Exam III General Chemistry I Lecture Fall 2013 11/15/13 Friday form 9:30 A 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. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) If you run out of space, please continue on the back page of the exam and clearly tell me where the remaining answer can be found. PV=nRT, R=0.08206 (L atm)/(mol K), $P_1V_1/P_2V_2 = T_1/T_2$ 1 mol gas = 22.4 Liters at STP Avogadro's number = 6.022×10^{23}

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 22 pts pts total)

1) What are the possible values of l if $n = 6$? $l = 0, \ldots (n-1)$ 1) B
A) 6 (B) 0, 1, 2, 3, 4, or 5
C) –5, –4, –3, –2, –1, 0, +1, +2, +3, +4, or +5 D) –4, –3, –2, –1, 0, +1, +2, +3, or +4

2) Which reaction below represents the **electron affinity** of Li? 2) A
(A) $Li(g) + e^- \rightarrow Li^-(g)$
B) $Li^+(g) + e^- \rightarrow Li(g)$
C) $Li^+(g) \rightarrow Li(g) + e^-$
D) $Li(g) \rightarrow Li^+(g) + e^-$
E) $Li(g) + e^- \rightarrow Li^+(g)$

3) Which of the following occur as the energy of electromagnetic radiation increases? 3) C
A) Planck's constant increases
B) the frequency decreases.
(C) the wavelength gets shorter.
D) All of the above statements are true.
E) None of the above occur as the energy of a photon increases.

4) What value of l is represented by a f orbital? s, p, d, f / 0 1 2 3 4) C
A) 2 B) 0 (C) 3 D) 1

5) For $n = 3$, what are the possible subshells? $n=3$, $l = 0, \ldots n-1$ 5) C
A) 0 B) 0, 1, 2, 3 (C) 0, 1, 2 D) 0, 1

6) The number of cycles that pass through a stationary point is called 6) C
A) area
B) median
(C) frequency
D) wavelength
E) amplitude

7) Identify the species that has the smallest radius (size). 7) B
A) neutral (B) cation
C) anion biggest D) they are all the same size

8) A cation of +2 indicates that an element has 8) E
A) gained two electrons.
B) lost two neutrons.
C) gained two protons.
D) lost two protons.
E) lost two electrons.

9) What is the maximum number of p orbitals that are possible? (p_x, p_y, p_z) 9) A
A) 3 B) 1 C) 9 D) 7 E) 5

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

11) A triple covalent bond contains _____ of electrons. 11) E
A) 1 pair B) 0 pairs C) 2 pairs D) 4 pairs E) 3 pairs

12) How many valence electrons do the halogens possess? 12) C
A) 5 B) 6 C) 1 D) 2 E) 7

group #

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit. (40 pts)

1. a. If principal quantum number n = 7, what are the possible (4 pts)

angular momentum quantum numbers (ℓ) 0, 1, 2, 3, 4, 5, 6 $\leq n-1$

2. Periodic trends: (8 pts, 2 pts each)

a. Circle the element with the higher electronegativity: [(O) or (N)] (circle one)

b. Circle the element with the lower ionization energy: [(Li) or (Cs)] (circle one)

IE opposite size, down group bigger - smaller IE

c. Circle the more reactive metal (in reaction where the metal is oxidized): [(Ca) or (Be)] (circle one)

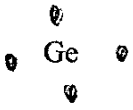
down group more reactive

d. Circle the smaller (smaller radius) element: [(Ne) or (Xe)] (circle one)

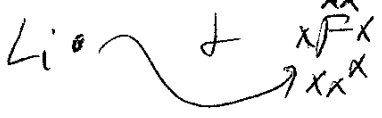
down group bigger

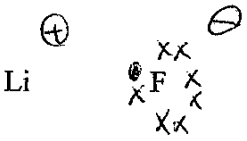
3. Give the Lewis Dot Symbol for the element Ge Make sure the dots are clearly visible. (9 pts)

Ge group IV A



4. Give the Lewis Dot Symbol for the ionic bonding for: (9 pts)



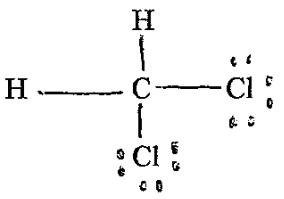


5. Lewis Dot Structure (10 pts total)

The number of valence electrons in CH_2Cl_2 is 20 Show work for full credit. (4 pts)

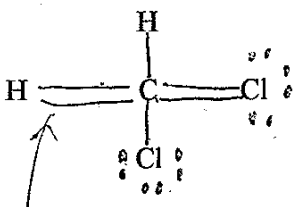
C H Cl
4 + (2*1) + (2*7) = 20

Which of the two Lewis Dot structures is the correct structure [(a) or (b)] (circle one) (6 pt)



(a)

10*2 = 20



(b)

12*2 = 24

too many e⁻

C, H cannot have more than octet

H can only have duet

Part III. Long Answer Please show work for full credit and to receive partial credit. (35 pts)
****** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.******

1. If you start with 157.2 grams of O_2 (g) (molar mass = 32.00 g/mol) , how many liters of CO_2(g) is produced at STP for the following balanced reaction ? [22.4 Liters = 1 mole of gas at STP] (show work) (15 pts)

   CH_4 (g) + 2 O_2 (g) → CO_2 (g) + 2 H_2O (g)

$$157.2\text{ g } O_2 \times \frac{\text{mol } O_2}{32.00\text{ g } O_2} \times \frac{1\text{ mol } CO_2}{2\text{ mol } O_2} \times \frac{22.4\text{ l}}{1\text{ mol } CO_2} =$$

$$55.02\text{ l } CO_2$$

2. Electron Configuration Question: (20 pts total)

a. Give the electron configuration for the element Ga . You should use the format of ($1s^2$, $2s^2$, etc This is not me giving the start of your electron configuration but just telling you the format for your answer.) DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS. (5 pts)

