

# CH 121

## General Chemistry

### Exam 3

June 13, 2002

Name: \_\_\_\_\_  
(please print)

SSN: \* \* \* \_ \* \* \_  
\_\_\_\_\_ (last 4 digits)

Each question is worth 1 point.

Circle your answer clearly, otherwise no credit will be given.

Circle only one answer. If you circle two or more, you will receive no credit.

1. How many electrons can be described by the set of quantum numbers  $n = 3$ ,  $l = 3$ ,  $m_l = -1$ ,  $m_s = -1/2$ ?
  - a. 18
  - b. 6
  - c. 2
  - d. 1
  - e. 0
2. Which of the following has the lowest 1st ionization energy?
  - a. F
  - b. O
  - c. Na
  - d. Mg
  - e. Ne
3. A measure of the ability of a gaseous atom to acquire an electron to become negatively charged is called its:
  - a. ionization energy.
  - b. polarizability.
  - c. electron affinity.
  - d. electronegativity.
  - e. electron density.
5. Which of the following particles has the largest radius?
  - a. Ne
  - b.  $F^-$
  - c.  $O^{2+}$
  - d.  $Mg^{2+}$
  - e.  $N^{3-}$
6. Which one of the following atoms has the largest atomic radius?
  - a. Al
  - b. Ge
  - c. Ga
  - d. Si
  - e. P

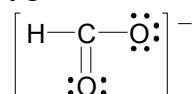
7. Which of the following compounds exhibits ionic bonding?

- a.  $\text{CCl}_4$
- b.  $\text{MgCl}_2$
- c.  $\text{Cl}_2$
- d.  $\text{PCl}_3$
- e.  $\text{OF}_2$

8. The central atom in the bromite ion  $\text{BrO}_2^-$  is surrounded by

- a. two bonding and two unshared pairs of electrons.
- b. three bonding and one unshared pair of electrons.
- c. one bonding and three unshared pairs of electrons.
- d. two double bonds and no unshared pairs of electrons.
- e. four bonding and four lone pairs of electrons.

9. What is the average carbon-oxygen bond order in the formate ion?

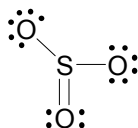


- a. 0
- b. 1
- c. 1.5
- d. 2
- e. 2.5

10. Which of the following groups of elements is arranged in order of increasing electronegativity?

- a.  $\text{Si} < \text{Al} < \text{Br} < \text{Cl}$
- b.  $\text{Na} < \text{K} < \text{Ca} < \text{Ba}$
- c.  $\text{P} < \text{S} < \text{O} < \text{F}$
- d.  $\text{K} < \text{Rb} < \text{Cs} < \text{F}$
- e.  $\text{N} < \text{P} < \text{S} < \text{Cl}$

11. From a consideration of the Lewis structure shown below, what is the formal charge on sulfur in the molecule,  $\text{SO}_3$ ?



- a. 0  
b. 1+  
c. 1-  
d. 2+  
e. 2-
12. What are the oxidation numbers of sulfur and oxygen in the molecule  $\text{SO}_3$ ?
- a. Sulfur is +1 and oxygen is -1.  
b. Sulfur is +6 and oxygen is -2.  
c. Sulfur is +6 and oxygen is -6.  
d. Sulfur is +3/2 and oxygen is -3.  
e. Sulfur is -2 and oxygen is -2.
13. Using the VSEPR theory, predict the molecular shape of  $\text{ClF}_3$ .
- a. triangular planar  
b. T-shaped  
c. linear  
d. tetrahedral  
e. square planar
14. How many pi ( $\pi$ ) bonds are in the following molecule?  
 $\text{H}_3\text{C}-\text{C}\equiv\text{C}-\text{C}\equiv\text{N}$
- a. 2  
b. 4  
c. 6  
d. 7  
e. 10

