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last name

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signature

McCord CH301
50070

Exam 3

Oct 26, 2017
Thursday

Remember to refer to the Periodic Table handout that is separate from this exam copy.

NOTE: Please keep this exam copy intact (all pages still stapled - including this cover page). You must turn in **ALL** the materials that were distributed. This means that you turn in your exam copy (name and signature included), bubble sheet, periodic table handout, and all scratch paper. Please also have your UT ID card ready to show as well.

This print-out should have 20 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 5.0 points

In an acceptable Lewis structure for NO_3^- , what is the formal charge on the central atom?

1. -1
2. +2
3. -2
4. 0
5. +1
6. None of the above

002 5.0 points

When a molecule or ion is shown via resonance structures, the proposed structures

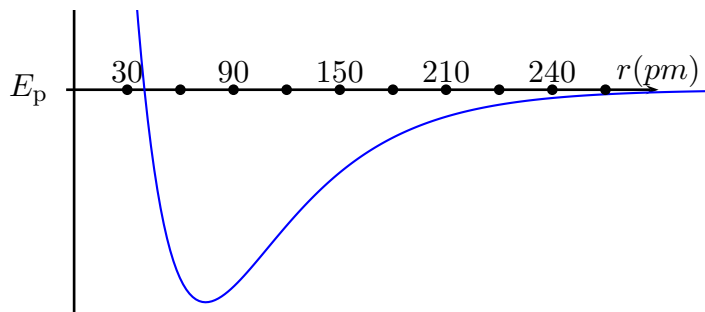
- I. can have any formal charge on the individual atoms as long as the formal charge of the molecule is less than 2
- II. should be averaged to best depict the bonding
- III. depict the physical vibrations of the bonds
- IV. show the various bonding extremes that resonate back and forth

1. I, II, III and IV
2. II only
3. I and II only
4. II and III only
5. None of the above
6. I and IV only
7. II and IV only

8. IV only

003 5.0 points

Consider the following potential energy (E_p) vs internuclear distance (r) plot for the interaction between two hydrogen atoms.



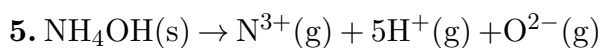
What will happen if you place two hydrogen atoms at an internuclear distance of 115 pm?

1. Attractions will dominate until the internuclear radius is equal to 0
2. There will be no attractions or repulsions at this distance
3. Attractions will dominate until potential energy is minimized
4. Repulsions will dominate until potential energy is minimized
5. Repulsions will dominate until the internuclear radius is infinite
6. Attractions will dominate until potential energy is zero

004 5.0 points

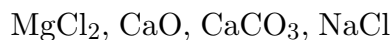
The lattice energy for NH_4OH is given by which reaction?

1. $2\text{NH}_4\text{OH}(\text{s}) \rightarrow 2\text{NH}_4(\text{g}) + \text{O}_2(\text{g}) + \text{H}_2(\text{g})$
2. $\text{NH}_4\text{OH}(\text{s}) \rightarrow \text{NH}_4^+(\text{g}) + \text{OH}^-(\text{g})$
3. $2\text{NH}_4\text{OH}(\text{s}) \rightarrow \text{N}_2(\text{g}) + 4\text{H}_2(\text{g}) + \text{H}_2\text{O}(\text{g})$
4. $\text{NH}_4\text{OH}(\text{s}) \rightarrow \text{NH}_4(\text{g}) + \text{OH}(\text{g})$



005 5.0 points

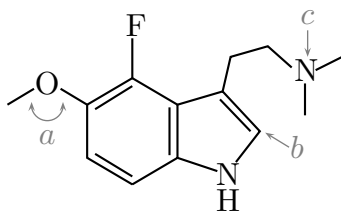
Rank the following ionic compounds from least to greatest lattice energy:



1. $\text{CaO} < \text{NaCl} < \text{MgCl}_2 < \text{CaCO}_3$
2. $\text{CaCO}_3 < \text{MgCl}_2 < \text{CaO} < \text{NaCl}$
3. $\text{NaCl} < \text{MgCl}_2 < \text{CaCO}_3 < \text{CaO}$
4. $\text{CaCO}_3 < \text{MgCl}_2 < \text{NaCl} < \text{CaO}$
5. $\text{NaCl} < \text{MgCl}_2 < \text{CaO} < \text{CaCO}_3$

006 (part 1 of 3) 5.0 points

The molecule shown below is a rare alkaloid found in plants native to South America with profound cultural significance.



What is the correct empirical formula for this compound?

1. $\text{C}_{15}\text{H}_{17}\text{FN}_2\text{O}$
2. $\text{C}_{13}\text{H}_{12}\text{FN}_2\text{O}$
3. $\text{C}_{12}\text{H}_{15}\text{FN}_2\text{O}$
4. $\text{C}_{13}\text{H}_{17}\text{FN}_2\text{O}$
5. $\text{C}_{13}\text{H}_{19}\text{FN}_2\text{O}$
6. $\text{C}_{13}\text{H}_{19}\text{N}_2\text{O}$

007 (part 2 of 3) 5.0 points

Which of the following best represents the bond angle labeled *a*?