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

b. Give the electron configuration for the **ion** shown: Ga^{+3} DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS (5 pts)

Ga^{+3} $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}$

→ remove $\bar{e}$ in 4s + 4p (outermost shell)

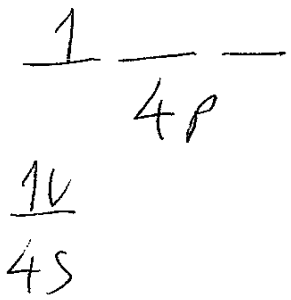
c. What is the **valence** electron configuration for the same uncharged element Ga ? Give the valence electron configuration in the form of ($1s^2$, $2s^2$ etc. This is not me giving the start of your electron configuration but just telling you the format for your answer) (5 pts)

$4s^2, 4p^1$

d. Give an orbital diagram for the **valence** electron configuration for the element Ga using the format with up or down arrows for electrons. (5 pts)

1↓ 1 ___ ___ ___ You should show the **lowest energy at the bottom** of this space

1s 2s 2p and the **highest energy at the top** of this space. (I typed the orbitals so that I can draw the thing on one line for ease of typing, you should show any difference in energy by drawing lines on a different level.)



green

Exam III General Chemistry I Lecture Fall 2013 11/15/13 Friday form 9:30 B 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. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) If you run out of space, please continue on the back page of the exam and clearly tell me where the remaining answer can be found. PV=nRT, R=0.08206 (L atm)/(mol K), $P_1V_1/P_2V_2 = T_1/T_2$ 1 mol of gas = 22.4 Liters at STP Avogadro's number = 6.022×10^{23}

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 24 pts pts total)

1) Identify the species that has the smallest radius (size). 1) B
A) neutral B) cation
C) anion D) they are all the same size

2) What is the maximum number of p orbitals that are possible? 2) A
A) 3 B) 7 C) 9 D) 1 E) 5

3) Which reaction below represents the **electron affinity** of Li? 3) E
A) $Li(g) + e^- \rightarrow Li^+(g)$
B) $Li^+(g) \rightarrow Li(g) + e^-$
C) $Li^+(g) + e^- \rightarrow Li(g)$
D) $Li(g) \rightarrow Li^+(g) + e^-$
E) $Li(g) + e^- \rightarrow Li^-(g)$

4) How many valence electrons do the halogens possess? 4) E
A) 2 B) 5 C) 6 D) 1 E) 7

5) What value of l is represented by an f subshell ? 5) C
A) 1 B) 0 C) 3 D) 2

6) A cation of +2 indicates that an element has 6) E
A) lost two protons.
B) lost two neutrons.
C) gained two electrons.
D) gained two protons.
E) lost two electrons.

7) Describe the shape of a p orbital. 7) E
A) eight balls
B) four balls
C) three balls
D) spherical
E) dumbbell shaped

8) A triple covalent bond contains _____ of electrons. 8) B
A) 4 pairs B) 3 pairs C) 0 pairs D) 1 pair E) 2 pairs

9) For $n = 3$, what are the possible subshells? 9) B

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

10) Which of the following occur as the energy of electromagnetic radiation increases? 10) C

A) Planck's constant increases
B) the frequency decreases.
C) the wavelength gets shorter.
D) All of the above statements are true.
E) None of the above occur as the energy of a photon increases.

11) The number of cycles of a wave that pass through a stationary point is called 11) C

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

12) What are the possible values of l if $n = 6$? 12) A

A) 0, 1, 2, 3, 4, or 5
B) -4, -3, -2, -1, 0, +1, +2, +3, or +4
C) 6
D) -5, -4, -3, -2, -1, 0, +1, +2, +3, +4, or +5

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit. (40 pts)

1. If principal quantum number n = 2, what are the possible (4 pts)

angular momentum quantum numbers (ℓ) 0, 1 ← (n − 1 = 1)

2. Periodic trends: (8 pts, 2 pts each)

a. Circle the element with the higher electronegativity: [(N) or (P)] (circle one)
down group EN decrease
b. Circle the element with the lower ionization energy: [(Li) or (O)] (circle one)
down group - bigger
c. Circle the more reactive metal (in reaction where the metal is oxidized): [(Li) or (K)] (circle one)
more reactive down group
d. Circle the smaller (smaller radius) element: [(Cl) or (P)] (circle one)
size decreases across period

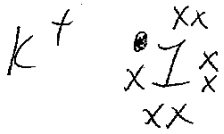
3. Give the Lewis Dot Symbol for the element Mg Make sure the dots are clearly visible. (9 pts)

↑ group 2

Mg •

4. Give the Lewis Dot Symbol for the ionic bonding for: (9 pts)

K I

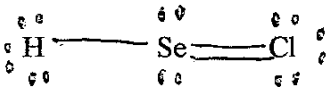


5. Lewis Dot Structure (10 pts total)

The number of valence electrons in H Se Cl is 14 Show work for full credit. (4 pts)

H Se Cl
1 + 6 + 7 = 14 e⁻

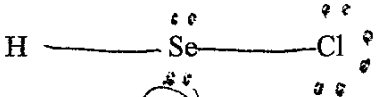
Which of the two Lewis Dot structures is the correct structure [(a) or (b)] (circle one) (6 pt)



(a)

11 x 2 = 22 e⁻

too many e⁻



(b)

7 x 2 = 14 e⁻

Part III. Long Answer Please show work for full credit and to receive partial credit. (35 pts)
****** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.******

1. If you start with 0.349 C(s) (molar mass = 12.01 g/mol) , how many liters of $CCl_4(g)$ is produced at STP for the following balanced reaction ? [22.4 Liters = 1 mole of gas at STP] (show work) (15 pts)