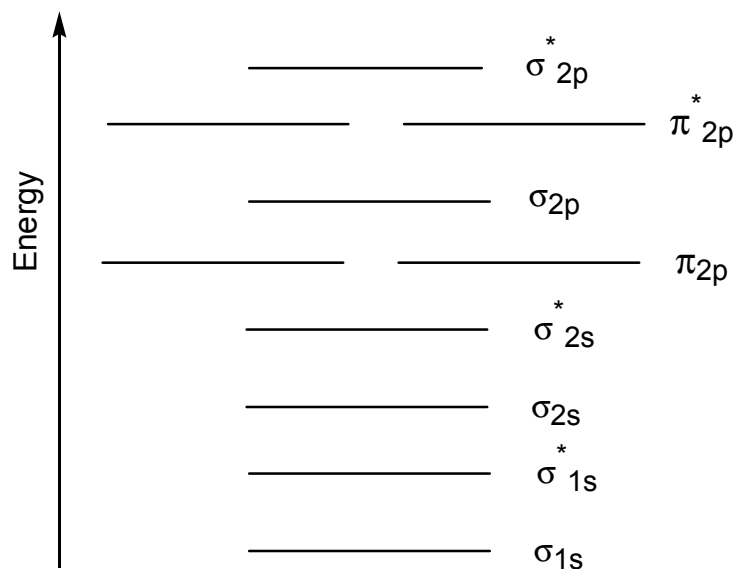
15. What type of hybrid orbital set is used by the boron atom in the  $\text{BCl}_4^-$  ion?

- a.  $sp$
- b.  $sp^2$
- c.  $sp^3$
- d.  $sp^3d$
- e.  $sp^3d^2$

16. The number of  $\pi$ -bonds in hydrazine,  $\text{H}_2\text{NNH}_2$  is

- a. 0
- b. 1
- c. 2
- d. 3
- e. 4

The molecular orbital diagram can be used in answering the following questions.



17. Consider the diatomic molecules of the second period  $\text{Li}_2$ ,  $\text{Be}_2$ ,  $\text{B}_2$ , and  $\text{C}_2$ .

The two molecules which have the same bond order are

- a.  $\text{Li}_2$  and  $\text{Be}_2$
- b.  $\text{Li}_2$  and  $\text{B}_2$
- c.  $\text{Li}_2$  and  $\text{C}_2$
- d.  $\text{Be}_2$  and  $\text{B}_2$
- e.  $\text{Be}_2$  and  $\text{C}_2$

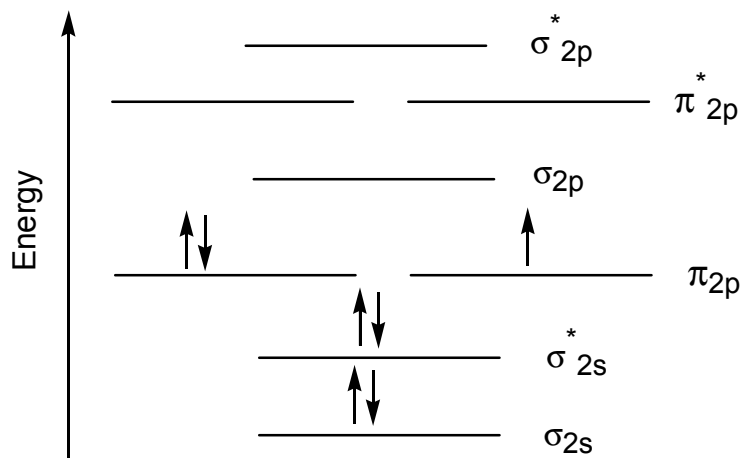
18. The species below having the longest bond (if any) is

- a.  $N_2^+$
- b.  $N_2$
- c.  $N_2^-$
- d.  $N_2^{2-}$
- e. They are all the same length.

19. The species below having the shortest bond (if any) is

- a.  $N_2^+$
- b.  $N_2$
- c.  $N_2^-$
- d.  $N_2^{2-}$
- e. They are all the same length.

20. The following molecular orbital energy level diagram is appropriate for which one of the listed particles?



- a.  $B_2^+$
- b.  $B_2^-$
- c.  $N_2^+$
- d.  $N_2^-$
- e.  $N_2$