sub>3</sub>		
 4 tetrahedral Bond angle: $109.5^\circ$	 2 bent $109.5^\circ$ H <sub>2</sub> O	 3 trigonal pyramid $109.5^\circ$ NH <sub>3</sub>	 4 tetrahedral $109.5^\circ$ CH <sub>4</sub>	
	2 bonding groups	3 bonding groups	4 bonding groups	

**BONDING ELECTRON GROUPS**  
(*Molecular Geometry*)

## PERIODIC CHART OF THE ELEMENTS

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

\* Lanthanide Series

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

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

SCRATCH

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