HW08 - Bonding Theories & IMF

This is a preview of the draft version of the quiz

Started: Aug 8 at 4:52pm

Quiz Instructions

Homework 08 - Bonding Theories & IMF

Question 1 **1 pts**

A sigma bond...

- is always polar.
- may exist alone or in conjunction with a pi bond.
- always exists in conjunction with a pi bond.
- stems from sp hybridization of orbitals.
- is composed of non-bonding orbitals.

Question 2 **1 pts**

In a new compound, it is found that the central carbon atom is sp^2 hybridized. This implies that...

- carbon has four sigma bonds.
- carbon has four lone pairs of electrons.
- carbon has four regions of high electron density.
- carbon has a tetrahedral electronic geometry.
- carbon is also involved in a pi bond.

Question 3 **1 pts**

In the molecule, C_2H_4, what are the atomic orbitals that participate in forming the sigma bond between the C and H atoms?

- H: sp^2, C: sp^2
- H: 1s, C: sp^2
- H: 1s, C: sp
- H: 1s, C: 2p
- H: 2p, C: sp^3

Question 4 **1 pts**

What is the expected bond order for the diatomic species B_2?

- 0
- 2
- 4
- 3
- 1

Question 5 **1 pts**

Consider the molecule B_2 (explored above in question #4). What is the magnetism and number of unpaired electrons in B_2?

- paramagnetic, 2
- diamagnetic, 2

- diamagnetic, 0
- paramagnetic, 1

Question 6 **1 pts**

According to molecular orbital theory, which of the following is NOT predicted to exist?

- He^{2+}
- He^{2-}
- All are predicted to exist.
- He
- He_2

Question 7 **1 pts**

N_2 has a bond order of 3 and O_2 has a bond order of 2. Based on this information, choose the response that best completes the following sentence: N_2 is (less, more) stable than O_2, and has a (larger, shorter) bond length and a (higher, lower) bond energy.

- less, longer, lower
- more, shorter, lower
- less, shorter, lower
- more, shorter, higher

Question 8 **1 pts**

Which of the following species possesses a delocalized bond?

- H_2S
- NO_3^-
- No molecule given here possesses a delocalized bond.
- NCl_3
- H_2O

Question 9 **1 pts**

Which of the following statements concerning molecular orbital theory is true?

1. Bonding orbitals are lower in energy than their corresponding anti-bonding orbitals.

2. If a molecule has an odd number of electrons, then it is paramagenetic.

3. The MO diagrams for O_2, F_2, Ne_2 are NOT filled using the Aufbau principle.

- 1 only
- 1 and 3
- 2 only
- 1, 2, and 3
- 2 and 3
- 1 and 2

Question 10 **1 pts**

Which of the following statements concerning molecular orbital theory is/are true?

1. Bonding orbitals are equal in energy to their corresponding anti-bonding orbitals.

2. Adding electrons to anti-bonding orbitals destabilizes molecules.

3. Unlike when we fill atomic orbitals, we DON'T use Hund's Rule to fill molecular orbitals.

- 1, 2, and 3

- 2 and 3
- 1 and 3
- 2 only
- 1 only
- 3 only

Question 11 **1 pts**

Which of the following statements is true about a molecule with a bond order of one?

- The molecule has a single bond.
- The molecule is as stable as molecules with bond orders of two and three.
- The molecule has no electrons in antibonding orbitals.
- Two side-by-side p orbitals combine to form pi bond and pi antibond orbitals; therefore, the bond order is 1.

Question 12 **1 pts**

Which of the following must be observed when filling a molecular orbital energy diagram?

- Hund's Rule, Pauli Exclusion Principle, and Dalton's Law
- Aufbau Principle, Hund's Rule, and Pauli Exclusion Principle
- Aufbau Principle, Hund's Rule, and Graham's Law
- Aufbau Principle, Conservation of Matter and Energy, and Planck's Law

Question 13 **1 pts**

Will H_2^+ be more or less stable than H_2 and why?

- more stable; H_2^+ has one less electron in bonding orbitals
- more stable; H_2^+ has one less electron in antibonding orbitals
- less stable; H_2^+ has one less electron in antibonding orbitals
- less stable; H_2^+ has one less electron in bonding orbitals

Question 14 **1 pts**

A chemist has synthesized two new dyes based on the molecular structure of plant-based dyes. The lowest energy absorption line for the first dye is light in the visible region at 530 nm. The lowest energy absorption line for the second dye is light in the visible region at 645 nm. Based on this evidence, which molecule has the higher HOMO-LUMO gap?

