

Name Keyz (print) Name \_\_\_\_\_ (sign)

Please show work for partial 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)

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts per question, 28 pts total)

$l = 0, 1, 2 = l$   
 $m_l = (-l, \dots, 0, \dots, +l)$   
 s, p, d

1) Give the numbers for  $m_l$  for a d orbital.

A) 1, 2, 3

B) 0, 1, 2, 3, 4

C) 1, 2, 3, 4, 5

D) -2, -1, 0, 1, 2

1) D

2) Identify the species that has the smallest radius.

A) neutral  
 C) anion

more e- the larger

B) cation

D) they are all the same size

2) B

3) The vertical height of a wave is called

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

3) E

4) Which of the following have the same number of valence electrons?

A) Ar, Kr, Br

B) As, Sb, Bi

C) Ga, Sn, Bi

D) Rb, Sb, I

4) B

5) Identify the compound with ionic bonding.

A) He

B) H<sub>2</sub>O

C) NaCl

D) S

E) Li

5) C

6) Which of the following statements is TRUE?

A) Single bonds are shorter than double bonds.

B) A covalent bond has a lower potential energy than the two separate atoms.

C) A pair of electrons involved in a covalent bond are sometimes referred to as "lone pairs."

D) A covalent bond is formed through the transfer of electrons from one atom to another.

E) It is not possible for two atoms to share more than two electrons.

6) B

7) A double covalent bond contains \_\_\_\_\_ of electrons.

A) 2 pairs

B) 0 pairs

C) 3 pairs

D) 4 pairs

E) 1 pair

7) A

8) Describe the shape of a p orbital.

A) two connected balls

B) eight connected balls

C) three connected balls

D) four connected balls

E) a ball



8) A

9) Which reaction below represents the first ionization of O?

9) C

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

10) Which reaction below represents the electron affinity of Li?

10) B

- 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)  $Li^+(g) + e^- \rightarrow Li(g)$

11) How many valence shell electrons does an atom of indium have? (In)

11) A

A) 3

B) 49

C) 1

D) 2

12) Which of the following occur as the energy of a photon of electromagnetic radiation increases?

12) C

- A) the frequency decreases.
  - B) the wavelength increases.
  - C) the wavelength gets shorter.
  - D) the speed increases.
  - E) None of the above occur as the energy of a photon increases.
- $E \uparrow, \lambda \downarrow, \nu \uparrow$

13) Which of the following represent the Lewis structure for N?

13) B

A)  $\cdot\ddot{N}:$

B)  $\cdot\ddot{N}:$

C)  $N:$

D)  $N\cdot$

E)  $\cdot\ddot{N}:$

14) Place the following elements in order of increasing electronegativity. (hint: most electronegative element is F)

14) E

K      Cs      P

- A)  $Cs < P < K$
- B)  $P < Cs < K$
- C)  $K < P < Cs$
- D)  $P < K < Cs$
- E)  $Cs < K < P$

$\leftarrow$  F  
less EN  
 $\downarrow$  less EN

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answer the question. (42 pts)

1. Principal quantum number is abbreviated (a) n (2 pts) (a letter) and is correlated with (b) period (2 pts) numbers in the periodic table.

Principal quantum numbers are also called the (c) (shell) subshell, orbital) (circle one) (2 pts)

The Principal quantum number gives (d) (how far the electron is from the nucleus) (the shape of the electrons cloud around the nucleus) (circle one) (2 pts) The angular momentum quantum number is abbreviated (e) l (2 pts) is also called the subshell

magnetic quantum number is abbreviated (f)  $m_l$  (2 pts) (a letter symbol)

In the **p** subshell, there are (g) 3 (give # in blank) orbitals. (3 pts)

Maximum number of electrons in the **p** subshell is (h) 6 (give # in blank) (3 pts)

The **s** block of the periodic table consists of Group (i) IA to Group (j) IIA.

(using the exact group number in the periodic table handed out with this exam) (3 pts each, 6 pt)

2. For principal quantum # **5** the possible angular momentum quantum numbers are (3 pts)

$l = 0, \dots, n-1$ ;  $l = 0, 1, 2, 3, 4$

3. For angular momentum quantum number **3** the possible magnetic quantum numbers are (3 pt)

$l = 3, m_l = -3, -2, -1, 0, +1, +2, +3$  ( $l=3$  subshell)

