

Name: \_\_\_\_\_

- Supply answers to all questions on this examination, or paper provided.
- No calculators are permitted.
- Partial credit will be limited.
- The score for short answer questions is directly proportional to the completeness and quality of the answer provided.
- There are 113 points possible for this examination. Your score will be reported as a percentage of 113.

1. Distinguish between the following:
  - a. Binary and ternary compounds (2 pts.)
  - b. Ammonia and ammonium ion (2 pts.)
  - c. Shape of a s orbital and a p orbital (2 pts.)
2. Why does the 3d orbital fill after the 4s orbital? (2 pts.)
3. What is an isotope? What is different between two isotopes? What is the same? (3 pts.)
4. How many electrons (at most) can be placed in the 6<sup>th</sup> energy level (n = 6)? (1 pt.)
5. How many electrons (at most) can be placed in the f sublevel (f orbital)? (2 pts.)
6. Distinguish between an ionic bond and a covalent bond. Include considerations regarding electrons, electronegativity, and the classification of elements in your response. (3 pts.)
7. Define polar covalent bond. (2 pts.)
8. Define coordinate covalent bond. (2 pts.)
9. The radius of the Mg atom is 160 pm, and the radius of the Mg<sup>2+</sup> cation is 65 pm. Explain the change in size. (2 pts.)
10. The following four questions refer to the following block of nine elements in the Periodic Table:

Al	Si	P
Ga	Ge	As
In	Sn	Sb

- a. Which element is the smallest in atomic size? (1 pt.)
- b. Which element has the highest electronegativity? (1 pt.)
- c. Which element has the highest first ionization energy? (1 pt.)
- d. Which element is most metallic in character? (1 pt.)

Name: \_\_\_\_\_

11. Prior to the discovery of germanium (Ge) in 1886, Mendeleev predicted in 1869 the properties of this element, which he called “eka-silicon.” Using the periodic table, determine the following for germanium (atomic number 32)
- Would this element be classified as a metal, nonmetal, or metalloid? (1 pt.)
  - How many valence electrons would it have? (1 pt.)
  - Write the electronic configuration in sublevels for both germanium and its group precursor, silicon. (2 pts.)
  - Would it be more metallic or more nonmetallic than its precursor, silicon? (1 pt.)
12. What is the name and symbol of an element in the group or period provided? (10 pts. *You must have both the name and symbol correct to receive credit*)

Group	Name	Symbol
transition elements		
metalloids		
halogens		
chalogens		
actinide series		
noble gases		
alkali metals		
alkaline earth metals		
non-metals		
lanthanide series		

13. Matching: (10 pts. *Match both the formula to the common name and the common name to the characteristic*)

Formula	Common Name	Characteristic
NaOH	Ammonia	Strong base
NH <sub>3</sub>	Sugar	Weak acid
H <sub>2</sub> SO <sub>4</sub>	Vinegar	Non-electrolyte
C <sub>12</sub> H <sub>22</sub> O <sub>11</sub>	Battery Acid	Weak base
HC <sub>2</sub> H <sub>3</sub> O <sub>2</sub>	Drain Cleaner	Strong acid

Name: \_\_\_\_\_

14. Name the following acids. Classify them as strong or weak: (8 pts.)

Formula	Name	Strong or Weak
HNO <sub>3</sub>		
	Acetic acid	
	Perchloric acid	
HCN		

15. Name the following compounds. Classify them as a strong acid, a weak acid, a strong base, a weak base, or a salt. Assume that all are soluble compounds in solution. (12 pts.)

Formula	Name	Classification
H <sub>3</sub> PO <sub>4</sub>		
SrCO <sub>3</sub>		
Ca(OH) <sub>2</sub>		
HCH <sub>3</sub> COOH		
LiOH		
Al(OH) <sub>3</sub>		

16. Name the following compounds, or supply the formula if the name is provided (10 pts)

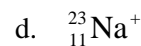
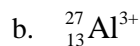
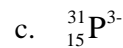
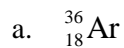
calcium hypochlorite	
LiBrO <sub>4</sub>	
diphosphorous pentasulfide	
iron (II) phosphate	
copper (II) chlorate	
SnI <sub>4</sub>	
Al <sub>2</sub> (Cr <sub>2</sub> O <sub>7</sub> ) <sub>3</sub>	
CH <sub>4</sub>	
Ag <sub>3</sub> PO <sub>4</sub>	
Hg <sub>2</sub> Cl <sub>2</sub>	

Name: \_\_\_\_\_

17. Name the following compounds, or supply the formula if the name is provided (10 pts)

barium acetate	
tetraphosphorous hexaoxide	
CaO	
PF <sub>5</sub>	
iron (III) perchlorate	
dinitrogen tetraoxide	
(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	
Cd(IO <sub>3</sub> ) <sub>2</sub>	
sulfur trioxide	
disodium hydrogen phosphate	

18. For each of the following atoms or ions, calculate the number of protons and neutrons in the nucleus and the number of electrons outside the nucleus. Arrange the electrons in their *sublevels*; i.e. write the electronic configuration for each of the following atoms or ions (12 pts.):



19. Calculate the oxidation number for all the elements in the following compounds or ions (9 pts.):

