General Chemistry I Lecture Fall 2016 11/14/16 M Exam III form White Dr. Hahn Exam # _____

Name Key (print) Name _____(sign)

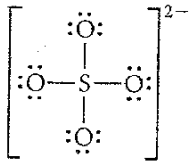
Please show work for partial credit and full credit on the Long Answers and in some of the Short Answer Questions. Multip choice questions have no partial credit. Please write anything you want graded legibly. If you run out of space, please continue on the empty back pages but clearly label where the remaining answer can be found. (If I can't find your answer or cannot read it, I obviously cannot grade it). Return your entire exam including the periodic table.

(Please count your exam pages and make sure there are 8 real pages + periodic table+ Lewis Dot Structure direction .)

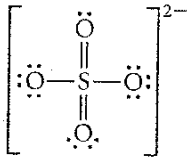
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts each, 26 pts total)

1) Choose the best Lewis structure for SO_4^{2-}. 1) D

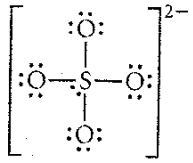
A)



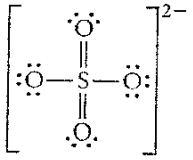
B)



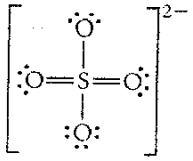
C)



D)



E)



2) What is the maximum number of d orbitals that are possible? 2) D

A) 9 B) 1 C) 7 D) 5 E) 3

3) How many orbitals are contained in the third principal level ($n = 3$, principal quantum number) of a given atom ? 3) B

A) 5 B) 9 C) 18 D) 3 E) 7

4) Give the numbers for m_ℓ (magnetic quantum numbers) for $\ell = 1$ (angular momentum quantum numbers) 4) C

A) -2, -1, 0, 1, 2 B) 0, 1 C) -1, 0, 1 D) 1, 2

5) Identify the shortest bond. 5) C
A) single covalent bond
B) double covalent bond
C) triple covalent bond
D) all of the above bonds are the same length

6) Which reaction below represents the first ionization of O? 6) A
A) $O(g) \rightarrow O^+(g) + e^-$
B) $O^+(g) + e^- \rightarrow O(g)$
C) $O^-(g) \rightarrow O(g) + e^-$
D) $O(g) + e^- \rightarrow O^-(g)$
E) $O^-(g) + e^- \rightarrow O^{2-}(g)$

7) Identify the species that has the smallest radius. 7) C
A) N^{-2} B) N^0 C) N^{+3} D) N^{-5} E) N^{+1}

8) The distance between adjacent crests of a wave is called 8) C
A) frequency
B) area
C) wavelength
D) amplitude
E) median

9) A cation of +2 indicates that an element has 9) E
A) gained two protons.
B) lost two neutrons.
C) gained two electrons.
D) lost two protons.
E) lost two electrons.

10) Describe the shape of a p orbital. 10) B
A) three balls
B) dumbbell shaped
C) spherical
D) four balls
E) eight balls

11) Which of the following elements can form compounds with an expanded octet? 11) D

A) C
B) F
C) Li
D) Se
E) All of the above elements can form compounds with an expanded octet.

12) How many different values of ℓ (angular momentum quantum number) are possible in the third principal level? 12) B

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

13) For $n = 3$ (principal quantum numbers), what are the possible values of ℓ (angular momentum quantum numbers) ? 13) A

A) 0, 1, 2 B) 0, 1 C) 0, 1, 2, 3 D) 0

II. Short Answers (41 pts)

1. Matching: Match the following with the description by filling in the blank with one of the letters. Each letter can only be used ONE time. (9 pts total, 3 pts each)

   (a) n, principal quantum number
   (b) m_ℓ, magnetic quantum number
   (c) ℓ, angular momentum quantum number

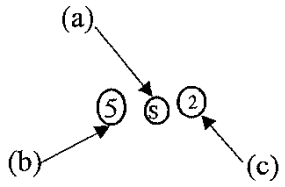
   (S) determines the shape of the orbitals in the subshell, subshell, goes with the s block, p block, d block or f block of the periodic table

   (a) determines how far away from the nucleus the electron is located, also the shell or period number of the periodic table

   (b) determines the orientation of the orbitals (example: x direction - p_x y direction - p_y z direction - p_z

2. Match the following by filling in the blank with one of the letters. Each letter may only be used ONE time (9 pts each, 3 pts each)

   for the symbol $5s^2$



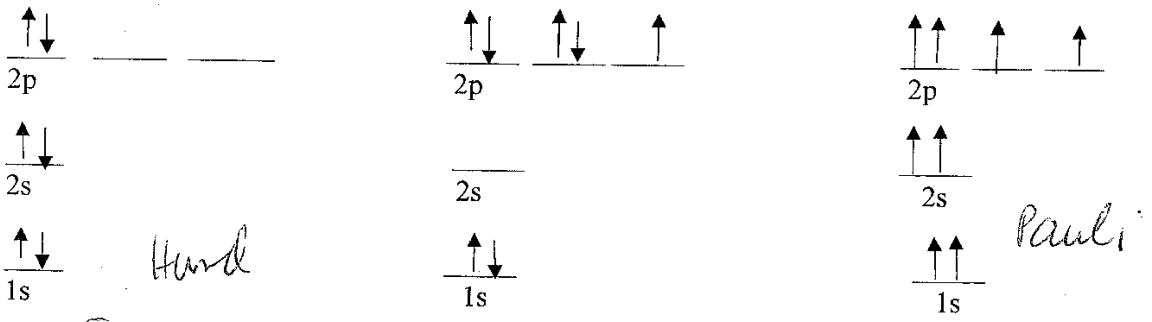
   (a) gives the subshell or shape of the orbitals in the subshell

