

**Part One: Multiple Choice (60 points)**

Choose the best answer for each question. There is only one correct answer.

- Which subatomic particle has the smallest mass?  
a. electron      b. proton      c. neutron      d. they all have the same mass
- Which of the following is **NOT** an isotope of hydrogen?  
a. protium      b. deuterium      c. hydronium      d. tritium
- Which of the following is **NOT** an oxide?  
a.  $\text{Na}_2\text{O}$       b.  $\text{MgO}$       c.  $\text{Al}_2\text{O}_3$       d.  $\text{Ba}(\text{OH})_2$
- Which of the following is **NOT** a halogen?  
a.  $\text{F}_2$       b.  $\text{Br}_2$       c.  $\text{N}_2$       d.  $\text{I}_2$       e. they are all halogens
- Which of the following elements has unpaired electrons?  
a. Be      b. N      c. Ca      d. Zn      e. Xe
- All of the following are ionic compounds **except**:  
a.  $\text{BaCl}_2$       b.  $\text{PbO}_2$       c.  $\text{CuF}_2$       d.  $\text{SO}_3$
- Which of the following elements has the highest electronegativity?  
a. F      b. Br      c. Ca      d. Na
- How many orbitals are filled for Bromine in its ground state?  
a. 33      b. 17      c. 18      d. 7      e. 8
- Which of the following groups have one valence electron?  
a. alkaline earth metals      b. alkali metals      c. transition metals  
d. halogens      e. noble gases
- Which of the following is **ionic**?  
a. carbon dioxide      b. ammonium      c. lithium carbonate      d. nitric acid
- What is the formula for perchloric acid?  
a.  $\text{HClO}_4$       b.  $\text{HClO}_3$       c.  $\text{HClO}_2$       d.  $\text{HClO}$       e.  $\text{HCl}$
- Which of the following has the most nonbonding pairs of electrons?  
a. ammonia      b. carbon dioxide      c. water      d. hydrogen bromide
- Which of the following contains a triple bond?  
a. nitrogen      b. oxygen      c. carbon dioxide      d. iodide
- How many neutrons are in carbon-14?  
a. 6      b. 8      c. 14      d. zero      e. 12

15. Which of the following is a transition metal?  
a. strontium    b. chromium    c. barium    d. lead
16. Which of the following atoms has the smallest atomic radius?  
a. Potassium    b. Iron    c. Arsenic    d. Bromine
17. Which of the following molecules is non-polar?  
a. methane    b. ammonia    c. water    d. hydrogen fluoride
18. Which atom has the highest electronegativity?  
a. H    b. Fr    c. F    d. At
19. What is the maximum number of electrons that may exist in the 4<sup>th</sup> shell?  
a. 8    b. 18    c. 32    d. 50
20. Which of the following is **NOT** an acid?  
a. H<sub>2</sub>SO<sub>4</sub>    b. HCl    c. CH<sub>4</sub>    d. HNO<sub>3</sub>

**Part Two: Short Answer (20 points)**

*Write your answer in the space provided*

For the following names, please provide the correct chemical formulas:

1. Magnesium acetate
2. Lithium phosphide
3. Carbon tetrafluoride
4. Sodium hypochlorite
5. Lead (IV) iodide
6. Silver nitrite
7. Perchloric acid
8. Zinc sulfate
9. Barium dichromate
10. Nickel (II) sulfide

For the following compounds, please provide the correct name:

1.  $\text{Cu}(\text{NO}_2)_2$
2.  $\text{H}_2\text{CO}_3$
3.  $\text{NH}_4\text{OH}$
4.  $\text{K}_2\text{CrO}_4$
5.  $\text{FeBr}_3$
6.  $\text{K}_2\text{CO}_3$
7.  $\text{HIO}$
8.  $\text{Hg}_2\text{Cl}_2$
9.  $\text{Al}(\text{BrO}_2)_3$
10.  $\text{HCl}$

**Part Three: Short Answer (20 points)**

1. Draw the Lewis dot structure for the following molecules:

a. Ethene ( $\text{C}_2\text{H}_4$ )

b. Carbon tetrafluoride

c. Hydrogen cyanide

d. Oxygen (the molecule not the atom)

2. Explain the trend in atomic size when going across the periodic table and down the periodic table. (You should write your answer on the back of this page and be certain to use complete sentences and to answer the questions thoughtfully).

**Part One: Multiple Choice (60 points)**

Choose the best answer for each question. There is only one correct answer.