$C(s) + 2\ Cl_2(g) \rightarrow CCl_4(g)$

$$0.349\ g\ C(s) \times \frac{1\ mol\ C}{12.01\ g\ C} \times \frac{1\ mol\ CCl_4}{1\ mol\ C} \times \frac{22.4\ l\ CCl_4(g)}{1\ mol\ CCl_4} = 0.651\ l\ CCl_4(g)$$

2. Electron Configuration Question: (20 pts total)

a. Give the electron configuration for the element Te . You should use the format of ($1s^2$, $2s^2$, etc This is not me giving the start of your electron configuration but just telling you the format for your answer.) DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS. (5 pts)

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

b. Give the electron configuration for the **ion** shown: Te^{-2} DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS (5 pts)

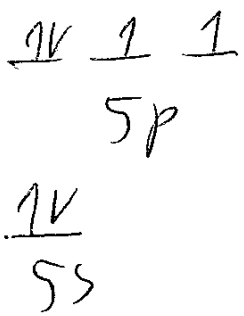
$1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^{10}, 4p^6, 5s^2$
$4d^{10}, 5p^6$
octet

c. What is the **valence** electron configuration for the same uncharged element Te ? Give the valence electron configuration in the form of ($1s^2$, $2s^2$ etc. This is not me giving the start of your electron configuration but just telling you the format for your answer) (5 pts)

$5s^2, 5p^4$

d. Give an orbital diagram for the **valence** electron configuration for the element Te using the format with up or down arrows for electrons. (5 pts)

↿⇂ ↿ — — — — You should show the **lowest energy at the bottom** of this space
1s 2s 2p and the **highest energy at the top** of this space. (I typed the orbitals so that I can draw the thing on one line for ease of typing, you should show any difference in energy by drawing lines on a different level.)



Exam III General Chemistry I Lecture Fall 2013 11/15/13 Friday form 10:30 A Dr. Hahn Exam # _____

Name Key (print) Name _____ (sign)

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Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 24 pts pts total)

1) Which reaction below represents the first ionization of O? 1) 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) $O^-(g) + e^- \rightarrow O^{2-}(g)$

$l = n - 1 = 2$ s p d 0, 1, 2

2) What are the possible subshells for $n = 3$? 2) B

A) s, p, d, f B) s, p, d C) s, p D) s

3) Describe the shape of a s orbital. 3) E

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

4) Identify the species that has the smallest radius (size). - most + 4) A

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

5) A double covalent bond contains _____ of electrons. 5) C

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

6) A cation of +2 indicates that an element has 6) A

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

7) How many valence electrons do the alkali metals (Gp IA) possess? 7) E

A) 6 B) 8 C) 2 D) 7 E) 1

8) The distance between adjacent crests (or troughs of a wave) is called 8) A

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

9) Each of the following sets of quantum numbers is supposed to specify an orbital. Which of the following sets of quantum numbers contains an error? 9) D

A) $n = 1, l = 0, m_l = 0$
B) $n = 3, l = 0, m_l = 0$
C) $n = 2, l = 1, m_l = +1$
D) $n = 3, l = 3, m_l = -2$
E) $n = 4, l = 2, m_l = 0$

l must be smaller than n, $m_l = l = 2$ max

10) What value of l is represented by a d subshell? 10) B

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

s p d f
0 1 2 3

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

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

12) Which of the following occur as the wavelength of electromagnetic radiation increases? 12) B

A) Planck's constant decreases
B) the frequency decreases
C) the energy increases
D) All of the above statements are true.
E) None of the above occur as the wavelength of a photon increases.

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit. (40 pts)

1. If angular momentum quantum number is $\ell = 2$ (nickname d), what are the possible (4 pts)

magnetic quantum numbers (m_ℓ) = −2, −1, 0, +1, +2

2. Periodic trends: (8 pts, 2 pts each)

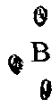
a. Circle the element with the higher electronegativity: [(Te) or (Sn)] (circle one)

b. Circle the element with the lower ionization energy: [(F) or (Br)] (circle one)
down group size increases, IE decreases

c. Circle the more reactive metal (in reaction where the metal is oxidized): [(Na) or (Mg)] (circle one)
smaller across period, less reactive

d. Circle the smaller (smaller radius) element: [(Rb) or (Sr)] (circle one)
smaller across period

3 Give the Lewis Dot Symbol for the element B Make sure the dots are clearly visible. (9 pts)

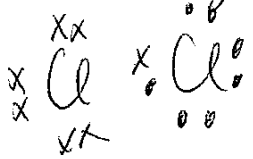


↖ group 3, 3 dots

4. Give the Lewis Dot Symbol for the covalent bonding for: (9 pts)

Cl Cl

Cl - group 7



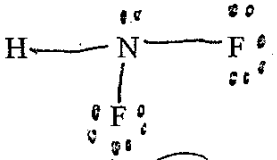
5. Lewis Dot Structure (10 pts total)

The number of valence electrons in HNF_2 is 20 Show work for full credit. (4 pts)

H N F

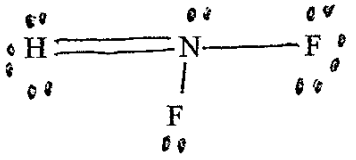
$1 + 5 + (2 * 7) = 20\bar{e}$

Which of the two Lewis Dot structures is the correct structure [(a) or (b)] (circle one) (6 pt)



(a)

$10 \times 2 = 20\bar{e}$



(b)

$12 \times 2 = 24\bar{e}$

- too many $\bar{e}$
- H can only have duet
- N cannot have expanded octet (2nd period)

Part III. Long Answer Please show work for full credit and to receive partial credit. (35 pts)
****** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.******

