

Fall 2008 Practice Quiz 4

- Using molecular orbital theory, determine the bond order for CN^- ?
 - 1
 - 2
 - 2.5
 - 3
 - 1.5
- Which of the following statements is true regarding paramagnetism?
 - A molecule is paramagnetic if it has an odd number of total electrons
 - A molecule is not paramagnetic if it has an even number of total electrons
 - A molecule is paramagnetic if it has no unpaired electrons
 - I and III
 - I and II
 - I only
 - III only
 - I, II, and III
- Using molecular orbital theory, rank the following species in terms of increasing bond energy: N_2 (3), O_2 (2), C_2 (2), B_2 (1), and Li_2 (1).
 - $\text{Li}_2 = \text{B}_2 < \text{O}_2 = \text{C}_2 < \text{N}_2$
 - $\text{N}_2 < \text{C}_2 = \text{O}_2 < \text{B}_2 = \text{Li}_2$
 - $\text{Li}_2 = \text{B}_2 < \text{N}_2 < \text{O}_2 = \text{C}_2$
 - $\text{O}_2 = \text{C}_2 < \text{Li}_2 = \text{B}_2 < \text{N}_2$
 - $\text{O}_2 = \text{Li}_2 = \text{B}_2 < \text{C}_2 = \text{N}_2$
- Choose the species below that exhibits delocalization.
 - SO_4^{2-}
 - CH_4
 - KF
 - F_2
 - NH_3
- Burning butane can be represented by this combustion reaction:
 $2\text{C}_4\text{H}_{10}(\text{l}) + 13\text{O}_2(\text{g}) \rightarrow 8\text{CO}_2(\text{g}) + 10\text{H}_2\text{O}(\text{g})$
If we completely combusted four moles of butane with twenty-six moles of oxygen at STP, what volume would it occupy? Assume the reaction goes to completion. Assume all gases behave ideally.
 - 92 L
 - 120,000 L
 - 810 L
 - 8.35 L
 - 0.62 L
- A rigid 5 L container holds 2 moles of ammonia gas (assume ideal gas) at room temperature ($T = 25^\circ\text{C}$). The temperature is increased by 30 degrees. What is the final pressure?
 - 32 atm
 - 21.5 atm
 - 0.9 atm
 - 42.5 atm

5. 10.8 atm

7. Which of the following statements is/are true?

- I. Increasing gas speed results in increased diffusion speed but lowered effusion speed.
- II. Given the same kinetic energy, a larger molecule will move slower than a smaller molecule.
- III. Regardless of identity, gas molecules move at the same speed if they have the same kinetic energy.
- IV. Effusion is the process of molecules flowing through a hole.
- V. Diffusion is faster than gas speeds because collisions push the molecules in a particular direction, whereas individual gas molecules may be moving against diffusion.

- 1. I and IV
- 2. II only
- 3. IV only
- 4. I and III
- 5. II, IV, and V
- 6. II and IV
- 7. I, II, and III

8. Rank the following gases in terms of decreasing ideality: CH_4 , C_2H_6 , C_3H_8 , C_4H_{10}

- 1. $\text{CH}_4 > \text{C}_2\text{H}_6 > \text{C}_3\text{H}_8 > \text{C}_4\text{H}_{10}$
- 2. $\text{CH}_4 > \text{C}_2\text{H}_6 > \text{C}_4\text{H}_{10} > \text{C}_3\text{H}_8$
- 3. $\text{CH}_4 > \text{C}_3\text{H}_8 > \text{C}_2\text{H}_6 > \text{C}_4\text{H}_{10}$
- 4. $\text{CH}_4 > \text{C}_3\text{H}_8 > \text{C}_4\text{H}_{10} > \text{C}_2\text{H}_6$
- 5. $\text{CH}_4 > \text{C}_4\text{H}_{10} > \text{C}_3\text{H}_8 > \text{C}_2\text{H}_6$
- 6. $\text{CH}_4 > \text{C}_4\text{H}_{10} > \text{C}_2\text{H}_6 > \text{C}_3\text{H}_8$