   (n) gives principal quantum number of shell

   (c) gives the number of electrons in the designated subshell

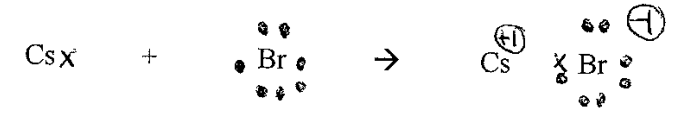
3. Match the name of the electron configuration rule with the orbital diagram which shows a violation of the electron configuration rule by circling one of the letters under each electron orbital diagram. (9 pts total, 3 pts each)

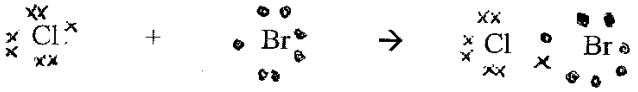
(a) Pauli Exclusion Principal (b) aufbau Principal (c) Hund's Rule



[(a)(b)(c)](circle one) [(a)(b)(c)](circle one) [(a)(b)(c)](circle one)

4. Which of the following shows a **covalent bonding** Lewis Dot Structure reaction for the formation of an **covalent bond**. Circle the letter of the correct reaction. (5 pts)

Reaction (a) 

Reaction (b) 

5. Periodic Trends: (9 pts total, 3 pts each letter)

(a) Circle the element which has a **larger atomic radius** [(C) or (F)] (circle one)

(b) Circle the element which has a **higher first ionization energy** [C or (F)] (circle one)

(c) Circle the element which has **higher electronegativity** [(B) or (F)] (circle one)

III. Long Answer (34 pts) Please show work. If you get the final correct number without showing your work, you will lose points.

1. For the element, **Br** (18 pts total, 3 pts each letter)

(a) Give the **electron configuration** of the element above in the format, ($1s^2$, $2s^2$, $2p^6$, ...)

$1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^{10}, 4p^5$

(b) Give the **valence** electron configuration of the same element in the format. ($1s^2$, $2s^2$, $2p^6$, ...)

$4s^2, 4p^5$

(c) Give the **valence** electron configuration of the anion $\mathbf{Br^{-1}}$ in the format ($1s^2$, $2s^2$, $2p^6$, ...)

$+1\bar{e}$ $4s^2, 4p^6$

Br - 1

(d) Give the **valence** electron configuration diagram for the same element showing a line for an orbital and up and down arrows for the +1/2 and -1/2 electrons

(**format** required: ↑↓ (1s) ↑ (2s) ___ (2p) ___ ___) (format is not necessarily the answer)

↑↓ ↑↓ ↑↓ ↑

4s 4p

not valence

(e) How many valence electrons does the element have ? 7

(f) Give the Lewis Dot symbol (Lewis dot structure) for the same element by itself.

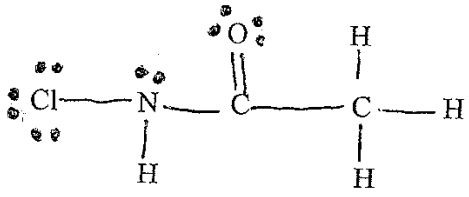
2. Complete the following about the same Lewis Dot structure. (16 pts total)

(A) For the molecule below with the molecular formula **(Cl N C_2 O H_4)** , give the total number of valence electrons in the entire molecule. Show work. (6 pts)

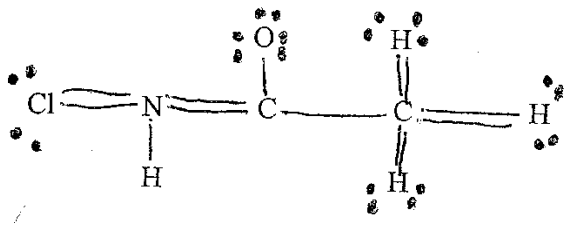
$7\bar{e} + 5\bar{e} + 2(4\bar{e}) + 6\bar{e} + 4(1\bar{e}) = 30\bar{e}$

Cl N C O H

(B) Given the two possible Lewis Dot structures, circle the letter of the best Lewis Dot structure. (2 pts)



(a)



(b)

$15 \times 2 = 30\bar{e}$

(C) For the Lewis Dot structure which you chose in part (B), explain why the one you **did not** choose is incorrect by **doing an electron count** and explain why you did not choose this Lewis Dot structure. (4 pts)