1. If you start with 1.47 grams of $H_2(g)$ (molar mass = 2.02 g/mol) , how many liters of $H_2O(g)$ is produced at STP for the following balanced reaction ? [22.4 Liters = 1 mole of gas at STP] (show work) (15 pts)

$2\ H_2\ (g) + O_2\ (g) \rightarrow 2\ H_2O\ (g)$

$$1.47\ g\ of\ H_2(g) \times \frac{1\ mol\ H_2}{2.02\ g\ H_2} \times \frac{2\ mol\ H_2O}{2\ mol\ H_2}$$

$$\times \frac{22.4\ l\ H_2O}{1\ mol\ H_2O} = 16.3\ l\ H_2O(g)$$

2. Electron Configuration Question: (20 pts total)
   a. Give the electron configuration for the element Ba . You should use the format of ($1s^2$, $2s^2$, etc This is not me giving the start of your electron configuration but just telling you the format for your answer.) DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS. (5 pts)

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

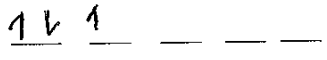
b. Give the electron configuration for the **ion** shown: Ba^{+2} DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS (5 pts)

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

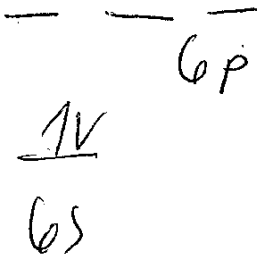
c. What is the **valence** electron configuration for the same uncharged element Ba ? Give the valence electron configuration in the form of ($1s^2$, $2s^2$ etc. This is not me giving the start of your electron configuration but just telling you the format for your answer) (5 pts)

$6s^2$

d. Give an orbital diagram for the **valence** electron configuration for the element Ba using the format with up or down arrows for electrons. (5 pts)



You should show the **lowest energy at the bottom** of this space and the **highest energy at the top** of this space. (I typed the orbitals so that I can draw the thing on one line for ease of typing, you should show any difference in energy by drawing lines on a different level.)



Exam III General Chemistry I Lecture Fall 2013 11/15/13 Friday form 10:30 B Dr. Hahn yellow 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. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) If you run out of space, please continue on the back page of the exam and clearly tell me where the remaining answer can be found. PV=nRT, R=0.08206 (L atm)/(mol K), $P_1V_1/P_2V_2 = T_1/T_2$ 1 mol of gas = 22.4 Liters at STP Avogadro's number = 6.022×10^{23}

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 24 pts pts total)

1) Each of the following sets of quantum numbers is supposed to specify an orbital. Which of the following sets of quantum numbers contains an error? 1) E

A) $n = 1, l = 0, m_l = 0$
B) $n = 3, l = 0, m_l = 0$
C) $n = 4, l = 2, m_l = 0$
D) $n = 2, l = 1, m_l = +1$
E) $n = 3, l = 3, m_l = -2$

2) Which reaction below represents the first ionization of O? 2) C

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

3) A cation of +2 indicates that an element has 3) C

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

4) A double covalent bond contains _____ of electrons. 4) E

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

5) The distance between adjacent crests (or troughs of a wave) is called 5) A

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

6) What value of l is represented by a d subshell? 6) A

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

7) How many valence electrons do the alkali metals (Gp IA) possess? 7) B

A) 7 B) 1 C) 6 D) 2 E) 8

8) What are the possible subshells for $n = 3$? 8) C

A) s, p, d, f B) s C) s, p, d D) s, p

9) Which of the following occur as the wavelength of electromagnetic radiation increases? 9) B

A) the energy increases
B) the frequency decreases
C) Planck's constant decreases
D) All of the above statements are true.
E) None of the above occur as the wavelength of a photon increases.

10) Describe the shape of a s orbital. 10) B

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

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

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

12) Identify the species that has the smallest radius (size). 12) D

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

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit. (40 pts)

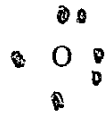
1. If angular momentum quantum number is $\ell = 2$ (nickname d), what are the possible (4 pts)

magnetic quantum numbers (m_ℓ) $-2, -1, 0, +1, +2$

2. Periodic trends: (8 pts, 2 pts each)

a. Circle the element with the higher electronegativity: [(C) or (Si)] (circle one)
down group - lower EN
b. Circle the element with the lower ionization energy: [(F) or (B)] (circle one)
decrease size across period - increase IE
c. Circle the more reactive metal (in reaction where the metal is oxidized): [(K) or (Ca)] (circle one)
smaller across period - less reactive
d. Circle the smaller (smaller radius) element: [(B) or (F)] (circle one)
smaller across period -

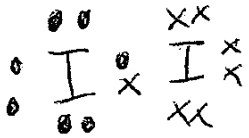
3 Give the Lewis Dot Symbol for the element O Make sure the dots are clearly visible. (9 pts)



group 6 - 6 dots on 4 sides - distribute on 4 sides & then pair up

4. Give the Lewis Dot Symbol for the covalent bonding for: (10 pts)

I in group 7
7 dots each - share 1 $\bar{e}$ from each I



I I

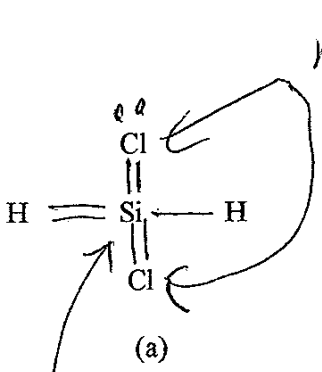
5. Lewis Dot Structure (10 pts total)

The number of valence electrons in $H_2 Si Cl_2$ is 20 Show work for full credit. (4 pts)

