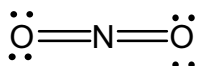


- How many unpaired electrons are present in Fe^{2+}
 - 4
- Which of the following particles has the largest radius?
 - N^{3-}
- Rank Ba, Ca, Na in order of increasing 2nd ionization energy.
 - $\text{Ba} < \text{Ca} < \text{Na}$
- According to molecular orbital theory, which of the following species is unlikely to exist?
 - He_2
- Using the VSEPR theory, predict the molecular shape of SCl_2 .
 - angular (bent)
- Which of the following sets of quantum numbers is not allowed?
 - $n = 2, l = 2, m_l = -1, m_s = +1/2$
- Which of the following elements is a d-block element?
 - copper
- Which of the following is (are) **CORRECT** resonance structure(s) for the formate ion?
 - $$\left[\begin{array}{c} \text{H}-\text{C}=\ddot{\text{O}} \\ | \\ \ddot{\text{O}} \end{array} \right]^{-}$$
 - $$\left[\begin{array}{c} \text{H}-\text{C}=\ddot{\text{O}} \\ || \\ \ddot{\text{O}} \end{array} \right]^{-}$$
 - $$\left[\begin{array}{c} \text{H}-\text{C}-\ddot{\text{O}} \\ || \\ \ddot{\text{O}} \end{array} \right]^{-}$$
 - 1 and 3 only

- The Lewis structure



represents

- NO_2^+

10. In the Lewis electron dot structure for hydrazine, N_2H_4 , the total number of lone electron pairs around the two nitrogen atoms is
- c. 2
11. Which compound contains a carbon-oxygen bond with a bond order of 2?
- a. CO_2
12. Using the VSEPR theory, predict the molecular shape of ClF_3 .
- b. T-shaped
13. What is the hybridization of the nitrogen atoms in NH_3 and NH_4^+ respectively?
- b. sp^3 , sp^3
14. In the combustion of methane, CH_4 , what change in hybridization (if any) occurs to the carbon atom?
- d. sp^3 to sp
15. What type of hybrid orbital set is used by the sulfur atom in the compound SF_6 ?
- e. sp^3d^2
16. Consider the diatomic molecules of the second period Li_2 , Be_2 , and C_2 . Which is (are) unlikely to exist?
- c. Be_2
17. In order to create a *p-type* semiconductor, a silicon crystal could be doped with
- a. Ga
18. The following molecular orbital energy level diagram is appropriate for which one of the listed particles?
- b. B_2^-
19. What are the oxidation numbers of sulfur and oxygen in the molecule SO_3 ?
- b. Sulfur is +6 and oxygen is -2.

20. Which response contains all the characteristics listed that should apply to BF_3 ?

1. trigonal planar
 2. one unshared pair of electrons on B
 3. sp^2 hybridized boron atom
 4. polar molecule
 5. polar bonds
- d. 1, 3, and 5