$24 \times 2 = 48\bar{e}$ too many $\bar{e}$

($\bar{e}$ pairs

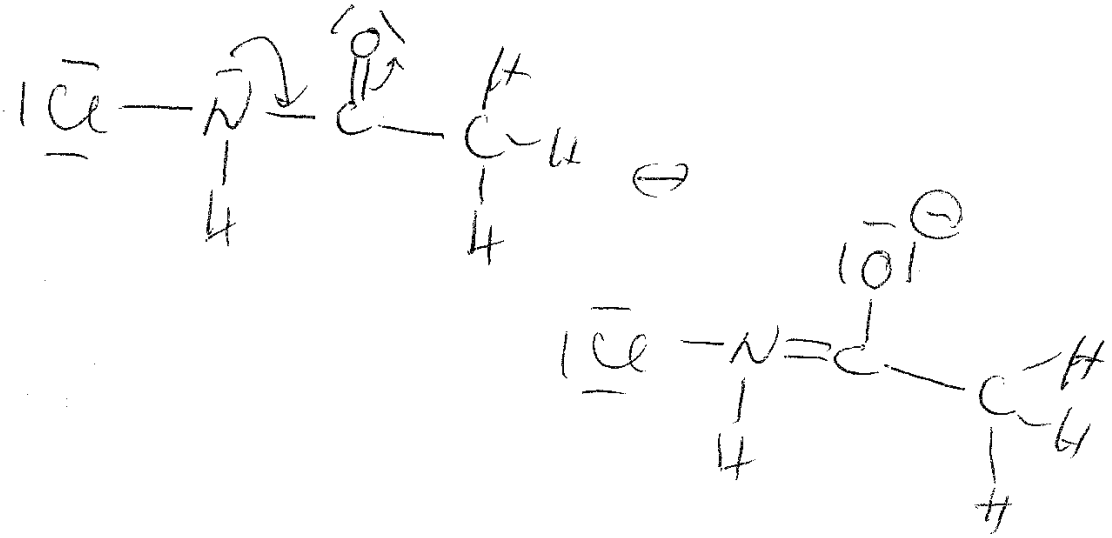
(D) Give one other explanation of why the structure that you did not choose is incorrect. (2 pts)

(1) C have more than octet - not allowed Quantum mechanics

(2) H can only have duet

(3) N cannot have more than octet

(E) For the Lewis Dot structure which you chose in part (A) above, draw one valid **resonance structure**. (2 pts)



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(Please count your exam pages and make sure there are 8 real pages + periodic table+ Lewis Dot Structure direction .)

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts each, 26 pts total)

1) Describe the shape of a p orbital. 1) C

A) four balls
B) three balls
C) dumbbell shaped
D) eight balls
E) spherical

2) For $n = 3$ (principal quantum numbers), what are the possible values of ℓ (angular momentum quantum numbers) ? 2) A

(0, ... n-1)

A) 0, 1, 2 B) 0 0, 1, 2 C) 0, 1 D) 0, 1, 2, 3

3) The distance between adjacent crests of a wave is called 3) A

A) wavelength
B) frequency
C) amplitude
D) median
E) area

4) Identify the species that has the smallest radius. 4) E

Cation smaller

A) N^0 B) N^{+1} C) N-5 D) N^{-2} E) N^{+3}

5) How many orbitals are contained in the third principal level ($n = 3$, principal quantum number) of a given atom ? 5) D

0, 1, 2

A) 3 B) 5 C) 7 D) 9 E) 18

s p d

1 + 3 + 5

6) Which reaction below represents the first ionization of O? 6) C

A) $O(g) + e^- \rightarrow O^-(g)$
B) $O^-(g) + e^- \rightarrow O(g)$
C) $O(g) \rightarrow O^+(g) + e^-$
D) $O^-(g) \rightarrow O(g) + e^-$
E) $O^-(g) + e^- \rightarrow O^{2-}(g)$

7) Give the numbers for m_ℓ (magnetic quantum numbers) for $\ell = 1$ (angular momentum quantum numbers) 7) C

-1, 0, +1

A) -2, -1, 0, 1, 2 B) 1, 2 C) -1, 0, 1 D) 0, 1

8) Which of the following elements can form compounds with an expanded octet? 8) A

(A) Se
B) C
C) Li
D) F
E) All of the above elements can form compounds with an expanded octet.

Group 3 + higher

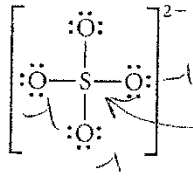
9) A cation of +2 indicates that an element has 9) A

(A) lost two electrons.
B) lost two neutrons.
C) gained two protons.
D) gained two electrons.
E) lost two protons.

10) Choose the best Lewis structure for SO_4^{2-}. 10) D

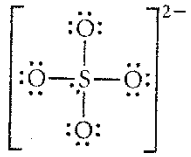
$5 \times 6 = 30 + 2 = 32\bar{e}$

A)



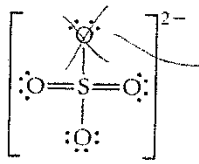
$6 - 4 = +2$ large charge

B)



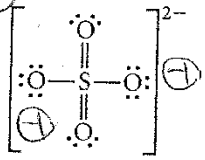
$14 \times 2 = 34e$ too many e

C)

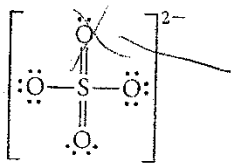


not octet

(D)



E)



not octet

11) What is the maximum number of d orbitals that are possible? 11) E

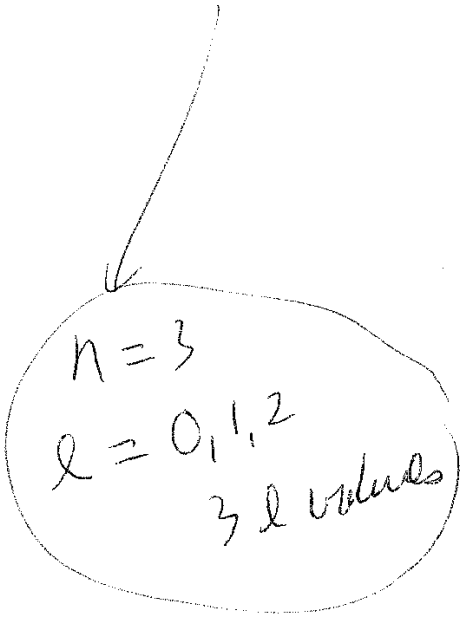
A) 7 B) 3 C) 9 D) 1 (E) 5

12) How many different values of ℓ (angular momentum quantum number) are possible in the third principal level? 12) A