H Si Cl

[(1 e)*2] + 4ē + [(7 e)*2] = 20ē

Which of the two Lewis Dot structures is the correct structure [(a) or (b)] (circle one) (6 pt)



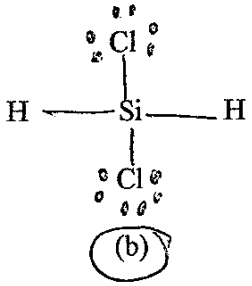
(a)

not octet

8 x 2 = 16 ē

too few ē

more than octet allowed for period 3 + higher



(b)

10 x 2 = 20 ē

Part III. Long Answer Please show work for full credit and to receive partial credit. (35 pts)
****** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.******

1. If you start with 95.2 grams of $H_2(g)$ (molar mass = 2.02 g/mol) , how many liters of HCl (g) is produced at STP for the following balanced reaction ? [22.4 Liters = 1 mole of gas at STP] (show work) (15 pts)

$H_2(g) + Cl_2(g) \rightarrow 2\,HCl(g)$

$$95.2\ g\ H_2(g) \times \frac{1\ mol\ H_2}{2.02\ g\ H_2} \times \frac{2\ mol\ HCl}{1\ mol\ H_2} \times \frac{22.4\ l\ HCl}{1\ mol\ HCl}$$

$$= 2111.4 \rightarrow \text{w correct sig fig}$$

$$2.11 \times 10^3\ \text{liters HCl}$$

2. Electron Configuration Question: (20 pts total)
a. Give the electron configuration for the element Rb . You should use the format of ($1s^2$, $2s^2$, etc This is not me giving the start of your electron configuration but just telling you the format for your answer.) DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS. (5 pts)

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

b. Give the electron configuration for the **ion** shown: Rb^{+1} DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS (5 pts)

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

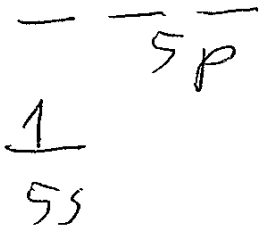
c. What is the **valence** electron configuration for the same uncharged element Rb ? Give the valence electron configuration in the form of ($1s^2$, $2s^2$ etc. This is not me giving the start of your electron configuration but just telling you the format for your answer) (5 pts)

$5s^1$

d. Give an orbital diagram for the **valence** electron configuration for the element Rb using the format with up or down arrows for electrons. (5 pts)

1↓ 1 ___ ___ ___ ___ You should show the **lowest energy at the bottom** of this space

1s 2s 2p and the **highest energy at the top** of this space. (I typed the orbitals so that I can draw the thing on one line for ease of typing, you should show any difference in energy by drawing lines on a different level.)



Exam III General Chemistry I Lecture Fall 2013 11/15/13 Friday form 9:30 A Dr. Hahn Exam # 1-7

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. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) If you run out of space , please continue on the back page of the exam and clearly tell me where the remaining answer can be found. PV=nRT, R=0.08206 (L atm)/(mol K), $P_1V_1/P_2V_2 = T_1/T_2$ 1 mol gas = 22.4 Liters at STP Avogadro's number = 6.022×10^{23}

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 22 pts pts total)

1) What are the possible values of l if $n = 6$? 1) _____

A) 6
B) 0, 1, 2, 3, 4, or 5
C) –5, –4, –3, –2, –1, 0, +1, +2, +3, +4, or +5
D) –4, –3, –2, –1, 0, +1, +2, +3, or +4

2) Which reaction below represents the **electron affinity** of Li? 2) _____

A) $Li(g) + e^- \rightarrow Li^-(g)$
B) $Li^+(g) + e^- \rightarrow Li(g)$
C) $Li^+(g) \rightarrow Li(g) + e^-$
D) $Li(g) \rightarrow Li^+(g) + e^-$
E) $Li(g) + e^- \rightarrow Li^+(g)$

3) Which of the following occur as the energy of electromagnetic radiation increases? 3) _____

A) Planck's constant increases
B) the frequency decreases.
C) the wavelength gets shorter.
D) All of the above statements are true.
E) None of the above occur as the energy of a photon increases.

4) What value of l is represented by a f orbital? 4) _____

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

5) For $n = 3$, what are the possible subshells? 5) _____

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

6) The number of cycles that pass through a stationary point is called 6) _____

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

7) Identify the species that has the smallest radius (size). 7) _____

A) neutral
B) cation
C) anion
D) they are all the same size

8) A cation of +2 indicates that an element has 8) _____
A) gained two electrons.
B) lost two neutrons.
C) gained two protons.
D) lost two protons.
E) lost two electrons.

9) What is the maximum number of p orbitals that are possible? 9) _____
A) 3 B) 1 C) 9 D) 7 E) 5

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

11) A triple covalent bond contains _____ of electrons. 11) _____
A) 1 pair B) 0 pairs C) 2 pairs D) 4 pairs E) 3 pairs

12) How many valence electrons do the halogens possess? 12) _____
A) 5 B) 6 C) 1 D) 2 E) 7

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit. (40 pts)

1. a. If principal quantum number n = 7, what are the possible (4 pts)

   angular momentum quantum numbers (ℓ) _____

2. Periodic trends: (8 pts, 2 pts each)

   a. Circle the element with the higher electronegativity: [(O) or (N)] (circle one)

   b. Circle the element with the lower ionization energy: [(Li) or (Cs)] (circle one)

   c. Circle the more reactive metal (in reaction where the metal is oxidized): [(Ca) or (Be)] (circle one)

   d. Circle the smaller (smaller radius) element: [(Ne) or (Xe)] (circle one)