4. For the angular momentum quantum number  $l=2$  the symbol is (s, p, d, f) (circle one) (3 pts)

$\begin{matrix} 1 & 1 & 1 \\ 0 & 1 & 2 \end{matrix}$

5. Periodic Properties:

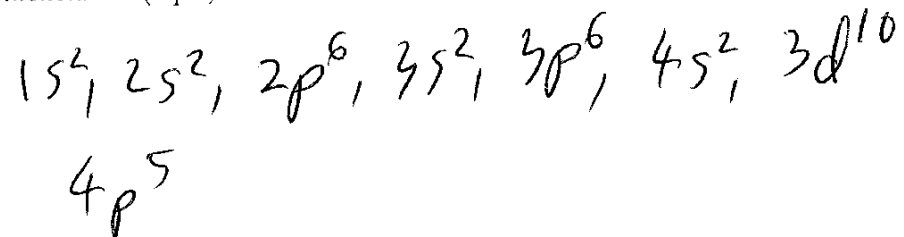
a. The bigger atomic size (atomic radius) is the element (circle one) (Mg) or (Ba) (3 pt)

b. The smaller ionization energy is for the element (circle one) (Li) or (Rb) (3 pt)

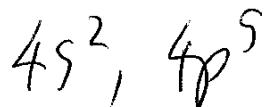
c. The more reactive element is (circle one) (Na) or (K) (3 pt)

Part III. Long Answer (29 pts)

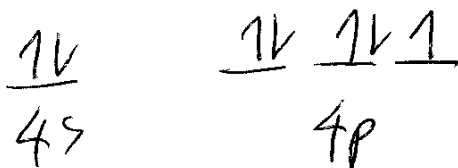
1. a. Give the electron configuration for the element **Br** using the  $1s^2, 2s^2$  nomenclature (7 pts)



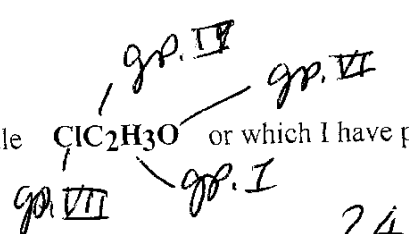
- b. Give the **valence** electron configuration for the same element using the same notation. (6 pts)



- c. Give the **orbital diagram** for the **valence** electrons of the element including showing the electrons as up or down arrows. (6 pts)



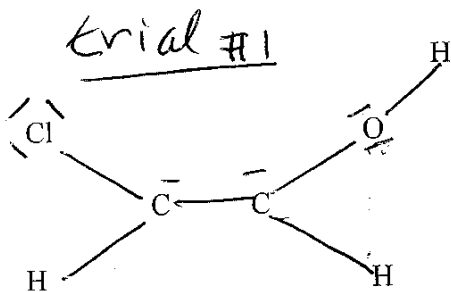
2. Give the Lewis Dot Structure for the molecule  $\text{ClC}_2\text{H}_3\text{O}$  or which I have provided the formula and frame by:



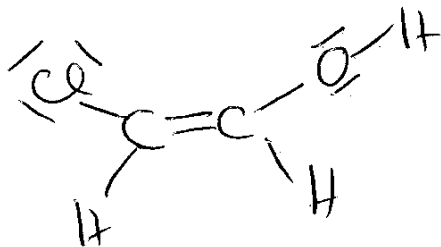
- a. Give the total number of valence electrons for the molecule 24 (4 pts)  
 (show work for full credit)

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

- b. Complete the Lewis Dot Structure **Hint: Lewis Dot structure has one double bond.**  
Elements in period 1 & 2 cannot expand its octet. The formula for the Lewis Dot structure is:  $\text{ClC}_2\text{H}_3\text{O}$  (6 pts)



$13 \times 2 = 26$   
 too many  $e^-$



$12 \times 2 = 24e^-$

Name Key (print) Name \_\_\_\_\_ (sign)

Please show work for partial 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)

**Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts per question, 28 pts total)**

1) Which of the following statements is TRUE?

- A) A covalent bond is formed through the transfer of electrons from one atom to another.  
 B) A covalent bond has a lower potential energy than the two separate atoms.  
 C) It is not possible for two atoms to share more than two electrons.  
 D) Single bonds are shorter than double bonds.  
 E) A pair of electrons involved in a covalent bond are sometimes referred to as "lone pairs."

1) B2) Which reaction below represents the electron affinity of Li?

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

2) D

3) How many valence shell electrons does an atom of indium have?

- A) 2                      B) 3                      C) 49                      D) 1

3) B4) Place the following elements in order of increasing electronegativity. (hint: most electronegative element is F)

K                      Cs                      P

- A)  $\text{P} < \text{K} < \text{Cs}$   
 B)  $\text{Cs} < \text{P} < \text{K}$   
 C)  $\text{Cs} < \text{K} < \text{P}$   
 D)  $\text{P} < \text{Cs} < \text{K}$   
 E)  $\text{K} < \text{P} < \text{Cs}$

4) C

5) Which of the following have the same number of valence electrons?

