

CH301 Fall 2009 Practice Quiz 4 Answer Key

1. All of the species below have the same bond order except for one. Which is it?

1. C_2^{3+}
2. H_2^-
3. F_2^+
4. O_2^{3-}
5. Ne_2^+

All of the species have a bond order of 0.5 except for F_2^+ , whose bond order is 1.5.

2. Which of the species below is the most paramagnetic?

1. O_2^-
2. C_2
3. N_2^+
4. B_2
5. Li_2^-

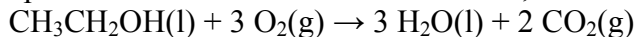
Diboron has two unpaired electrons. All of the other species have either zero or one.

3. Rank the following species from longest to short bonds based on bond order: O_2^+ , He_2^+ , B_2^- , F_2 , C_2 .

1. $B_2^- > He_2^+ > F_2 > C_2 > O_2^+$
2. $B_2^- > He_2^+ > F_2 > O_2^+ > C_2$
3. $He_2^+ > F_2 > B_2^- > C_2 > O_2^+$
4. $He_2^+ > F_2 > B_2^- > C_2 > O_2^+$
5. $F_2 > He_2^+ > B_2^- > C_2 > O_2^+$

The species O_2^+ , He_2^+ , B_2^- , F_2 and C_2 have bond orders of 2.5, 0.5, 1.5, 1 and 2 respectively.

4. Consider the reaction below. If one 1 g of ethanol (CH_3CH_2OH) is completely combusted and the products are collected in a 0.5 L vessel, what will the pressure be inside that vessel at 450 K?



1. 5.84 atm
2. 1.60 atm
3. 2.57 atm
4. 8.02 atm

1 g ethanol (1 mol/46.07 g) = 0.0217 moles ethanol.
this will produce 0.1085 moles of gaseous products.

$$PV = nRT$$

$$P = nRT/V = 0.1085 * 0.0821 * 450 / 0.5 = 8.02 \text{ atm}$$

5. A sample of gas stored at 25 °C has a pressure of 2.50 atm. If the temperature is increased to 50 °C, what will the new pressure be?

1. 2.71 atm
2. 5.00 atm
3. 1.25 atm
4. 2.31 atm

$$2.5 \text{ atm} (323 \text{ K} / 298 \text{ K}) = 2.7 \text{ atm}$$

6. According to kinetic molecular theory, which of the following factors will affect the velocity of a gas molecule?

I. the system's temperature

II. the molecule's dipole

III. the molecule's mass

1. I only

2. II only

3. III only

4. I and II

5. I and III

6. II and III

7. I, II and III

$$E = \frac{1}{2} \cdot k \cdot T = \frac{1}{2} \cdot m \cdot v^2$$

$$v = (k \cdot T / m)^{1/2}$$

Only the mass of the molecule and the temperature of the system define the molecules velocity.