3. Give the Lewis Dot Symbol for the element Ge Make sure the dots are clearly visible. (9 pts)

   Ge

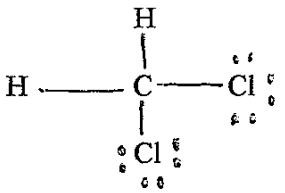
4. Give the Lewis Dot Symbol for the ionic bonding for: (9 pts)

Li F

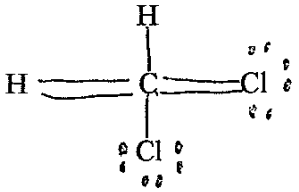
5. Lewis Dot Structure (10 pts total)

The number of valence electrons in CH_2Cl_2 is _____ Show work for full credit. (4 pts)

Which of the two Lewis Dot structures is the correct structure [(a) or (b)] (circle one) (6 pt)



(a)



(b)

Part III. Long Answer Please show work for full credit and to receive partial credit. (35 pts)
****** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.******

1. If you start with 157.2 grams of O_2 (g) (molar mass = 32.00 g/mol) , how many liters of CO_2(g) is produced at STP for the following balanced reaction ? [22.4 Liters = 1 mole of gas at STP] (show work) (15 pts)

   CH_4 (g) + 2 O_2 (g) → CO_2 (g) + 2 H_2O (g)

2. Electron Configuration Question: (20 pts total)

a. Give the electron configuration for the element Ga . You should use the format of ($1s^2$, $2s^2$, etc This is not me giving the start of your electron configuration but just telling you the format for your answer.) DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS. (5 pts)

b. Give the electron configuration for the **ion** shown: Ga^{+3} DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS (5 pts)

c. What is the **valence** electron configuration for the same uncharged element Ga ? Give the valence electron configuration in the form of ($1s^2$, $2s^2$ etc. This is not me giving the start of your electron configuration but just telling you the format for your answer) (5 pts)

d. Give an orbital diagram for the **valence** electron configuration for the element Ga using the format with up or down arrows for electrons. (5 pts)

↑↓ ↑ ___ ___ ___

1s 2s 2p

You should show the **lowest energy at the bottom** of this space and the **highest energy at the top** of this space. (I typed the orbitals so that I can draw the thing on one line for ease of typing, you should show any difference in energy by drawing lines on a different level.)

Exam III General Chemistry I Lecture Fall 2013 11/15/13 Friday form 9:30 B Dr. Hahn Exam # 1-6

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. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) If you run out of space, please continue on the back page of the exam and clearly tell me where the remaining answer can be found. PV=nRT, R=0.08206 (L atm)/(mol K), $P_1V_1/P_2V_2 = T_1/T_2$ 1 mol of gas = 22.4 Liters at STP Avogadro's number = 6.022×10^{23}

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 24 pts pts total)

1) Identify the species that has the smallest radius (size). 1) _____
A) neutral B) cation
C) anion D) they are all the same size

2) What is the maximum number of p orbitals that are possible? 2) _____
A) 3 B) 7 C) 9 D) 1 E) 5

3) Which reaction below represents the **electron affinity** of Li? 3) _____
A) $Li(g) + e^- \rightarrow Li^+(g)$
B) $Li^+(g) \rightarrow Li(g) + e^-$
C) $Li^+(g) + e^- \rightarrow Li(g)$
D) $Li(g) \rightarrow Li^+(g) + e^-$
E) $Li(g) + e^- \rightarrow Li^-(g)$

4) How many valence electrons do the halogens possess? 4) _____
A) 2 B) 5 C) 6 D) 1 E) 7

5) What value of l is represented by an f subshell ? 5) _____
A) 1 B) 0 C) 3 D) 2

6) A cation of +2 indicates that an element has 6) _____
A) lost two protons.
B) lost two neutrons.
C) gained two electrons.
D) gained two protons.
E) lost two electrons.

7) Describe the shape of a p orbital. 7) _____
A) eight balls
B) four balls
C) three balls
D) spherical
E) dumbbell shaped

8) A triple covalent bond contains _____ of electrons. 8) _____
A) 4 pairs B) 3 pairs C) 0 pairs D) 1 pair E) 2 pairs

9) For $n = 3$, what are the possible subshells? 9) _____

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

10) Which of the following occur as the energy of electromagnetic radiation increases? 10) _____

A) Planck's constant increases
B) the frequency decreases.
C) the wavelength gets shorter.
D) All of the above statements are true.
E) None of the above occur as the energy of a photon increases.

11) The number of cycles of a wave that pass through a stationary point is called 11) _____

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

12) What are the possible values of l if $n = 6$? 12) _____

A) 0, 1, 2, 3, 4, or 5
B) –4, –3, –2, –1, 0, +1, +2, +3, or +4
C) 6
D) –5, –4, –3, –2, –1, 0, +1, +2, +3, +4, or +5

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit. (40 pts)

1. If principal quantum number n = 2, what are the possible (4 pts)

angular momentum quantum numbers (ℓ) _____

2. Periodic trends: (8 pts, 2 pts each)

a. Circle the element with the higher electronegativity: [(N) or (P)] (circle one)

b. Circle the element with the lower ionization energy: [(Li) or (O)] (circle one)

c. Circle the more reactive metal (in reaction where the metal is oxidized): [(Li) or (K)] (circle one)

d. Circle the smaller (smaller radius) element: [(Cl) or (P)] (circle one)

3. Give the Lewis Dot Symbol for the element Mg Make sure the dots are clearly visible. (9 pts)

Mg

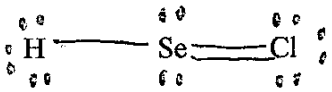
4. Give the Lewis Dot Symbol for the ionic bonding for: (9 pts)

K I

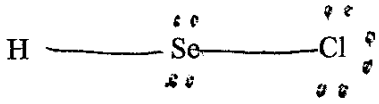
5. Lewis Dot Structure (10 pts total)