- A) Rb, Sb, I                      B) Ar, K, Br                      C) Ga, Sn, Bi                      D) As, Sb, Bi

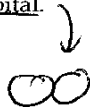
6) The vertical height of a wave is called

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

5) D6) A

7) Describe the shape of a p orbital.

- A) eight connected balls
- B) four connected balls
- C) two connected balls
- D) three connected balls
- E) a ball



7) C

8) Which of the following occur as the energy of a photon of electromagnetic radiation increases?

- A) the wavelength increases
- B) the wavelength gets shorter.
- C) the frequency decreases.
- D) the speed increases.
- E) None of the above occur as the energy of a photon increases.



8) B

9) Which of the following represent the Lewis structure for N?

- A)  $\cdot\dot{N}:$
- B)  $\cdot\ddot{N}:$
- C)  $:\ddot{N}:$
- D)  $\ddot{N}:$
- E)  $N\cdot$

9) A

10) Identify the species that has the smallest radius.

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

10) C

11) A double covalent bond contains \_\_\_\_\_ of electrons.

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

11) B

12) Give the numbers for  $m_l$  for a d orbital.

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

12) C

13) Which reaction below represents the first ionization of O?

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

13) B

14) Identify the compound with ionic bonding.

- A) NaCl
- B) H<sub>2</sub>O
- C) Li
- D) He
- E) S

14) A

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answer the question. (42 pts)

- 15) 1. Principal quantum number is abbreviated (a)  $n$  (2 pts) (a letter) and is correlated with (b) period (2 pts) numbers in the periodic table.

Principal quantum numbers are also called the (c) (shell) (shell, subshell, orbital) (circle one) (2 pts)

The Principal quantum number gives (d) (how far the electron is from the nucleus) (the shape of the electrons cloud around the nucleus) (circle one) (2 pts) The angular momentum quantum number is abbreviated (e)  $l$  (2 pts) is also called the subshell

magnetic quantum number is abbreviated (f)  $m_l$  (2 pts) (a letter symbol)

In the **d** subshell, there are (g) 5 (give # in blank) orbitals. (3 pts)

Maximum number of electrons in the **d** subshell is (h) 10 (give # in blank) (3 pts)

The **p** block of the periodic table consists of Group (i) III A to Group (j) VIII A.

(using the exact group number in the periodic table handed out with this exam) (3 pts each, 6 pts)

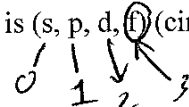
2. For principal quantum number **6** the possible angular momentum quantum numbers are (3 pts)

$n = 6, l = 0, \dots, n-1$   $0, 1, 2, 3, 4, 5 = l$

3. For angular momentum quantum number **2** the possible magnetic quantum numbers are (3 pts)

$l = 2, m_l = -2, \dots, +2$   $m_l = -2, -1, 0, +1, +2$

4. For the angular momentum quantum number  $l = 3$  the symbol is (s, p, d, f) (circle one) (3 pts)



5. Periodic Properties:

a. The bigger atomic size (atomic radius) is the element (circle one) (Sr) or (Rb) (3 pt)

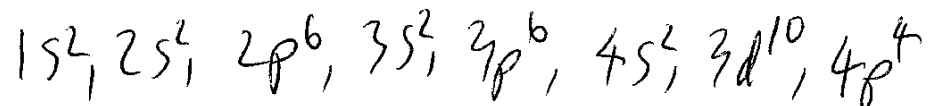
b. The smaller ionization energy is for the element (circle one) (Mg) or (Ca) (3 pt)

c. The more reactive element is (circle one) (Na) or (Li) (3 pt)

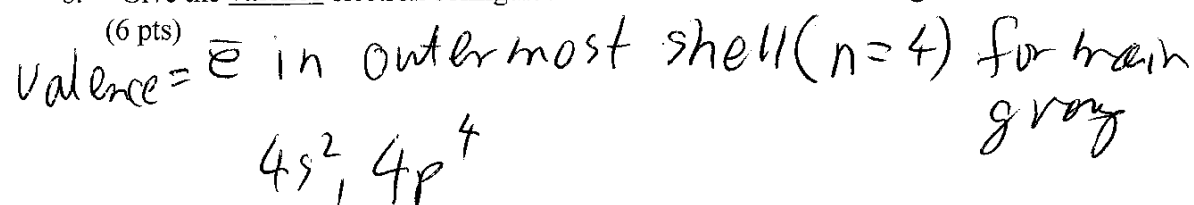


Part III. Long Answer (29 pts)

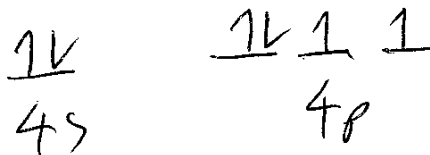
1. a. Give the electron configuration for the element **Se** using the  $1s^2, 2s^2$  nomenclature (7 pts)