1. 104.5°

2. 120°

3. 109.5°

4. 118°

5. 90°

6. 180°

7. 178°

008 (part 3 of 3) 5.0 points

What is the electronic geometry around the central atom labeled *b*?

1. Trigonal planar
2. Seesaw
3. Bent
4. Trigonal pyramid
5. Tetrahedral

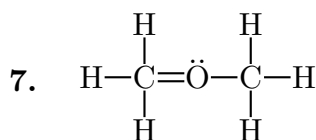
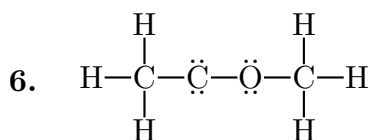
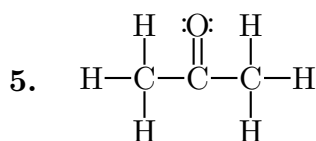
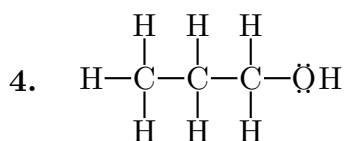
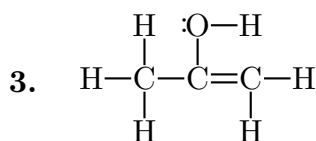
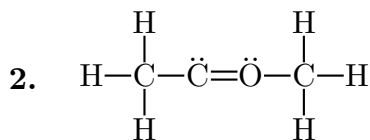
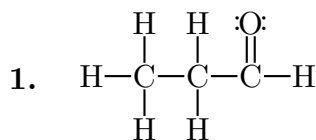
009 5.0 points

What are the bond angles around the central atom of CF_4 ?

1. 180°
2. 109.5°
3. 135°
4. 120°
5. 90°
6. 109°

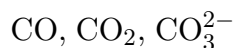
010 5.0 points

Which of the following choices is the correct line structure for propionaldehyde, $\text{CH}_3\text{CH}_2\text{CHO}$?



011 5.0 points

Consider the following molecules:



Which molecule has the strongest covalent bonds?

- All carbon-oxygen bonds have the same strength bonds
- CO₃²⁻
- CO₂
- Both CO₃²⁻ and CO₂ have the strongest bonds
- CO

012 5.0 points

Ozone (O₃) is...

- a non-polar molecule with polar bonds.
- a polar molecule with polar bonds.
- a polar molecule with non-polar bonds.
- a polar molecule with both polar and non-polar bonds.
- a non-polar molecule with non-polar bonds.
- a non-polar molecule with both polar and non-polar bonds.

013 5.0 points

Which of the following molecules is non-polar?

- CH₃Cl
- BeF₂
- NH₃
- H₂O
- PCl₃

014 (part 1 of 3) 5.0 points

For the next three questions, classify the bonds according to their relative difference in electronegativity.

HCl contains a(n)...

- Nonpolar covalent bond
- Polar covalent bond
- Ionic bond

015 (part 2 of 3) 5.0 points

Ag₂CO₃ contains...

1. Only polar covalent bonds
2. Ionic and polar covalent bonds
3. Nonpolar and polar covalent bonds
4. Only ionic bonds
5. Ionic and nonpolar covalent bonds

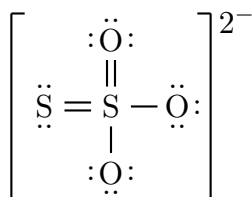
016 (part 3 of 3) 5.0 points

Cl₂ contains a(n)...

1. Polar covalent bond
2. Nonpolar covalent bond
3. Ionic bond

017 5.0 points

Consider the Lewis Structure drawn below:



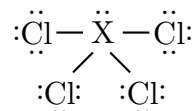
Is this an acceptable structure for thio-sulfate (S₂O₃²⁻)? If not, choose the answer that best explains why this is an unacceptable drawing.

1. This is not an acceptable structure because the formal charge on the atoms does not add up to the formal charge of the polyatomic ion
2. This is not an acceptable structure because it has the wrong number of electrons
3. This is not an acceptable structure because at least one atom disobeys the octet rule
4. This structure is unacceptable because of ALL reasons listed (formal charge, number of electrons, AND the octet rule are violated)

5. This is an acceptable structure

018 5.0 points

Consider the following molecule:



What is the identify of the central atom, X?

1. Oxygen
2. Selenium
3. Chlorine
4. Nitrogen
5. Carbon
6. Phosphorus

019 5.0 points

What is the electronic geometry of the polyatomic ion IF₄⁻?

1. Octahedral
2. Tetrahedral
3. T-shaped
4. Square pyramid
5. Square planar
6. None of the above
7. Linear
8. Trigonal bipyramid

020 5.0 points

VSEPR theory can estimate imperfect bond angles based on the fact that

1. bonding regions attract each other while lone pair regions repel each other

2. lone pair regions are more repulsive than bonding regions

3. molecular orbitals hybridize

4. bonding regions are more repulsive than lone pair regions