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McCord CH301

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TTh 9:30 am - 11 am

Exam 2

Oct 15, 2018

Monday 7:30 - 9:00 PM

A - Mi in BUR 106

Mo - Z in JES A121A

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 22 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

Polyatomic Nomenclature 18
001 3.0 points

Which of the following is the correct name for the chemical formula, $(NH_4)_2CO_3$?

1. Ammonium carbonate

2. Nitrohydrogen carbonic oxide

3. Nitrohydrogen carbamite

4. Nitrohydrogen carbonate

5. Ammonium carbamite

6. Diammonium carbonic oxide

Wavelength to Energy per Mole
002 5.0 points

A mixture of argon and mercury vapor used in advertising signs emits light of wavelength of 580 nm. What is the energy for 1.00 mole of photons emitted at this wavelength?

1. 203 kJ/mol

2. 206 kJ/mol

3. 2.72×10^5 kJ/mol

4. 2.34×10^5 kJ/mol

5. 285 kJ/mol

6. 218 kJ/mol

7. 239 kJ/mol

8. 1.71×10^5 kJ/mol

Rydberg Balmer Series
003 5.0 points

What is the wavelength corresponding to the smallest energy transition in the Balmer series?

1. 486 nm

2. 1875 nm

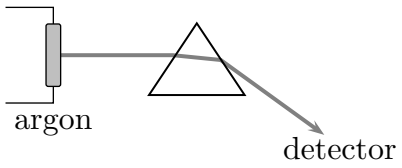
3. 657 nm

4. 122 nm

5. 182 nm

Absorption Emission Graphic Conceptual II
004 5.0 points

Argon gas absorbs light in the red, blue, and purple visible regions. To observe the emission spectra, a sample of argon gas is excited with electricity and the resulting electromagnetic radiation is passed through a prism (shown below).



Which of the following best describes the emission spectrum you should expect to see in this experiment?

1. A continuous spectrum broken by thin black lines in the green, orange, and yellow regions

2. Mostly black space with thin lines in the red, blue, and purple regions

3. Mostly black space with thin lines in the green, orange, and yellow regions

4. A continuous spectrum broken by thin black lines in the red, blue, and purple regions

5. A continuous spectrum

Photoelectric Effect Concept
005 5.0 points

In a photoelectric effect experiment, a blue light forces the electrons of a metallic surface

to eject at a velocity of about 380 m/s. The blue light is shut off and a dimmer (lower intensity) violet light is shined on the metal surface for the same amount of time. Which of the following best explains the results?

1. A fewer number of electrons are ejected, but the ejected electrons have a velocity greater than 380 m/s

2. The same number of electrons are ejected, but the ejected electrons have a velocity greater than 380 m/s

3. The same number of electrons are ejected and the ejected electrons have a velocity less than 380 m/s

4. The same number of electrons are ejected with the same velocity

5. A fewer number of electrons are ejected and the ejected electrons have a velocity less than 380 m/s

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Photoelectric Effect Calc Full
006 5.0 points

A 114 nm beam of light is shined on a palladium surface. What is the maximum velocity of the excited electrons? The work function of palladium is 5.60 eV.

1. No electrons are emitted

2. 964.0 km/s

3. -964.0 km/s

4. 1148 km/s

5. 1.859×10^9 km/s

6. 1363 km/s

7. 9.64×10^5 km/s

Schrodinger and PIB Conceptual V
007 3.0 points

Which of the following statement(s) is/are true regarding particle in a box and the radial distribution function?

I. When $n = 1$ for a particle in a box, the particle has the highest probability of being found in the center of the box

II. When $n = 3$ for a radial distribution function, there are three humps with the highest probability of finding an electron in the third hump (furthest from the nucleus)

III. The number of nodes is equal to the principal quantum number, n, for both radial distribution and particle in a box

IV. When $n = 1$ for a particle in a box, there is a zero percent chance that the particle will be found in the center of the box

1. I, II, and IV only

2. I and II only

3. II only

4. I, II, and III only

5. IV only

6. I only

Quantum Number Simple
008 4.0 points

Which of the following is a possible quantum number set for a valence electron in calcium?