- b. Give the **valence** electron configuration for the same element using the same notation. (6 pts)



- c. Give the **orbital diagram** for the **valence** electrons of the element including showing the electrons as up or down arrows. (6 pts)



2. Give the Lewis Dot Structure for the molecule  $\text{CO}_2\text{HBr}$  for which I have provided the formula and frame by:

gp. 4 gp. 6

gp. 1 gp. 7

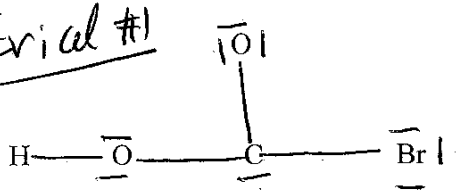
- a. Give the total number of valence electrons for the molecule \_\_\_\_\_ (4 pts)  
(show work for full credit)

$$4\bar{e} + 2(6\bar{e}) + 1\bar{e} + 7\bar{e} = 24\bar{e}$$

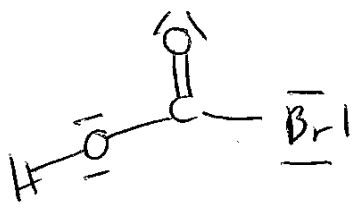
C            O            H            Br

- b. Complete the Lewis Dot Structure **Hint: Lewis Dot structure has one double bond.**  
Elements in period 1 & 2 cannot expand its octet. The formula for the Lewis Dot structure is:  $\text{CO}_2\text{HBr}$  (6 pts)

trial #1



$$13 \times 2 = 26$$



$$12 \times 2 = 24$$

Name Key (print) Name \_\_\_\_\_ (sign)

Please show work for partial 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)

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts per question, 28 pts total)

1) Which reaction below represents the electron affinity of Li? 1) E

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

2) Which of the following statements is TRUE? 2) C

- A) It is not possible for two atoms to share more than two electrons.  
 B) A pair of electrons involved in a covalent bond are sometimes referred to as "lone pairs."  
 C) A covalent bond has a lower potential energy than the two separate atoms.  
 D) Single bonds are shorter than double bonds.  
 E) A covalent bond is formed through the transfer of electrons from one atom to another.

3) What are the possible values of  $l$  if  $n = 6$ ? 3) A

- A) 0, 1, 2, 3, 4, or 5  
 B) -4, -3, -2, -1, 0, +1, +2, +3, or +4  
 C) -5, -4, -3, -2, -1, 0, +1, +2, +3, +4, or +5  
 D) 6
- $l = 0 \dots (n-1)$

4) Which of the following have the same number of valence electrons? 4) C

- A) Ar, Kr, Br  
 B) Rb, Sb, I  
 C) As, Sb, Bi  
 D) Ga, Sn, Bi

5) A triple covalent bond contains \_\_\_\_\_ of electrons. 5) A

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


6) How many valence electrons does a neutral tellurium atom have? 6) C

- A) 4  
 B) 52  
 C) 6  
 D) 2
- Te - go. VIA

7) Which of the following represent the Lewis structure for Cl? 7) B

- A)  $\cdot\ddot{\text{Cl}}\cdot$   
 B)  $:\ddot{\text{Cl}}:$   
 C)  $\cdot\ddot{\text{Cl}}\cdot$   
 D)  $\text{Cl}\cdot$   
 E)  $:\ddot{\text{Cl}}:$

8) Describe the shape of a  $s$  orbital. 8) D

- A) two connected balls  
 B) four connected balls  
 C) eight connected balls  
 D) a ball  
 E) three connected balls
- 

9) Which reaction below represents the first ionization of O?

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

9) A

10) Which of the following occur as the wavelength of a photon of electromagnetic radiation increases?

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

$\lambda \uparrow$   $\nu \downarrow$   $E \downarrow$

10) B

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

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

11) A

12) Identify the species that has the smallest radius.

- A) anion
- C) cation

most negative charge largest  
B) neutral  
D) they are all the same size

12) C

13) Place the following elements in order of decreasing electronegativity. (hint: the most electronegative element is F)

- S                  Cl                  Se
- A)  $Se > Cl > S$
  - B)  $Se > S > Cl$
  - C)  $Cl > S > Se$
  - D)  $S > Cl > Se$
  - E)  $Cl > Se > S$

$\leftarrow$  less EN  $\rightarrow$  F  
 $\downarrow$  less EN

13) C

14) Identify the compound with covalent bonding.

A) He

B)  $H_2O$

C) S

D) Li

E) NaCl

14) B

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answer the question. (42 pts)

1. Principal quantum number is abbreviated (a) n (2 pts) (a letter) and is correlated with (b) period (2 pts) numbers in the periodic table.

