HW08 - Bonding Theories & IMF

▲ This is a preview of the published version of the quiz

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Quiz Instructions

Homework 08 - Bonding Theories & IMF

Question 1	1 pts
A sigma bond	
O stems from sp hybridization of orbitals.	
O is composed of non-bonding orbitals.	
🔵 is always polar.	
may exist alone or in conjunction with a pi bond.	
O always exists in conjunction with a pi bond.	

Question 2	1 pts
In a new compound, it is found that the central carbon atom is sp ² hybridized. This implies that	
C carbon has four regions of high electron density.	
◯ carbon is also involved in a pi bond.	
◯ carbon has four sigma bonds.	
O carbon has a tetrahedral electronic geometry.	
Carbon has four lone pairs of electrons.	

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?	I
◯ H: 1s, C: sp ²	
◯ H: 1s, C: 2p	
◯ H: 2p, C: sp ³	
\bigcirc H: sp ² , C: sp ²	
◯ H: 1s, C: sp	

Question 4	1 pts
What is the expected bond order for the diatomic species B ₂ ?	
2	
○ 0	
0 1	
O 4	
3	

Question 5	1 pts
Consider the molecule B_2 (explored above in question #4). What is the magnetism and number of unpaired electron B_2 ?	s in
O diamagnetic, 0	
O paramagnetic, 2	
0	

diamagnetic, 2

O paramagnetic, 1

Question 6	1 pts
According to molecular orbital theory, which of the following is NOT predicted to exist?	
O He	
◯ He ²⁺	
◯ He ²⁻	
O He ₂	
All are predicted to exist.	

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 (r lower) bond energy.	ligher,
O less, longer, lower	
O less, shorter, lower	
O more, shorter, lower	
O more, shorter, higher	

Question 8	1 pts
Which of the following species possesses a delocalized bond?	

O NO3⁻					
O H₂S					
O No molecule	given here posses	ses a delocalized	d bond.		
O H ₂ O					

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.	
O 2 and 3	
1, 2, and 3	
2 only	
1 only	
1 and 2	
1 and 3	

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	

1 only			
O 3 only			
2 and 3			
1 and 3			
O 2 only			

Question 11	1 pts
Which of the following statements is true about a molecule with a bond order of one?	
Two side-by-side p orbitals combine to form pi bond and pi antibond orbitals; therefore, the bond order is -	1.
The molecule has no electrons in antibonding orbitals.	
The molecule has a single bond.	
O The molecule is as stable as molecules with bond orders of two and three.	

Question 12	1 pts
Which of the following must be observed when filling a molecular orbital energy diagram?	
O Aufbau Principle, Hund's Rule, and Pauli Exclusion Principle	
O Aufbau Principle, Conservation of Matter and Energy, and Planck's Law	
O Aufbau Principle, Hund's Rule, and Graham's Law	
O Hund's Rule, Pauli Exclusion Principle, and Dalton's Law	

Question 13

1 pts

Will $H_2{}^{\scriptscriptstyle +}$ be more or less stable than H_2 and why?

 \bigcirc less stable; H₂⁺ has one less electron in antibonding orbitals

 \bigcirc less stable; H₂⁺ has one less electron in bonding orbitals

 \bigcirc more stable; H₂⁺ has one less electron in bonding orbitals

 \bigcirc more stable; H₂⁺ has one less electron in antibonding 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 set is light in the visible on this evidence, which molecule has the higher HOMO-LUMO gap	rgy econd dye o?
The dye that absorbs at 645 nm.	
The dye that absorbs at 530 nm.	
O There is not enough information given to answer the question.	
The gap is the same as both dyes absorb light in the visible region.	

Question 15	1 pts
An antibonding orbital is formed when	
\bigcirc a p _x -orbital overlaps a p _z -orbital.	
a free electron is present in the molecule.	
O 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 3
2 and 3
1, 2, and 3
O 3 only
1 and 2
O 2 only
O 1 only

Question 17	1 pts
Forces between particles (atoms, molecules, or ions) of a substance are called	
O intramolecular forces	
on none of these	
O 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)?	
O dipole-dipole	
◯ ionic	
◯ covalent	

O dispersion

O hydrogen bonding



Question 20	1 pts
Which of the following structures represents a possible hydrogen bond?	
◯ CI-H CI	
○ F-H ····· F	
O Br-H ······ Br	
О С-Н О	

Question 21	1 pts
Identify the kinds of intermolecular forces that might arise between molecules of N_2H_4 .	
O London forces	
O London forces, dipole-dipole, and hydrogen bonding	

O London forces, dipole-dipole

O dipole-dipole

O hydrogen bonding

Question 22	1 pts
The dominant forces between molecules are	
O gravitational.	
O electrodynamic.	
O electrostatic.	
O electromagnetic.	
O magnetic.	

Which of the following molecules are likely to form hydrogen bonds? 1. CH ₃ CH ₂ OH 2. CH ₃ COOH 3. CH ₃ CHO 4. CH ₃ OCH ₃ 1, 2, and 3 1 only None of these form hydrogen bonds. 1, 2, 3, and 4 1 and 2 only	Question 23	1 pts
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3. CH ₃ CHO 4. CH ₃ OCH ₃ 1, 2, and 3 1 only None of these form hydrogen bonds. 1, 2, 3, and 4 1 and 2 only	2. CH ₃ COOH	
4. CH ₃ OCH ₃	3. CH ₃ CHO	
 1, 2, and 3 1 only None of these form hydrogen bonds. 1, 2, 3, and 4 1 and 2 only 	4. CH ₃ OCH ₃	
 1 only None of these form hydrogen bonds. 1, 2, 3, and 4 1 and 2 only 	1, 2, and 3	
 None of these form hydrogen bonds. 1, 2, 3, and 4 1 and 2 only 	1 only	
 1, 2, 3, and 4 1 and 2 only 	O None of these form hydrogen bonds.	
1 and 2 only	0 1, 2, 3, and 4	
	1 and 2 only	

Question 24	pts
Consider the two water molecules below. $\begin{array}{c} H \\ \downarrow \\ H \end{array}$	
The covalent bond A is weaker than the hydrogen bond B.	
The covalent bond B is weaker than the hydrogen bond A.	
The covalent bond A is stronger than the hydrogen bond B.	
The covalent bond B is stronger than the hydrogen bond A.	

Question 25	1 pts
Which of the following is not correctly paired with its dominant type of intermolecular forces?	
◯ SiH₄, instantaneous dipoles	
CaO, ionic forces	
◯ NH ₃ , hydrogen bonding	
\bigcirc C ₆ H ₆ (benzene), instantaneous dipoles	
O HBr, hydrogen bonding	

Which of the following interactions is gen	erally the strongest?		
O hydrogen bonding			
ionic interactions			
O dipole-dipole interactions			
O dispersion forces			

Question 27	1 pts
Which of the following statements is NOT correct? Dispersion forces	
O decrease in strength with increasing molecular size.	
O are temporary rather than permanent dipole-dipole interactions.	
are the only forces between nonpolar molecules.	
are also called London forces.	

Question 28	1 pts
Why is I_2 a solid while H_2 is a gas?	
\bigcirc H ₂ can perform hydrogen bonding.	
\bigcirc I ₂ has a larger dipole than H ₂ .	
\bigcirc I ₂ is more polarizable than H ₂ .	
\bigcirc I ₂ is less polarizable than H ₂ .	

gravitational forces.		
O cohesive forces.		
adhesive forces.		
dispersion forces		

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