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

13) Identify the shortest bond. 13) B

A) single covalent bond
B) triple covalent bond
C) double covalent bond
D) all of the above bonds are the same length



II. Short Answers (41 pts)

1. Matching: Match the following with the description by filling in the blank with one of the letters. Each letter can only be used ONE time. (9 pts total, 3 pts each)

(a) ℓ, angular momentum quantum number
(b) n, principal quantum number
(c) m_ℓ, magnetic quantum number

__c__ determines the orientation of the orbitals (example: x direction - p_x y direction - p_y z direction - p_z

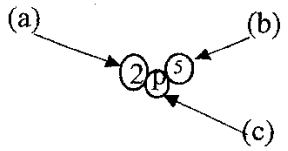
$-1, 0, +1$

__b__ determines how far away from the nucleus the electron is located, also the shell or period number of the periodic table

__a__ determines the shape of the orbitals in the subshell, subshell, goes with the s block, p block, d block or f block of the periodic table

2. Match the following by filling in the blank with one of the letters. Each letter may only be used ONE time (9 pts each, 3 pts each)

for the symbol $2p^5$



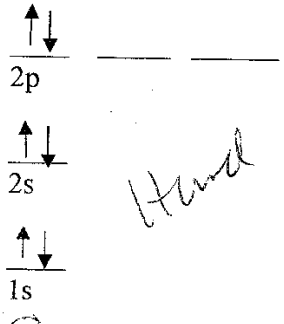
__b__ gives the number of electrons in the designated subshell

__a__ gives principal quantum number of shell

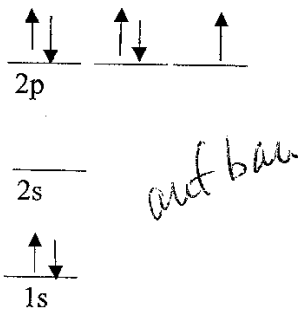
__c__ gives the subshell or shape of the orbitals in the subshell

3. Match the name of the electron configuration rule with the orbital diagram which shows a violation of the electron configuration rule by circling one of the letters under each electron orbital diagram. (9 pts total, 3 pts each)

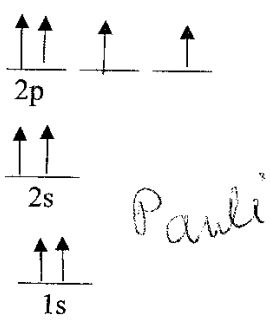
(a) Hund's Rule (b) Pauli Exclusion Principal (c) aufbau Principal



[(a)(b)(c)](circle one)

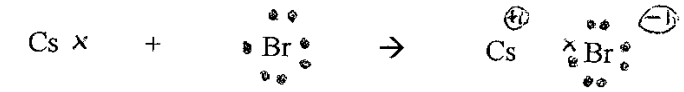


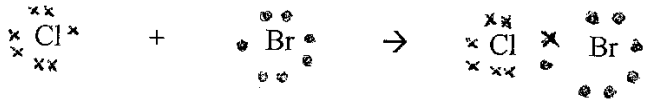
[(a)(b)(c)](circle one)



[(a)(b)(c)](circle one)

4. Which of the following shows an **ionic bonding** Lewis Dot Structure reaction for the formation of an **ionic bond**. Circle the letter of the correct reaction. (5 pts)

Reaction (a) 

Reaction (b) 

5. Periodic Trends: (9 pts total, 3 pts each letter)

(a) Circle the element which has a **larger atomic radius** [(C) or (Sn)] (circle one)

(b) Circle the element which has a **higher first ionization energy** [(Sn) or (C)] (circle one)

(c) Circle the element which has **higher electronegativity** [(F) or (I)] (circle one)

III. Long Answer (34 pts) Please show work. If you get the final correct number without showing your work, you will lose points.

1. For the element, **Te** (18 pts total, 3 pts each letter)

(a) Give the **electron configuration** of the element above in the format, ($1s^2$, $2s^2$, $2p^6$, ...)

$1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^{10}, 4p^6$
$5s^2, 4d^{10}, 5p^4$

(b) Give the **valence** electron configuration of the same element in the format. ($1s^2$, $2s^2$, $2p^6$, ...)

$5s^2, 5p^4$

(c) Give the **valence** electron configuration of the anion Te^{-2} in the format ($1s^2$, $2s^2$, $2p^6$, ...)