Principal quantum numbers are also called the (c) (shell), subshell, orbital (circle one) (2 pts)

The Principal quantum number gives (d) (how far the electron is from the nucleus) (the shape of the electrons cloud around the nucleus) (circle one) (2 pts) The angular momentum quantum number is abbreviated (e) l (2 pts) is also called the subshell

magnetic quantum number is abbreviated (f)  $m_l$  (2 pts) (a letter symbol)

In the f subshell, there are (g) 7 (give # in blank) orbitals. (3 pts)

Maximum number of electrons in the f subshell is (h) 14 (give # in blank) (3 pts)

The d block of the periodic table consists of Group (i) 3B to Group (j) 2B.

(using the exact group number in the periodic table handed out with this quiz) (3 pts each, 6 pts)

2. For principal quantum number 4 the possible angular momentum quantum numbers are (3 pts)

$n=4, l=0 \dots (n-1) \quad l=0, 1, 2, 3$

3. For angular momentum quantum number 2 the possible magnetic quantum numbers are (3 pts)

$l=2, m_l = -l \dots +l \quad -2, -1, 0, +1, +2$

4. For the angular momentum quantum number  $l=1$  the symbol is (s, p, d, f) (circle one) (3 pts)

$\begin{matrix} \downarrow & \downarrow & \downarrow & \downarrow \\ 0 & 1 & 2 & 3 \end{matrix}$

5. Periodic Properties:

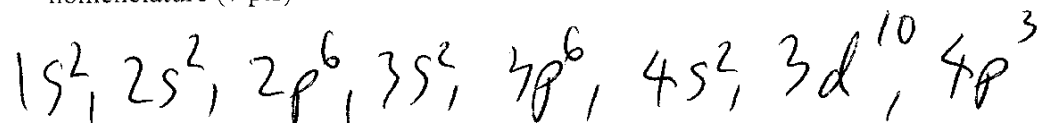
a. The bigger atomic size (atomic radius) is the element (circle one) (O) or (Se) (3 pt)

b. The smaller ionization energy is for the element (circle one) (C) or (Ge) (3 pt)

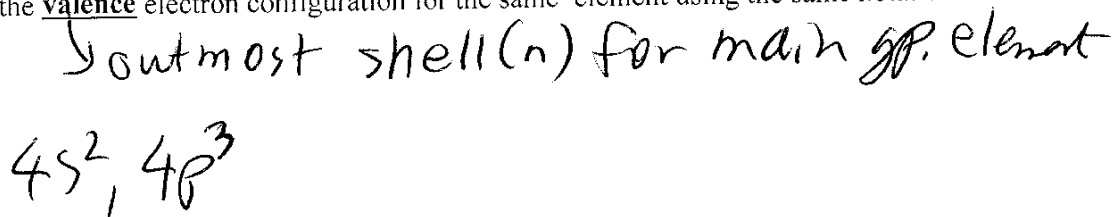
c. The more reactive element is (circle one) (Cs) or (Na) (3 pt)

Part III. Long Answer (29 pts)

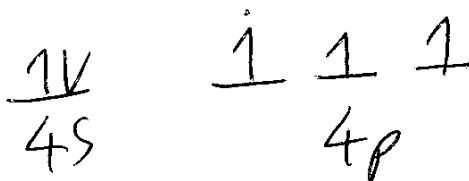
1. a. Give the electron configuration for the element **As** using the  $1s^2, 2s^2$  nomenclature (7 pts)



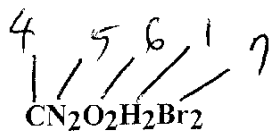
- b. Give the **valence** electron configuration for the same element using the same notation. (6 pts)



- c. Give the **orbital diagram** for the **valence** electrons of the element including showing the electrons as up or down arrows. (6 pts)



2. Give the Lewis Dot Structure for the molecule provided the formula and frame by:



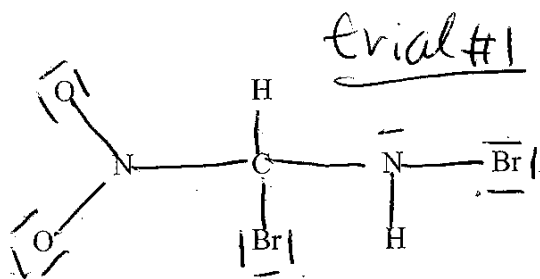
for which I have

- a. Give the total number of valence electrons for the molecule \_\_\_\_\_ (4 pts)  
(show work for full credit)