1. $n = 2, \ell = 0, m_\ell = -1, m_s = -1/2$

2. $n = 4, \ell = 4, m_\ell = -3, m_s = 1/2$

3. $n = 3, \ell = 0, m_\ell = 0, m_s = -1/2$

4. $n = 4, \ell = 0, m_\ell = 0, m_s = 1/2$

5. $n = 2, \ell = 2, m_\ell = -1, m_s = -1/2$

6. $n = 4, \ell = 3, m_\ell = -1, m_s = -1/2$

Quantum Number Sets
009 5.0 points

What is the maximum number of quantum number sets possible for a $4d$ electron?

1. 10

2. 5

3. 3

4. 14

5. 8

6. 6

Ionization E Configs Hard
010 5.0 points

The third ionization of titanium is given by the equation:

$$Ti^{2+}(g) \longrightarrow Ti^{3+}(g) + e^{-}$$

This electron is removed from the...

1. 3p subshell

2. 2p subshell

3. 3d subshell

4. 3s subshell

5. 4d subshell

6. 4s subshell

ChemPrin3e T01 41
011 4.0 points

Write the ground-state electron configuration of a chromium atom.

1. [Ar] $3d^6$

2. [Ar] $3d^5\,4s^1$

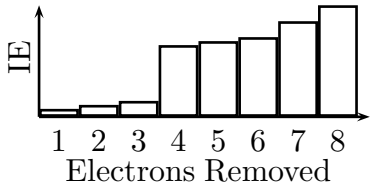
3. [Ar] $3d^4\,4s^2$

4. [Ar] $4s^2\,4d^4$

5. [Ar] $4s^1\,4d^5$

Ionization Energy 18
012 5.0 points

Which graph shows the correct trend for ionization energies, IE, of aluminum, Al?

1.


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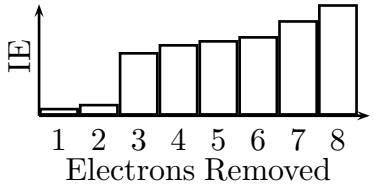

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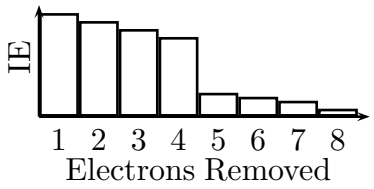

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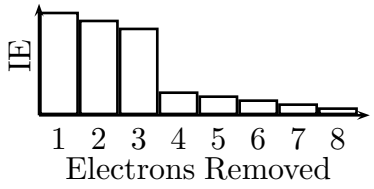

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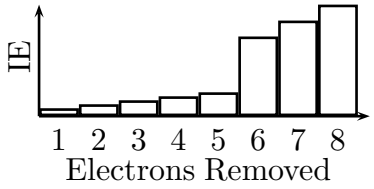


Atomic Radius Concept
013 5.0 points

As you go from the top right to the bottom left of the periodic table, the atomic radius increases because Z_{eff} is getting (larger/smaller) and the shielding is (increasing/decreasing).

1. larger, increasing

2. larger, decreasing

3. smaller, decreasing

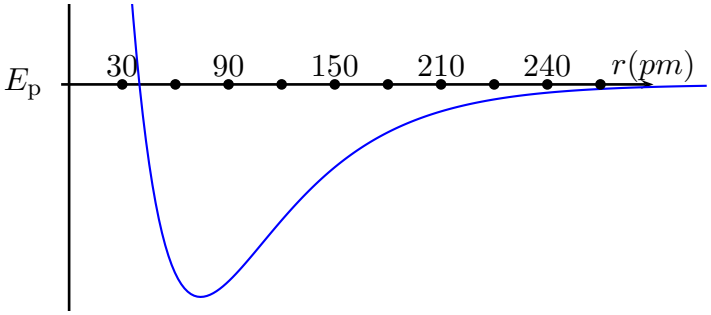
4. smaller, increasing

Stability Trend Exceptions
014 5.0 points

WITHDRAWN

Potential Energy Diagram 18
015 4.0 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 120 pm?