$+2e^- \longrightarrow$ $5s^2, 5p^6$

(d) Give the **valence** electron configuration diagram for the same element showing a line for an orbital and up and down arrows for the +1/2 and -1/2 electrons
(**format** required: ↑↓ (1s) ↑ (2s) ___ ___ ___ (2p)) (format is not necessarily the answer)

$\frac{\uparrow\downarrow}{5s}$ $\frac{\uparrow\downarrow}{5p}$ $\frac{\uparrow}{5p}$ $\frac{\uparrow}{5p}$

(e) How many valence electrons does the element have ? 6

(f) Give the Lewis Dot symbol (Lewis dot structure) for the same element by itself. ·· ·Te· ··

2. Complete the following about the same Lewis Dot structure. (16 pts total)

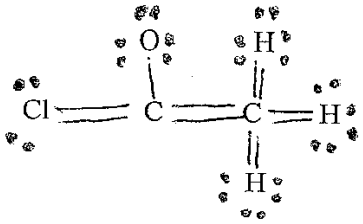
(A) For the molecule below with the molecular formula **(Cl C_2 O H_3)** , give the total number of valence electrons in the entire molecule. Show work. (6 pts)

7 4 6 1

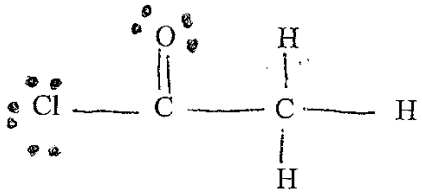
7e + (4e)2 + 6e + 3(1e) = 24e

Cl C O H

(B) Given the two possible Lewis Dot structures, circle the letter of the best Lewis Dot structure. (2 pts)



(a)



(b)

12 e pairs x2 = 24

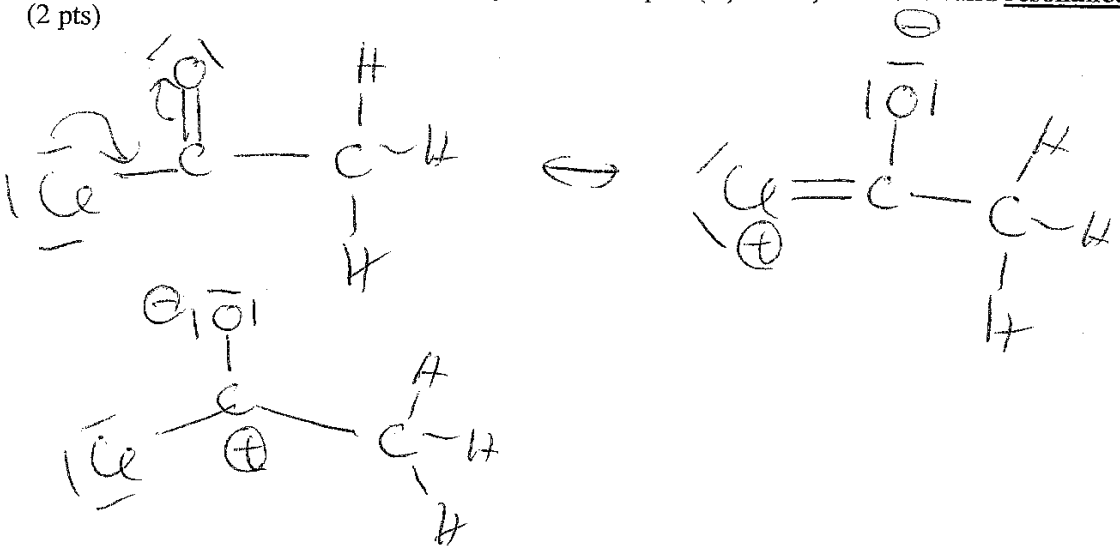
(C) For the Lewis Dot structure which you chose in part (B), explain why the one you **did not** choose is incorrect by **doing an electron count** and explain why you did not choose this Lewis Dot structure. (4 pts)

25 e pairs x2 = 50 e too many e

(D) Give one other explanation of why the structure that you did not choose is incorrect. (2 pts)

① H only has duet
② C has more than octet - not allowed by quantum mechanics

(E) For the Lewis Dot structure which you chose in part (A) above, draw one valid **resonance structure**. (2 pts)



correct # e⁻
but C not octet

General Chemistry I Lecture Fall 2016 11/14/16 M Exam III form White Dr. Hahn Exam # _____

Name_____ (print) Name _____(sign)

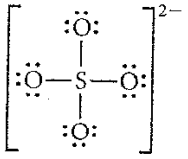
Please show work for partial credit and full credit on the Long Answers and in some of the Short Answer Questions. Multip choice questions have no partial credit. Please write anything you want graded legibly. If you run out of space , please continue on the empty back pages but clearly label where the remaining answer can be found. (If I can't find your answer or cannot read it, I obviously cannot grade it). Return your entire exam including the periodic table.

(Please count your exam pages and make sure there are 8 real pages + periodic table+ Lewis Dot Structure direction .)

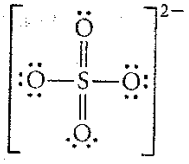
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts each, 26 pts total)

1) Choose the best Lewis structure for SO_4^{2-}. 1) _____

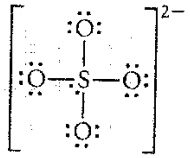
A)



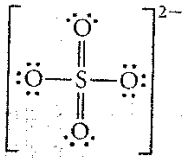
B)



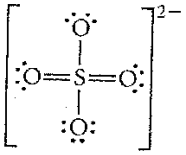
C)



D)



E)



2) What is the maximum number of d orbitals that are possible? 2) _____

A) 9 B) 1 C) 7 D) 5 E) 3

3) How many orbitals are contained in the third principal level ($n = 3$, principal quantum number) of a given atom ? 3) _____

A) 5 B) 9 C) 18 D) 3 E) 7

4) Give the numbers for m_ℓ (magnetic quantum numbers) for $\ell = 1$ (angular momentum quantum numbers) 4) _____