21. Which subatomic particle has the smallest mass?  
a. **electron**      b. proton      c. neutron      d. they all have the same mass
22. Which of the following is **NOT** an isotope of hydrogen?  
a. protium      b. deuterium      c. **hydronium**      d. tritium
23. Which of the following is **NOT** an oxide?  
a. Na<sub>2</sub>O      b. MgO      c. Al<sub>2</sub>O<sub>3</sub>      d. **Ba(OH)<sub>2</sub>**
24. Which of the following is **NOT** a halogen?  
a. F<sub>2</sub>      b. Br<sub>2</sub>      c. **N<sub>2</sub>**      d. I<sub>2</sub>      e. they are all halogens
25. Which of the following elements has unpaired electrons?  
a. Be      b. **N**      c. Ca      d. Zn      e. Xe
26. All of the following are ionic compounds **except**:  
a. BaCl<sub>2</sub>      b. PbO<sub>2</sub>      c. CuF<sub>2</sub>      d. **SO<sub>3</sub>**
27. Which of the following elements has the highest electronegativity? (*note: we did not discuss electronegativity*)  
a. **F**      b. Br      c. Ca      d. Na
28. How many orbitals are filled for Bromine in its ground state?  
a. 33      b. **17**      c. 18      d. 7      e. 8
29. Which of the following groups have one valence electron?  
a. alkaline earth metals      b. **alkali metals**      c. transition metals  
d. halogens      e. noble gases
30. Which of the following is **ionic**?  
a. carbon dioxide      b. ammonium      c. **lithium carbonate**      d. nitric acid
31. What is the formula for perchloric acid?  
a. **HClO<sub>4</sub>**      b. HClO<sub>3</sub>      c. HClO<sub>2</sub>      d. HClO      e. HCl
32. Which of the following has the most nonbonding pairs of electrons?  
a. ammonia      b. **carbon dioxide**      c. water      d. hydrogen bromide
33. Which of the following contains a triple bond?  
a. **nitrogen**      b. oxygen      c. carbon dioxide      d. iodide

34. How many neutrons are in carbon-14?  
a. 6                      b. **8**                      c. 14                      d. zero                      e. 12
35. Which of the following is a transition metal?  
a. strontium    b. **chromium**                      c. barium                      d. lead
36. Which of the following atoms has the smallest atomic radius?  
a. Potassium    b. Iron                      c. Arsenic                      d. **Bromine**
37. Which of the following molecules is non-polar? (*Note: we did not discuss polar bonds*)  
a. **methane**                      b. ammonia                      c. water                      d. hydrogen fluoride
38. Which atom has the highest electronegativity?  
a. H                      b. Fr                      c. **F**                      d. At
39. What is the maximum number of electrons that may exist in the 4<sup>th</sup> shell?  
a. 8                      b. 18                      c. **32**                      d. 50
40. Which of the following is **NOT** an acid?  
a. H<sub>2</sub>SO<sub>4</sub>                      b. HCl                      c. **CH<sub>4</sub>**                      d. HNO<sub>3</sub>

**Part Two: Short Answer (20 points)**

*Write your answer in the space provided*

For the following names, please provide the correct chemical formulas:

11. Magnesium acetate **Mg(C<sub>2</sub>H<sub>3</sub>O<sub>2</sub>)<sub>2</sub>**
12. Lithium phosphide **Li<sub>3</sub>P**
13. Carbon tetrafluoride **CF<sub>4</sub>**
14. Sodium hypochlorite **NaClO**
15. Lead (IV) iodide **PbI<sub>4</sub>**
16. Silver nitrite **AgNO<sub>2</sub>**
17. Perchloric acid **HClO<sub>4</sub>**
18. Zinc sulfate **ZnSO<sub>4</sub>**
19. Barium dichromate **BaCr<sub>2</sub>O<sub>7</sub>**
20. Nickel (II) sulfide **NiS**

For the following compounds, please provide the correct name:

11.  $\text{Cu}(\text{NO}_2)_2$       **Copper (II) Nitrite**
12.  $\text{H}_2\text{CO}_3$       **Carbonic Acid**
13.  $\text{NH}_4\text{OH}$       **Ammonium Hydroxide**
14.  $\text{K}_2\text{CrO}_4$       **Potassium Chromate**
15.  $\text{FeBr}_3$       **Iron (III) Bromide**
16.  $\text{K}_2\text{CO}_3$       **Potassium Carbonate**
17.  $\text{HIO}$       **Hypoiodous Acid**
18.  $\text{Hg}_2\text{Cl}_2$       **Mercury (I) Chloride**      (This compound is unusual)
19.  $\text{Al}(\text{BrO}_2)_3$       **Aluminum Bromite**
20.  $\text{HCl}$       **Hydrochloric Acid**

**Part Three: Short Answer (20 points) Please refer to your text book for these answers.**

3. Draw the Lewis dot structure for the following molecules:
  - a. Ethene ( $\text{C}_2\text{H}_4$ )
  - b. Carbon tetrafluoride
  - c. Hydrogen cyanide
  - d. Oxygen (the molecule not the atom)
  
4. Explain the trend in atomic size when going across the periodic table and down the periodic table. (You should write your answer on the back of this page and be certain to use complete sentences and to answer the questions thoughtfully).

**Atomic radii increase as one proceeds down a group because with each row of the periodic table a new orbital shell is being filled. Each shell places the electron further from the nucleus. Atomic radii decrease as one proceeds across a period. This is because the increase in the number of protons in the nucleus causes the entire shell to contract – or be drawn closer to the nucleus.**