$$4\bar{e} + 2(5\bar{e}) + 2(6\bar{e}) + 2(1\bar{e}) + 2(7\bar{e}) = 42$$

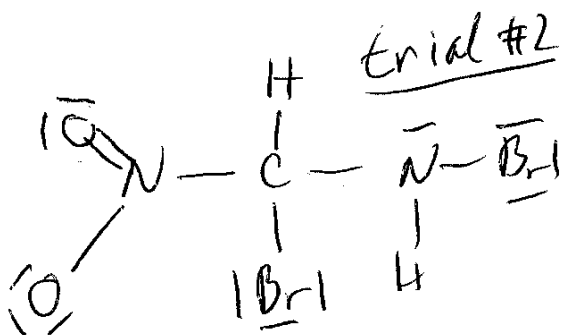
C
N
O
H
Br

- b. Complete the Lewis Dot Structure **Hint: Lewis Dot structure has one double bond.**  
Elements in period 1 & 2 cannot expand its octet. The formula for the Lewis Dot structure is: **CN<sub>2</sub>O<sub>2</sub>H<sub>2</sub>Br<sub>2</sub>** (6 pts)



$$22 \times 2 = 44 \bar{e}$$

too many  $\bar{e}$

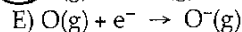
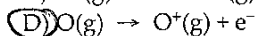
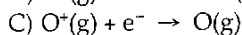
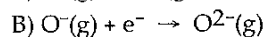
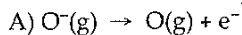
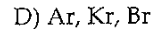
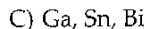
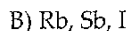
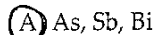


$$21 \times 2 = 42 \bar{e}$$

Name Key (print) Name \_\_\_\_\_ (sign)

Please show work for partial 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)

**Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts per question, 28 pts total)**

1) Which reaction below represents the first ionization of O? 1) D2) Which of the following have the same number of valence electrons? 2) A3) Which of the following represent the Lewis structure for Cl? 3) B4) How many valence electrons does a neutral tellurium atom have? 4) B

A) 4

 B) 6

C) 52

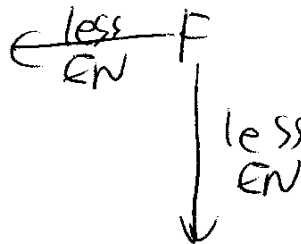
D) 2

5) Place the following elements in order of decreasing electronegativity. (hint: the most electronegative element is F) 5) B

S

Cl

Se

A)  $S > Cl > Se$  B)  $Cl > S > Se$ C)  $Cl > Se > S$ D)  $Se > Cl > S$ E)  $Se > S > Cl$ 6) The number of cycles that pass through a stationary point is called 6) E

A) median

B) amplitude

C) area

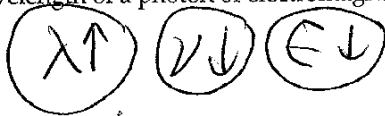
D) wavelength

 E) frequency



7) Which of the following occur as the wavelength of a photon of electromagnetic radiation increases?

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



7) D

8) Which reaction below represents the electron affinity of Li?

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

8) A

9) Identify the compound with covalent bonding.

- A) Li      B)  $\text{H}_2\text{O}$       C) NaCl      D) S      E) He

9) B

10) Describe the shape of a s orbital.

- A) two connected balls  
 B) four connected balls  
 C) a ball  
 D) eight connected balls  
 E) three connected balls



10) C

11) Which of the following statements is TRUE?

- A) A covalent bond has a lower potential energy than the two separate atoms.  
 B) Single bonds are shorter than double bonds.  
 C) It is not possible for two atoms to share more than two electrons.  
 D) A covalent bond is formed through the transfer of electrons from one atom to another.  
 E) A pair of electrons involved in a covalent bond are sometimes referred to as "lone pairs."

11) A

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

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

$$l = 0, \dots, (n-1)$$

12) A

13) Identify the species that has the smallest radius.

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

more negative charge  
 larger

13) A

14) A triple covalent bond contains \_\_\_\_\_ of electrons.

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

14) A

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answer the question. (42 pts)

1. Principal quantum number is abbreviated (a)  $n$  (2 pts) (a letter) and is correlated with (b) period (2 pts) numbers in the periodic table.

Principal quantum numbers are also called the (c) (shell) (subshell, orbital) (circle one) (2 pts)

The Principal quantum number gives (d) (how far the electron is from the nucleus) (the shape of the electrons cloud around the nucleus) (circle one) (2 pts) The angular momentum quantum number is abbreviated (e)  $l$  (2 pts) is also called the subshell

magnetic quantum number is abbreviated (f)  $m_l$  (2 pts) (a letter symbol)

In the **p** subshell, there are (g) 3 (give # in blank) orbitals. (3 pts)

Maximum number of electrons in the **p** subshell is (h) 6 (give # in blank) (3 pts)

The **p** block of the periodic table consists of Group (i) III A to Group (j) VIII A.