The number of valence electrons in H Se Cl is _____ Show work for full credit. (4 pts)

Which of the two Lewis Dot structures is the correct structure [(a) or (b)] (circle one) (6 pt)



(a)



(b)

Part III. Long Answer Please show work for full credit and to receive partial credit. (35 pts)
****** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.******

1. If you start with 0.349 C(s) (molar mass = 12.01 g/mol) , how many liters of $CCl_4(g)$ is produced at STP for the following balanced reaction ? [22.4 Liters = 1 mole of gas at STP] (show work) (15 pts)

$C(s) + 2\ Cl_2(g) \rightarrow CCl_4(g)$

2. Electron Configuration Question: (20 pts total)

a. Give the electron configuration for the element Te . You should use the format of ($1s^2$, $2s^2$, etc This is not me giving the start of your electron configuration but just telling you the format for your answer.) DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS. (5 pts)

b. Give the electron configuration for the **ion** shown: Te^{-2} DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS (5 pts)

c. What is the **valence** electron configuration for the same uncharged element Te ? Give the valence electron configuration in the form of ($1s^2$, $2s^2$ etc. This is not me giving the start of your electron configuration but just telling you the format for your answer) (5 pts)

d. Give an orbital diagram for the **valence** electron configuration for the element Te using the format with up or down arrows for electrons. (5 pts)

↑↓ ↑ ___ ___ ___ You should show the **lowest energy at the bottom** of this space

1s 2s 2p and the **highest energy at the top** of this space. (I typed the orbitals so that I can draw the thing on one line for ease of typing, you should show any difference in energy by drawing lines on a different level.)

Exam III General Chemistry I Lecture Fall 2013 11/15/13 Friday form 10:30 A 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. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) If you run out of space , please continue on the back page of the exam and clearly tell me where the remaining answer can be found. PV=nRT, R=0.08206 (L atm)/(mol K), $P_1V_1/P_2V_2 = T_1/T_2$ 1 mol of gas = 22.4 Liters at STP Avogadro's number = 6.022×10^{23}

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 24 pts pts total)

1) Which reaction below represents the first ionization of O? 1) _____

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) $O^-(g) + e^- \rightarrow O^{2-}(g)$

2) What are the possible subshells for $n = 3$? 2) _____

A) s, p, d, f B) s, p, d C) s, p D) s

3) Describe the shape of a s orbital. 3) _____

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

4) Identify the species that has the smallest radius (size). 4) _____

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

5) A double covalent bond contains _____ of electrons. 5) _____

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

6) A cation of +2 indicates that an element has 6) _____

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

7) How many valence electrons do the alkali metals (Gp IA) possess? 7) _____

A) 6 B) 8 C) 2 D) 7 E) 1

8) The distance between adjacent crests (or troughs of a wave) is called 8) _____

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

9) Each of the following sets of quantum numbers is supposed to specify an orbital. Which of the following sets of quantum numbers contains an error? 9) _____

A) $n = 1, l = 0, m_l = 0$
B) $n = 3, l = 0, m_l = 0$
C) $n = 2, l = 1, m_l = +1$
D) $n = 3, l = 3, m_l = -2$
E) $n = 4, l = 2, m_l = 0$

10) What value of l is represented by a d subshell? 10) _____

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

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

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

12) Which of the following occur as the wavelength of electromagnetic radiation increases? 12) _____

A) Planck's constant decreases
B) the frequency decreases
C) the energy increases
D) All of the above statements are true.
E) None of the above occur as the wavelength of a photon increases.

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit. (40 pts)

1. If angular momentum quantum number is $\ell = 2$ (nickname d), what are the possible (4 pts)

magnetic quantum numbers (m_ℓ) _____

2. Periodic trends: (8 pts, 2 pts each)

   a. Circle the element with the higher electronegativity: [(Te) or (Sn)] (circle one)

   b. Circle the element with the lower ionization energy: [(F) or (Br)] (circle one)

   c. Circle the more reactive metal (in reaction where the metal is oxidized): [(Na) or (Mg)] (circle one)

   d. Circle the smaller (smaller radius) element: [(Rb) or (Sr)] (circle one)

3 Give the Lewis Dot Symbol for the element B Make sure the dots are clearly visible. (9 pts)

B

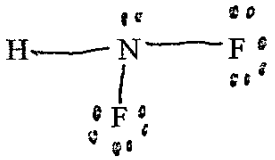
4. Give the Lewis Dot Symbol for the covalent bonding for: (9 pts)

Cl Cl

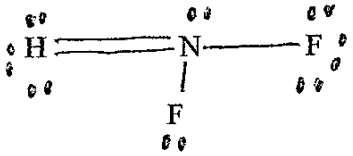
5. Lewis Dot Structure (10 pts total)

The number of valence electrons in HNF_2 is _____ Show work for full credit. (4 pts)

Which of the two Lewis Dot structures is the correct structure [(a) or (b)] (circle one) (6 pt)



(a)



(b)

Part III. Long Answer Please show work for full credit and to receive partial credit. (35 pts)
****** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.******

1. If you start with 1.47 grams of $H_2(g)$ (molar mass = 2.02 g/mol) , how many liters of $H_2O(g)$ is produced at STP for the following balanced reaction ? [22.4 Liters = 1 mole of gas at STP] (show work) (15 pts)

   $2\ H_2\ (g) + O_2\ (g) \rightarrow 2\ H_2O\ (g)$

2. Electron Configuration Question: (20 pts total)
   a. Give the electron configuration for the element Ba . You should use the format of ($1s^2$, $2s^2$, etc This is not me giving the start of your electron configuration but just telling you the format for your answer.) DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS. (5 pts)

b. Give the electron configuration for the **ion** shown: Ba^{+2} DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS (5 pts)

c. What is the **valence** electron configuration for the same uncharged element Ba ? Give the valence electron configuration in the form of ($1s^2$, $2s^2$ etc. This is not me giving the start of your electron configuration but just telling you the format for your answer) (5 pts)

d. Give an orbital diagram for the **valence** electron configuration for the element Ba using the format with up or down arrows for electrons. (5 pts)

↑↓ ↑ ___ ___ ___ You should show the **lowest energy at the bottom** of this space
1s 2s 2p and the **highest energy at the top** of this space. (I typed the orbitals so that I can draw the thing on one line for ease of typing, you should show any difference in energy by drawing lines on a different level.)