A) -2, -1, 0, 1, 2 B) 0, 1 C) -1, 0, 1 D) 1, 2

5) Identify the shortest bond. 5) _____
A) single covalent bond
B) double covalent bond
C) triple covalent bond
D) all of the above bonds are the same length

6) Which reaction below represents the first ionization of O? 6) _____
A) $O(g) \rightarrow O^+(g) + e^-$
B) $O^+(g) + e^- \rightarrow O(g)$
C) $O^-(g) \rightarrow O(g) + e^-$
D) $O(g) + e^- \rightarrow O^-(g)$
E) $O^-(g) + e^- \rightarrow O^{2-}(g)$

7) Identify the species that has the smallest radius. 7) _____
A) N^{-2} B) N^0 C) N^{+3} D) N^{-5} E) N^{+1}

8) The distance between adjacent crests of a wave is called 8) _____
A) frequency
B) area
C) wavelength
D) amplitude
E) median

9) A cation of +2 indicates that an element has 9) _____
A) gained two protons.
B) lost two neutrons.
C) gained two electrons.
D) lost two protons.
E) lost two electrons.

10) Describe the shape of a p orbital. 10) _____
A) three balls
B) dumbbell shaped
C) spherical
D) four balls
E) eight balls

11) Which of the following elements can form compounds with an expanded octet? 11) _____

A) C
B) F
C) Li
D) Se
E) All of the above elements can form compounds with an expanded octet.

12) How many different values of ℓ (angular momentum quantum number) are possible in the third principal level? 12) _____

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

13) For $n = 3$ (principal quantum numbers), what are the possible values of ℓ (angular momentum quantum numbers) ? 13) _____

A) 0, 1, 2 B) 0, 1 C) 0, 1, 2, 3 D) 0

II. Short Answers (41 pts)

1. Matching: Match the following with the description by filling in the blank with one of the letters. Each letter can only be used ONE time. (9 pts total, 3 pts each)

(a) n, principal quantum number
(b) m_ℓ, magnetic quantum number
(c) ℓ, angular momentum quantum number

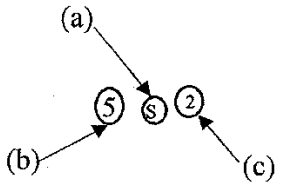
_____ determines the shape of the orbitals in the subshell, subshell, goes with the s block, p block, d block or f block of the periodic table

_____ determines how far away from the nucleus the electron is located, also the shell or period number of the periodic table

_____ determines the orientation of the orbitals (example: x direction - p_x y direction - p_y z direction - p_z

2. Match the following by filling in the blank with one of the letters. Each letter may only be used ONE time (9 pts each, 3 pts each)

for the symbol $5s^2$



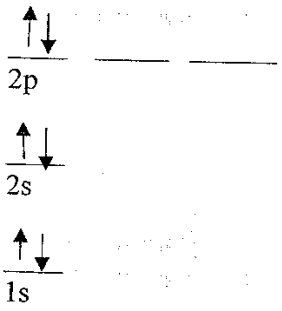
_____ gives the subshell or shape of the orbitals in the subshell

_____ gives principal quantum number of shell

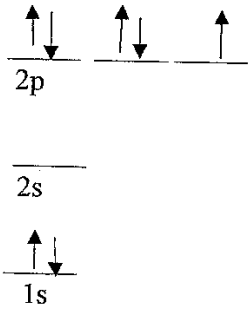
_____ gives the number of electrons in the designated subshell

3. Match the name of the electron configuration rule with the orbital diagram which shows a violation of the electron configuration rule by circling one of the letters under each electron orbital diagram. (9 pts total, 3 pts each)

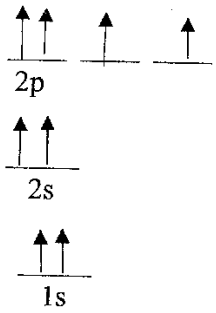
(a) Pauli Exclusion Principal (b) aufbau Principal (c) Hund's Rule



[(a)(b)(c)](circle one)

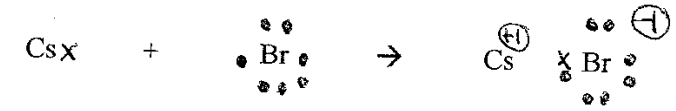


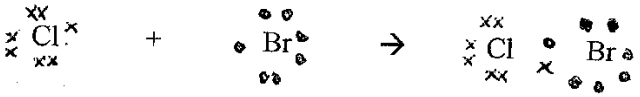
[(a)(b)(c)](circle one)



[(a)(b)(c)](circle one)

4. Which of the following shows a **covalent bonding** Lewis Dot Structure reaction for the formation of an **covalent bond**. Circle the letter of the correct reaction. (5 pts)

Reaction (a) 

Reaction (b) 

5. Periodic Trends: (9 pts total, 3 pts each letter)

(a) Circle the element which has a **larger atomic radius** [(C) or (F)] (circle one)

(b) Circle the element which has a **higher first ionization energy** [(C) or (F)] (circle one)

(c) Circle the element which has **higher electronegativity** [(B) or (F)](circle one)

III. Long Answer (34 pts) Please show work. If you get the final correct number without showing your work, you will lose points.

1. For the element, **Br** (18 pts total, 3 pts each letter)

(a) Give the **electron configuration** of the element above in the format, ($1s^2$, $2s^2$, $2p^6$, ...)

(b) Give the **valence** electron configuration of the same element in the format. ($1s^2$, $2s^2$, $2p^6$, ...)

