

Chem 101A Final Study Questions Fall 2018

Chapter 9

Study Questions for Ch1-8 on website
<http://chem.piersol.com/chem101/#handa>

This handout is is not collected for credit.

All Useful Information on Exams 1-4 will be provided on Final Exam.

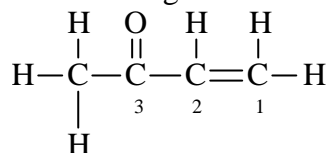
1. Atoms that are sp^2 hybridized form ____ pi bond(s).

- A) 4
- B) 3
- C) 0
- D) 2
- E) 1

2. The hybridization of the central atom in O_3 is:

- A) d^2sp^3
- B) dsp^3
- C) sp
- D) sp^3
- E) sp^2

3. Consider the following Lewis structure:



Which statement about the molecule is false?

- A) This molecule contains 28 valence electrons.
- B) Oxygen is sp^3 hybridized.
- C) There are 10 sigma and 2 pi bonds.
- D) There are some H-C-H bond angles of about 109° in the molecule.
- E) C-2 is sp^2 hybridized with bond angles of 120° .

4. The hybridization of I in IF_4^- is
- A) d^2sp^3
 - B) sp^3
 - C) sp
 - D) sp^2
 - E) dsp^3
5. The hybridization of the central atom, Al, in AlBr_3 is
- A) sp^3
 - B) d^2sp^3
 - C) sp^2
 - D) sp
 - E) dsp^3
6. When a carbon atom has sp^3 hybridization, it has
- A) four σ bonds
 - B) one π bond and three σ bonds
 - C) four π bonds
 - D) two π bonds and two σ bonds
 - E) three π bonds and one σ bond
7. The electron configuration of a particular diatomic species is $(\sigma_{2s})^2(\sigma_{2s}^*)^2(\sigma_{2p})^2(\pi_{2p})^2(\pi_{2p}^*)^2$. What is the bond order for this species?
- A) 2
 - B) 1.5
 - C) 1
 - D) 0.5
 - E) 2.5
8. If four orbitals on one atom overlap four orbitals on a second atom, how many molecular orbitals will form?
- A) 4
 - B) 8
 - C) 16
 - D) 1
 - E) none of these

9. When an electron pair is shared in the area centered on a line joining the atoms, a σ (sigma) bond is formed.
- A) True
 - B) False
10. For which of the following diatomic molecules would the bond order become greater if an electron is removed (i.e., if the molecule is converted to the positive ion in its ground state)?
- A) F_2
 - B) Na_2
 - C) C_2
 - D) P_2
 - E) B_2
11. Which of the following species is paramagnetic?
- A) H_2
 - B) F_2
 - C) C_2
 - D) O_2
 - E) none of these
12. Which charge(s) on an O_2 ion would give a bond order of 2.5?
- A) -1
 - B) +1
 - C) -2
 - D) two of these
 - E) none of these
13. What is the bond order of Ne_2 ?
- A) $1\frac{1}{2}$
 - B) 1
 - C) 2
 - D) $\frac{1}{2}$
 - E) 0

14. Which of the following statements is false?
- A) C_2 is diamagnetic.
 - B) The carbon-carbon bond in C_2^{2-} is shorter than the one in CH_3CH_3 .
 - C) C_2 is paramagnetic.
 - D) The carbon-carbon bond in C_2^{2-} is stronger than the one in CH_3CH_3 .
 - E) Two of the above.
15. The bond order in the NO molecule is
- A) 2
 - B) $2\frac{1}{2}$
 - C) $1\frac{1}{2}$
 - D) 3
 - E) 1
16. The following statements concern molecules that require resonance. Which is true?
- A) The sigma bonding is most clearly delocalized.
 - B) The benzene molecule is best described by the localized electron model.
 - C) The pi bonding is most clearly delocalized.
 - D) Both the sigma and pi bonding are delocalized.
 - E) The benzene molecule is best described by the MO theory.
17. Consider the benzene molecule. Which of the following statements about the molecule is false?
- A) It has delocalized pi bonding in the molecule.
 - B) The localized electron model must invoke resonance to account for the six equal C–C bonds.
 - C) All six C–C bonds are known to be equivalent.
 - D) The pi bonds of carbon involve sp^2 orbitals.
 - E) Each carbon atom is sp^2 hybridized.
18. Give the bond order for each of the following:
- a) H_2
 - b) H_2^+
 - c) H_2^-
 - d) CN^-
 - e) CN
 - f) CN^+

Answer Key

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|-----|---|----------------------|
| 1. | E | Chapter/Section: 9.1 |
| 2. | E | Chapter/Section: 9.1 |
| 3. | B | Chapter/Section: 9.1 |
| 4. | A | Chapter/Section: 9.1 |
| 5. | C | Chapter/Section: 9.1 |
| 6. | A | Chapter/Section: 9.1 |
| 7. | C | Chapter/Section: 9.2 |
| 8. | B | Chapter/Section: 9.2 |
| 9. | A | Chapter/Section: 9.2 |
| 10. | A | Chapter/Section: 9.3 |
| 11. | D | Chapter/Section: 9.3 |
| 12. | B | Chapter/Section: 9.3 |
| 13. | E | Chapter/Section: 9.3 |
| 14. | C | Chapter/Section: 9.3 |
| 15. | B | Chapter/Section: 9.4 |
| 16. | C | Chapter/Section: 9.5 |
| 17. | D | Chapter/Section: 9.5 |
| 18. | a) 1 b) $\frac{1}{2}$ c) $\frac{1}{2}$ d) 3 e) $2\frac{1}{2}$ f) 2 | Chapter/Section: 9.4 |