Exam III General Chemistry I Lecture Fall 2013 11/15/13 Friday form 10:30 B 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. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) If you run out of space , please continue on the back page of the exam and clearly tell me where the remaining answer can be found. PV=nRT, R=0.08206 (L atm)/(mol K), $P_1V_1/P_2V_2 = T_1/T_2$ 1 mol of gas = 22.4 Liters at STP Avogadro's number = 6.022×10^{23}

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. No partial credit for MC. (2 pts per question, 24 pts pts total)

1) Each of the following sets of quantum numbers is supposed to specify an orbital. Which of the following sets of quantum numbers contains an error? 1) _____

A) $n = 1, l = 0, m_l = 0$
B) $n = 3, l = 0, m_l = 0$
C) $n = 4, l = 2, m_l = 0$
D) $n = 2, l = 1, m_l = +1$
E) $n = 3, l = 3, m_l = -2$

2) Which reaction below represents the first ionization of O? 2) _____

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

3) A cation of +2 indicates that an element has 3) _____

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

4) A double covalent bond contains _____ of electrons. 4) _____

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

5) The distance between adjacent crests (or troughs of a wave) is called 5) _____

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

6) What value of l is represented by a d subshell? 6) _____

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

7) How many valence electrons do the alkali metals (Gp IA) possess? 7) _____

A) 7 B) 1 C) 6 D) 2 E) 8

8) What are the possible subshells for $n = 3$? 8) _____

A) s, p, d, f B) s C) s, p, d D) s, p

9) Which of the following occur as the wavelength of electromagnetic radiation increases? 9) _____

A) the energy increases
B) the frequency decreases
C) Planck's constant decreases
D) All of the above statements are true.
E) None of the above occur as the wavelength of a photon increases.

10) Describe the shape of a s orbital. 10) _____

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

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

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

12) Identify the species that has the smallest radius (size). 12) _____

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

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answers the question. Some questions may require that you show work. If you do not show work, you may lose points. Even on questions which do not require work, if you legibly show work, you may get some partial credit. (40 pts)

1. If angular momentum quantum number is $\ell = 2$ (nickname d), what are the possible (4 pts)

magnetic quantum numbers (m_ℓ) _____

2. Periodic trends: (8 pts, 2 pts each)

   a. Circle the element with the higher electronegativity: [(C) or (Si)] (circle one)

   b. Circle the element with the lower ionization energy: [(F) or (B)] (circle one)

   c. Circle the more reactive metal (in reaction where the metal is oxidized): [(K) or (Ca)] (circle one)

   d. Circle the smaller (smaller radius) element: [(B) or (F)] (circle one)

3 Give the Lewis Dot Symbol for the element O Make sure the dots are clearly visible. (9 pts)

O

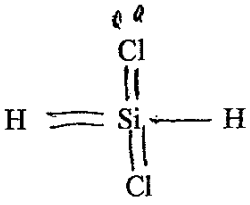
4. Give the Lewis Dot Symbol for the covalent bonding for: (10 pts)

I I

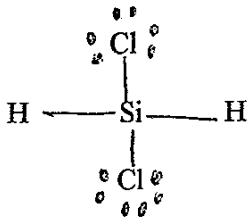
5. Lewis Dot Structure (10 pts total)

The number of valence electrons in $H_2 Si Cl_2$ is _____ Show work for full credit. (4 pts)

Which of the two Lewis Dot structures is the correct structure [(a) or (b)] (circle one) (6 pt)



(a)



(b)

Part III. Long Answer Please show work for full credit and to receive partial credit. (35 pts)
****** Please attempt every problem for partial credit. You will get no partial credit if you just rewrite the question with no change in anything.******

1. If you start with 95.2 grams of $H_2(g)$ (molar mass = 2.02 g/mol) , how many liters of HCl (g) is produced at STP for the following balanced reaction ? [22.4 Liters = 1 mole of gas at STP] (show work) (15 pts)

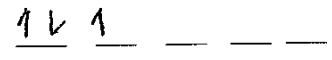
$H_2(g) + Cl_2(g) \rightarrow 2\,HCl(g)$

2. Electron Configuration Question: (20 pts total)
   a. Give the electron configuration for the element Rb . You should use the format of ($1s^2$, $2s^2$, etc This is not me giving the start of your electron configuration but just telling you the format for your answer.) DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS. (5 pts)

b. Give the electron configuration for the **ion** shown: Rb^{+1} DO NOT USE THE SHORTCUT ELECTRON CONFIGURATION USING THE NOBLE GAS (5 pts)

c. What is the **valence** electron configuration for the same uncharged element Rb ? Give the valence electron configuration in the form of ($1s^2$, $2s^2$ etc. This is not me giving the start of your electron configuration but just telling you the format for your answer) (5 pts)

d. Give an orbital diagram for the **valence** electron configuration for the element Rb using the format with up or down arrows for electrons. (5 pts)



1s 2s 2p You should show the **lowest energy at the bottom** of this space and the **highest energy at the top** of this space. (I typed the orbitals so that I can draw the thing on one line for ease of typing, you should show any difference in energy by drawing lines on a different level.)