(c) Give the **valence** electron configuration of the anion $\mathbf{Br^{-1}}$ in the format ($1s^2$, $2s^2$, $2p^6$, ...)

(d) Give the **valence** electron configuration diagram for the same element showing a line for an orbital and up and down arrows for the +1/2 and -1/2 electrons

(**format** required: ↑↓ (1s) ↑ (2s) ___ ___ ___ (2p)) (format is not necessarily the answer)

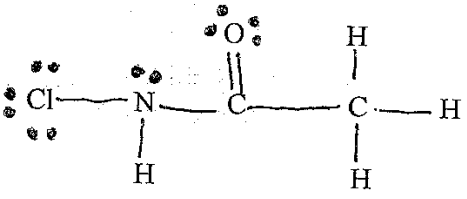
(e) How many valence electrons does the element have ? _____

(f) Give the Lewis Dot symbol (Lewis dot structure) for the same element by itself. _____

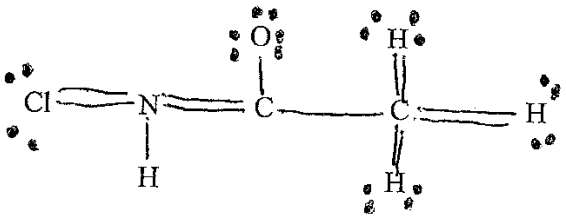
2. Complete the following about the same Lewis Dot structure. (16 pts total)

(A) For the molecule below with the molecular formula **(Cl N C_2 O H_4)** , give the total number of valence electrons in the entire molecule. Show work. (6 pts)

(B) Given the two possible Lewis Dot structures, circle the letter of the best Lewis Dot structure. (2 pts)



(a)



(b)

(C) For the Lewis Dot structure which you chose in part (B), explain why the one you **did not** choose is incorrect by **doing an electron count** and explain why you did not choose this Lewis Dot structure. (4 pts)

(D) Give one other explanation of why the structure that you did not choose is incorrect. (2 pts)

(E) For the Lewis Dot structure which you chose in part (A) above, draw one valid **resonance structure**. (2 pts)

General Chemistry I Lecture Fall 2016 11/14/16 M Exam III form Pink Dr. Hahn Exam # _____

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(Please count your exam pages and make sure there are 8 real pages + periodic table+ Lewis Dot Structure direction .)

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts each, 26 pts total)

1) Describe the shape of a p orbital. 1) _____
A) four balls
B) three balls
C) dumbbell shaped
D) eight balls
E) spherical

2) For $n = 3$ (principal quantum numbers), what are the possible values of ℓ (angular momentum quantum numbers) ? 2) _____
A) 0, 1, 2 B) 0 C) 0, 1 D) 0, 1, 2, 3

3) The distance between adjacent crests of a wave is called 3) _____
A) wavelength
B) frequency
C) amplitude
D) median
E) area

4) Identify the species that has the smallest radius. 4) _____
A) N^0 B) N^{+1} C) N^{-5} D) N^{-2} E) N^{+3}

5) How many orbitals are contained in the third principal level ($n = 3$, principal quantum number) of a given atom ? 5) _____
A) 3 B) 5 C) 7 D) 9 E) 18

6) Which reaction below represents the first ionization of O? 6) _____
A) $O(g) + e^- \rightarrow O^-(g)$
B) $O^-(g) + e^- \rightarrow O(g)$
C) $O(g) \rightarrow O^+(g) + e^-$
D) $O^-(g) \rightarrow O(g) + e^-$
E) $O^-(g) + e^- \rightarrow O^{2-}(g)$

7) Give the numbers for m_ℓ (magnetic quantum numbers) for $\ell = 1$ (angular momentum quantum numbers) 7) _____
A) -2, -1, 0, 1, 2 B) 1, 2 C) -1, 0, 1 D) 0, 1

8) Which of the following elements can form compounds with an expanded octet? 8) _____

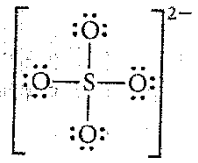
A) Se
B) C
C) Li
D) F
E) All of the above elements can form compounds with an expanded octet.

9) A cation of +2 indicates that an element has 9) _____

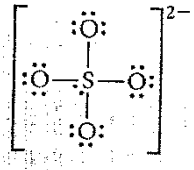
A) lost two electrons.
B) lost two neutrons.
C) gained two protons.
D) gained two electrons.
E) lost two protons.

10) Choose the best Lewis structure for SO_4^{2-}. 10) _____

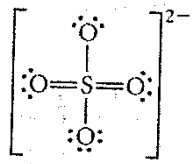
A)



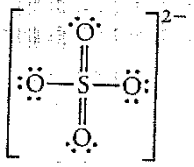
B)



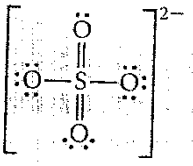
C)



D)



E)



11) What is the maximum number of d orbitals that are possible? 11) _____

A) 7 B) 3 C) 9 D) 1 E) 5

12) How many different values of ℓ (angular momentum quantum number) are possible in the third principal level? 12) _____

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

13) Identify the shortest bond. 13) _____

A) single covalent bond
B) triple covalent bond
C) double covalent bond
D) all of the above bonds are the same length

II. Short Answers (41 pts)

1. Matching: Match the following with the description by filling in the blank with one of the letters. Each letter can only be used ONE time. (9 pts total, 3 pts each)