(using the exact group number in the periodic table handed out with this quiz) (3 pts each, 6 pts)

2. For principal quantum number **3** the possible angular momentum quantum numbers are (3 pts)

$n=3, l=0, \dots, n-1$  0, 1, 2

3. For angular momentum quantum number **3** the possible magnetic quantum numbers are (3 pts)

$m_l = -l \dots +l$  -3, -2, -1, 0, +1, +2, +3

4. For the angular momentum quantum number  $l=0$  the symbol is (s, p, d, f) (circle one) (3 pts)

5. Periodic Properties:

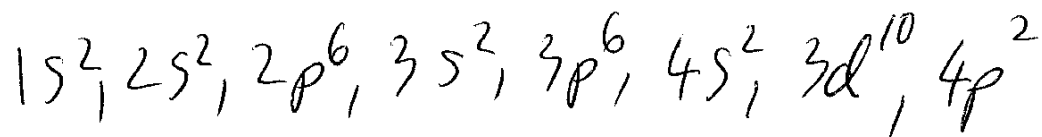
a. The bigger atomic size (atomic radius) is the element (circle one) (Cl) or (F) (3 pt)

b. The smaller ionization energy is for the element (circle one) (C) or (F) (3 pt)

c. The more reactive element is (circle one) (Li) or (Rb) (3 pt)

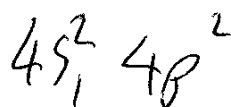
Part III. Long Answer (29 pts)

1. a. Give the electron configuration for the element **Ge** using the  $1s^2, 2s^2$  nomenclature (7 pts)

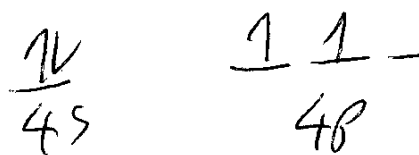


- b. Give the **valence** electron configuration for the same element using the same notation. (6 pts)

↳ outermost shell (largest n)  
for main group element



- c. Give the **orbital diagram** for the **valence** electrons of the element including showing the electrons as up or down arrows. (6 pts)



4 6 7 5 1

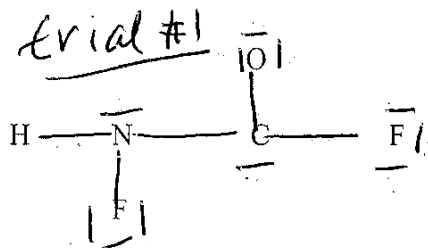
2. Give the Lewis Dot Structure for the molecule  $\text{COF}_2\text{NH}$  for which I have provided the formula and frame by:

a. Give the total number of valence electrons for the molecule 30e<sup>-</sup> (4 pts)  
(show work for full credit)

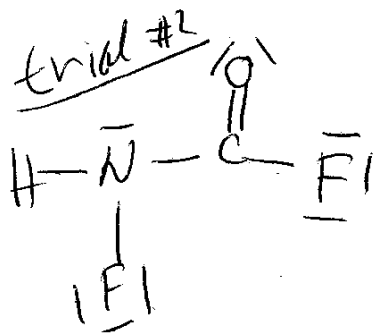
$$4e^- + 6e^- + 2(7e^-) + (5e^-) + 1e^- = 30e^-$$

C      O      F              N              H

b. Complete the Lewis Dot Structure **Hint: Lewis Dot structure has one double bond.**  
Elements in period 1 & 2 cannot expand its octet. The formula for the Lewis Dot structure is:  $\text{COF}_2\text{NH}$  (6 pts)



$16 \times 2 = 32e^-$   
too many e<sup>-</sup>



$15 \times 2 = 30e^-$

Name \_\_\_\_\_ (print) Name \_\_\_\_\_ (sign)

Please show work for partial 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)

**Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts per question, 28 pts total)**

- 1) Give the numbers for  $m_l$  for a d orbital. 1) \_\_\_\_\_  
A) 1, 2, 3 B) 0, 1, 2, 3, 4 C) 1, 2, 3, 4, 5 D) -2, -1, 0, 1, 2
- 2) Identify the species that has the smallest radius. 2) \_\_\_\_\_  
A) neutral B) cation  
C) anion D) they are all the same size
- 3) The vertical height of a wave is called 3) \_\_\_\_\_  
A) frequency  
B) median  
C) wavelength  
D) area  
E) amplitude
- 4) Which of the following have the same number of valence electrons? 4) \_\_\_\_\_  
A) Ar, Kr, Br B) As, Sb, Bi C) Ga, Sn, Bi D) Rb, Sb, I
- 5) Identify the compound with ionic bonding. 5) \_\_\_\_\_  
A) He B) H<sub>2</sub>O C) NaCl D) S E) Li
- 6) Which of the following statements is TRUE? 6) \_\_\_\_\_  
A) Single bonds are shorter than double bonds.  
B) A covalent bond has a lower potential energy than the two separate atoms.  
C) A pair of electrons involved in a covalent bond are sometimes referred to as "lone pairs."  
D) A covalent bond is formed through the transfer of electrons from one atom to another.  
E) It is not possible for two atoms to share more than two electrons.
- 7) A double covalent bond contains \_\_\_\_\_ of electrons. 7) \_\_\_\_\_  
A) 2 pairs B) 0 pairs C) 3 pairs D) 4 pairs E) 1 pair
- 8) Describe the shape of a p orbital. 8) \_\_\_\_\_  
A) two connected balls  
B) eight connected balls  
C) three connected balls  
D) four connected balls  
E) a ball