1. Attractions will dominate until the internuclear distance is approximately 75 pm

2. Attractions will dominate until the internuclear distance is approximately 90 pm

3. There will be no attractions or repulsions at this distance

4. Repulsions will dominate until the internuclear distance is infinite

5. Repulsions will dominate until the internuclear distance is approximately 75 pm

6. Attractions will dominate until the internuclear distance is equal to 0 pm

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Lewis Structure Simple II
016 4.0 points

Which of the following fully describes the Lewis structure of CH_3OH?

1. 5 single bonds and 2 lone pairs

2. 3 single bonds and 1 double bond

3. 3 single bonds, 1 double bond, and 1 lone pair

4. 4 single bonds and 2 lone pairs

5. 5 single bonds and 0 lone pairs

Lattice Energy Comp 18ii
017 5.0 points

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

MgO, NaF, $CaCO_3$, Na_2O, NH_4ClO

1. $NH_4ClO < NaF < MgO < CaCO_3 < Na_2O$

2. $NH_4ClO < NaF < Na_2O < CaCO_3 < MgO$

3. $Na_2O < NaF < CaCO_3 < MgO < NH_4ClO$

4. $MgO < CaCO_3 < NH_4ClO < NaF < Na_2O$

5. $Na_2O < MgO < NaF < NH_4ClO < CaCO_3$

Resonance Bond Order
018 5.0 points

What is the approximate bond order of the carbon-nitrogen bonds in the resonance hybrid of $C(NH_2)_3^+$?

1. 1.33

2. 4

3. 1 and 2

4. 4 and 3

5. 1, 2, and 3

6. 3

Classifying Bonds with Polyatomic
019 4.0 points

Identify the type of compound for each of the following:

CaI_2 HCl $Ca_3(PO_4)_2$

1. CaI_2: Ionic
HCl: Covalent
$Ca_3(PO_4)_2$: Ionic

2. CaI_2: Ionic
HCl: Covalent
$Ca_3(PO_4)_2$: Covalent

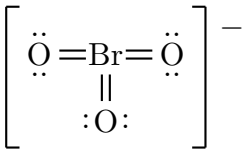
3. CaI_2: Ionic
HCl: Ionic
$Ca_3(PO_4)_2$: Ionic

4. CaI_2: Covalent
HCl: Ionic
$Ca_3(PO_4)_2$: Covalent

5. CaI_2: Covalent
HCl: Covalent
$Ca_3(PO_4)_2$: Ionic

Lewis Structure Expanded
020 5.0 points

Which of the following is an acceptable Lewis structure for the bromate anion (BrO_3^-)?

1.


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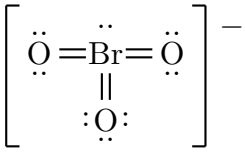

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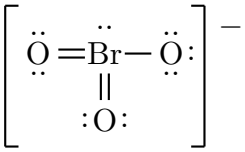

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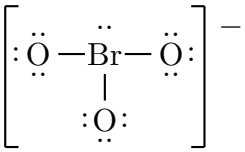

5. None of these structures contribute to the resonance of BrO_3^-

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Lewis structure covalent bond comparison
021 5.0 points

Consider the Lewis structures for HCN and CH_3NH_2. Compared to HCN, the carbon-nitrogen bond in CH_3NH_2 is (longer/shorter) and (stronger/weaker).

1. longer, weaker

2. shorter, weaker

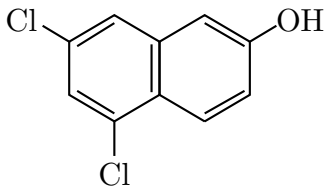
3. The carbon-nitrogen bond is the same length and strength in each molecule

4. shorter, stronger

5. longer, stronger

Big Ass Molecule 18 1pt
022 4.0 points

Consider the substituted naphthalene molecule below:



What is the correct empirical formula for this compound?

1. $C_{12}H_6Cl_2O$

2. $C_{10}H_6Cl_2O$

3. $C_{10}H_5Cl_2O$

4. $C_{10}H_{11}Cl_2O$

5. $C_{13}H_5Cl_2O$

6. $C_{12}H_8Cl_2O$