(a) ℓ, angular momentum quantum number
(b) n, principal quantum number
(c) m_ℓ, magnetic quantum number

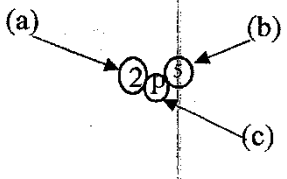
_____ determines the orientation of the orbitals (example: x direction - p_x y direction - p_y z direction - p_z

_____ determines how far away from the nucleus the electron is located, also the shell or period number of the periodic table

_____ determines the shape of the orbitals in the subshell, subshell, goes with the s block, p block, d block or f block of the periodic table

2. Match the following by filling in the blank with one of the letters. Each letter may only be used ONE time (9 pts each, 3 pts each)

for the symbol $2p^5$



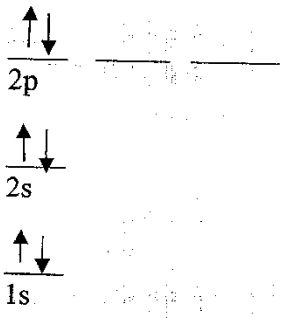
_____ gives the number of electrons in the designated subshell

_____ gives principal quantum number of shell

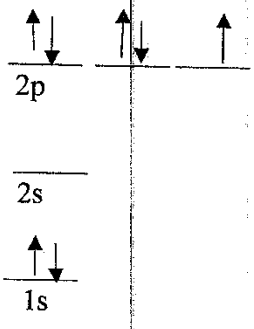
_____ gives the subshell or shape of the orbitals in the subshell

3. Match the name of the electron configuration rule with the orbital diagram which shows a violation of the electron configuration rule by circling one of the letters under each electron orbital diagram. (9 pts total, 3 pts each)

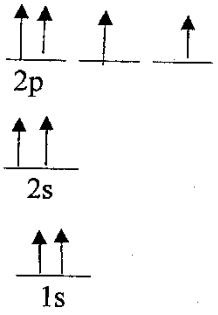
(a) Hund's Rule (b) Pauli Exclusion Principal (c) aufbau Principal



[(a)(b)(c)](circle one)



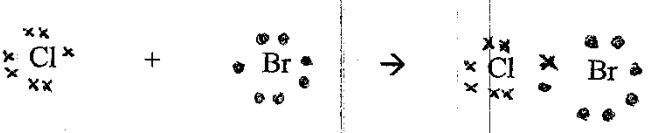
[(a)(b)(c)](circle one)



[(a)(b)(c)](circle one)

4. Which of the following shows an **ionic bonding** Lewis Dot Structure reaction for the formation of an **ionic bond**. Circle the letter of the correct reaction. (5 pts)

Reaction (a) 

Reaction (b) 

5. Periodic Trends: (9 pts total, 3 pts each letter)

(a) Circle the element which has a **larger atomic radius** [(C) or (Sn)] (circle one)

(b) Circle the element which has a **higher first ionization energy** [(Sn) or (C)] (circle one)

(c) Circle the element which has **higher electronegativity** [(F) or (I)] (circle one)

III. Long Answer (34 pts) Please show work. If you get the final correct number without showing your work, you will lose points.

1. For the element, **Te** (18 pts total, 3 pts each letter)

(a) Give the **electron configuration** of the element above in the format, ($1s^2$, $2s^2$, $2p^6$, ...)

(b) Give the **valence** electron configuration of the same element in the format. ($1s^2$, $2s^2$, $2p^6$, ...)

(c) Give the **valence** electron configuration of the anion Te^{-2} in the format ($1s^2$, $2s^2$, $2p^6$, ...)

(d) Give the **valence** electron configuration diagram for the same element showing a line for an orbital and up and down arrows for the +1/2 and -1/2 electrons

(**format** required: ↑↓ (1s) ↑ (2s) ___ ___ ___ (2p)) (format is not necessarily the answer)

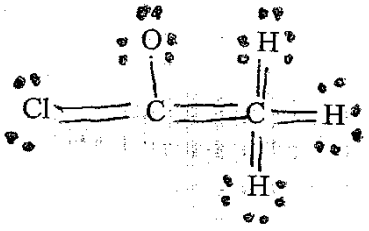
(e) How many valence electrons does the element have ? _____

(f) Give the Lewis Dot symbol (Lewis dot structure) for the same element by itself . _____

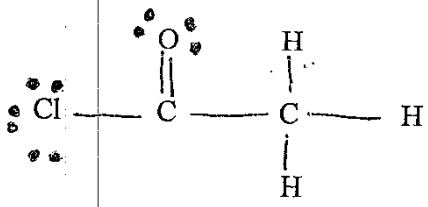
2. Complete the following about the same Lewis Dot structure. (16 pts total)

(A) For the molecule below with the molecular formula **(Cl C_2 O H_3)** , give the total number of valence electrons in the entire molecule. Show work. (6 pts)

(B) Given the two possible Lewis Dot structures, circle the letter of the best Lewis Dot structure. (2 pts)



(a)



(b)

(C) For the Lewis Dot structure which you chose in part (B), explain why the one you **did not** choose is incorrect by **doing an electron count** and explain why you did not choose this Lewis Dot structure. (4 pts)

(D) Give one other explanation of why the structure that you did not choose is incorrect. (2 pts)

(E) For the Lewis Dot structure which you chose in part (A) above, draw one valid **resonance structure**. (2 pts)