6th Practice Exam

1. What are the oxidation numbers of sulfur and oxygen in the molecule 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

2. How many unshared electron pairs (lone pairs) are in a molecule of SO_2?

   a. 2
   b. 5
   c. 7
   d. 9
   e. 12

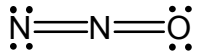
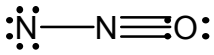
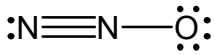
3. In the Lewis structure for SF_4, the number of lone pairs of electrons around the central sulfur atom is

   a. 0
   b. 1
   c. 2
   d. 4
   e. 5

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

   a. Si < Al < Br < Cl
   b. Na < K < Ca < Ba
   c. P < S < O < F
   d. K < Rb < Cs < F
   e. N < P < S < Cl

5. Which of the following is (are) **CORRECT** resonance structure(s) for the N_2O molecule?

1.  2.  3. 

a. 1 only

b. 2 only

c. 3 only

d. 2 and 3 only

e. 1, 2, and 3

6. Which of the following elements is most likely to display sp^3d hybridization?

a. oxygen

b. nitrogen

c. phosphorus

d. carbon

e. boron

7. What type of hybrid orbital set is used by the boron atom in the BCl_4^- ion?

a. sp

b. sp^2

c. sp^3

d. sp^3d

e. sp^3d^2

8. The molecular orbital configuration of B_2 is

a. [core electrons] $(\sigma_{2s})^2(\sigma^*_{2s})^2(\pi_{2p})^4(\sigma_{2p})$,

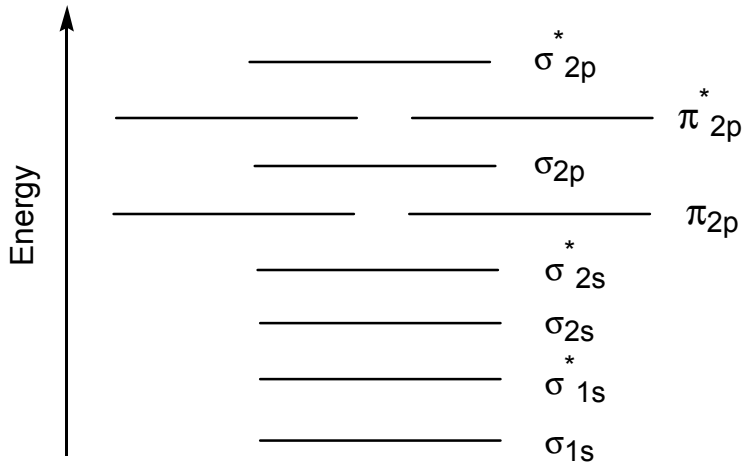
b. [core electrons] $(\sigma_{2s})^2(\sigma^*_{2s})^2(\pi_{2p})^4(\sigma_{2p})^1(\pi^*_{2p})^1$

c. [core electrons] $(\sigma_{2s})^2(\sigma^*_{2s})^2(\pi_{2p})^2(\sigma_{2p})^1$

d. [core electrons] $(\sigma_{2s})^2(\sigma^*_{2s})^2(\pi_{2p})^1$

e. [core electrons] $(\sigma_{2s})^2(\sigma^*_{2s})^2(\pi_{2p})^2$

This molecular diagram can be used in answering the following question



9. In a diatomic molecule, when two atomic orbitals of the same type combine to form molecular orbitals, which of the following statements best describes the energy of the resulting pair of molecular orbitals?

   a. Both molecular orbitals will be higher in energy than the component atomic orbitals.

   b. Both molecular orbitals will be lower in energy than the component atomic orbitals.

   c. One molecular orbital will be higher in energy and one will be lower in energy than the component atomic orbitals.

   d. Both molecular orbitals will be identical in energy to the component atomic orbitals.

   e. One molecular orbital will be antibonding and the other will be nonbonding.

10. According to molecular orbital theory, which of the following species is unlikely to exist?

   a. H_2

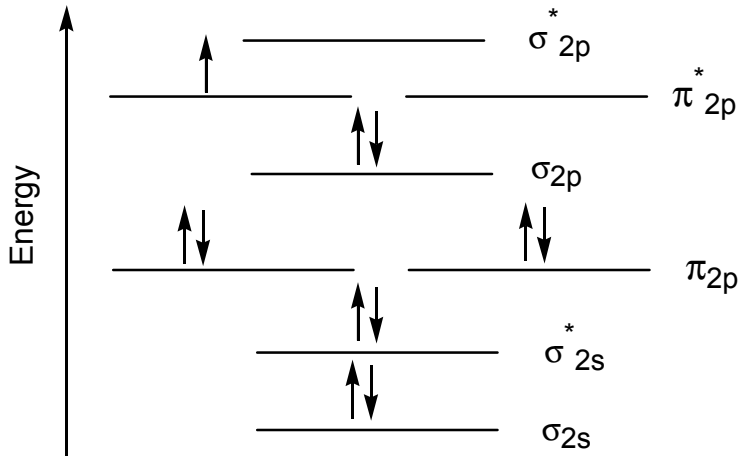
   b. H_2^+

   c. He_2^+

   d. He_2

   e. H_2^-

11. 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

12. Which of the following is **not** a correct Lewis dot structure?

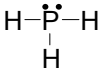
a. :N≡N:

b. H−C≡N:

c. $[:N{\equiv}O:]^-$

d. :C≡O:

e.



13. Using the VSEPR theory, predict the molecular shape of SCl_2.

a. triangular planar

b. T-shaped

c. linear

d. tetrahedral

e. angular (bent)

14. Which of the following is (are) **CORRECT** Lewis dot structure(s)?

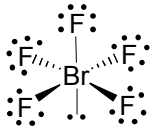
a. 1 only

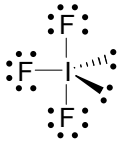
b. 2 only

c. 3 only

d. 1 and 2 only

e. 2 and 3 only

1. 

2. 

3.