- The dye that absorbs at 530 nm.
- The gap is the same as both dyes absorb light in the visible region.
- The dye that absorbs at 645 nm.
- There is not enough information given to answer the question.

Question 15 **1 pts**

An antibonding orbital is formed when...

- a p_x-orbital overlaps a p_z-orbital.
- a free electron is present in the molecule.
- the overlap of the corresponding atomic orbitals leads to destructive interference.
- an s-orbital overlaps a p-orbital.

Question 16 **1 pts**

Which of the following are important contributions that MO theory makes to chemistry?

1. The ability to use MO theory with a computer to calculate the minimum energy geometry of a molecule.

2. The ability to predict the energy at which a molecule will absorb light.

3. The ability to predict whether or not a molecule should be paramagnetic or diamagnetic.

- 1 and 2
- 3 only
- 1 only
- 2 and 3
- 1, 2, and 3
- 1 and 3
- 2 only

Question 17 **1 pts**

Forces between particles (atoms, molecules, or ions) of a substance are called...

- intramolecular forces
- none of these
- intermolecular forces.
- armed forces

Question 18 **1 pts**

What would be the most significant type of intermolecular forces in a liquid sample of fluoroform (CHF_3)?

- dipole-dipole
- ionic
- dispersion
- covalent
- hydrogen bonding

Question 19 **1 pts**

What is the predominant intermolecular force between IBr molecules in liquid IBr?

- dipole forces
- ionic forces
- dispersion forces
- covalent bonds
- hydrogen bonds

Question 20 **1 pts**

Which of the following structures represents a possible hydrogen bond?

- F-H ····· F
- Br-H ····· Br
- C-H ····· O
- Cl-H ····· Cl

Question 21 **1 pts**

Identify the kinds of intermolecular forces that might arise between molecules of N_2H_4.

- London forces, dipole-dipole
- hydrogen bonding
- dipole-dipole
- London forces, dipole-dipole, and hydrogen bonding
- London forces

Question 22 **1 pts**

The dominant forces between molecules are...

- electrostatic.
- electrodynamic.
- magnetic.
- electromagnetic.
- gravitational.

Question 23 **1 pts**

Which of the following molecules are likely to form hydrogen bonds?

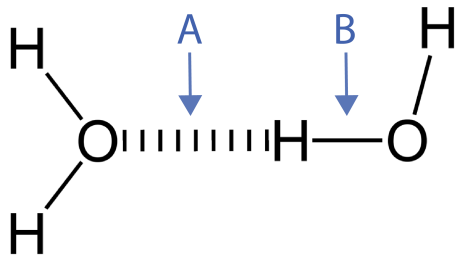
1. CH_3CH_2OH
2. CH_3COOH
3. CH_3CHO
4. CH_3OCH_3

- 1, 2, and 3

- 1 and 2 only
- None of these form hydrogen bonds.
- 1 only
- 1, 2, 3, and 4

Question 24 **1 pts**

Consider the two water molecules below.



Which of the following statements is correct?

- The covalent bond A is stronger than the hydrogen bond B.
- The covalent bond B is stronger than the hydrogen bond A.
- The covalent bond A is weaker than the hydrogen bond B.
- The covalent bond B is weaker than the hydrogen bond A.

Question 25 **1 pts**

Which of the following is not correctly paired with its dominant type of intermolecular forces?

- CaO, ionic forces
- C_6H_6 (benzene), instantaneous dipoles

- SiH_4, instantaneous dipoles
- HBr, hydrogen bonding
- NH_3, hydrogen bonding

Question 26 **1 pts**

Which of the following interactions is generally the strongest?

- ionic interactions
- dispersion forces
- hydrogen bonding
- dipole-dipole interactions

Question 27 **1 pts**

Which of the following statements is NOT correct?

Dispersion forces...

- are temporary rather than permanent dipole-dipole interactions.
- decrease in strength with increasing molecular size.
- are also called London forces.
- are the only forces between nonpolar molecules.

Question 28 **1 pts**

Why is I_2 a solid while H_2 is a gas?

- I_2 has a larger dipole than H_2.
- H_2 can perform hydrogen bonding.
- I_2 is less polarizable than H_2.
- I_2 is more polarizable than H_2.

Question 29 **1 pts**

Very weak and very short range attractive forces between temporary (induced) dipoles are called...

- adhesive forces.
- dispersion forces.
- gravitational forces.
- cohesive forces.

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