9) Which reaction below represents the first ionization of O? 9) \_\_\_\_\_

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

10) Which reaction below represents the electron affinity of Li? 10) \_\_\_\_\_

- 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)  $Li^+(g) + e^- \rightarrow Li(g)$

11) How many valence shell electrons does an atom of indium have? 11) \_\_\_\_\_

- A) 3
- B) 49
- C) 1
- D) 2

12) Which of the following occur as the energy of a photon of electromagnetic radiation increases? 12) \_\_\_\_\_

- A) the frequency decreases.
- B) the wavelength increases
- C) the wavelength gets shorter.
- D) the speed increases.
- E) None of the above occur as the energy of a photon increases.

13) Which of the following represent the Lewis structure for N? 13) \_\_\_\_\_

- A)  $:\ddot{N}:$
- B)  $\cdot\ddot{N}:$
- C)  $\ddot{N}:$
- D)  $N\cdot$
- E)  $\cdot\ddot{N}:$

14) Place the following elements in order of increasing electronegativity. (hint : most electronegative element is F) 14) \_\_\_\_\_

K Cs P

- A)  $Cs < P < K$
- B)  $P < Cs < K$
- C)  $K < P < Cs$
- D)  $P < K < Cs$
- E)  $Cs < K < P$

**Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answer the question. (42 pts)**

1. Principal quantum number is abbreviated (a) \_\_\_\_\_ (2 pts) (a letter) and is correlated with (b) \_\_\_\_\_ (2 pts) numbers in the periodic table.

Principal quantum numbers are also called the (c) (shell, subshell, orbital) (circle one) (2 pts)

The Principal quantum number gives (d) (how far the electron is from the nucleus) (the shape of the electrons cloud around the nucleus) (circle one) (2 pts) The angular momentum quantum number is abbreviated (e) \_\_\_\_\_ (2 pts) is also called the subshell

magnetic quantum number is abbreviated (f) \_\_\_\_\_ (2 pts) ( a letter symbol)

In the **p** subshell, there are (g) \_\_\_\_\_ (give # in blank) orbitals. ( 3 pts)

Maximum number of electrons in the **p** subshell is (h) \_\_\_\_\_ (give # in blank) (3 pts)

The **s** block of the periodic table consists of Group (i) \_\_\_\_\_ to Group (j) \_\_\_\_\_.

(using the exact group number in the periodic table handed out with this exam) ( 3 pts each , 6 pt

2. For principal quantum # **5** the possible angular momentum quantum numbers are ( 3 pts)

---

3. For angular momentum quantum number **3** the possible magnetic quantum numbers are (3 pt)

---

4. For the angular momentum quantum number  $l = 2$  the symbol is (s, p, d, f) (circle one) (3 pts)

5. Periodic Properties:

a. The bigger atomic size (atomic radius) is the element(circle one) (Mg) or (Ba) (3 pt)

b. The smaller ionization energy is for the element (circle one) (Li) or (Rb) (3 pt)

c. The more reactive element is (circle one) (Na) or (K) (3 pt)

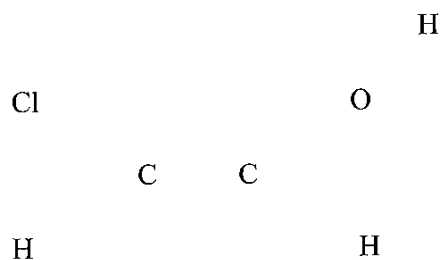




2. Give the Lewis Dot Structure for the molecule  $\text{ClC}_2\text{H}_3\text{O}$  or which I have provided the formula and frame by:

a. Give the total number of valence electrons for the molecule \_\_\_\_\_ (4 pts)  
(show work for full credit)

b. Complete the Lewis Dot Structure **Hint: Lewis Dot structure has one double bond.**  
Elements in period 1 & 2 cannot expand its octet. The formula for the Lewis Dot structure is:  $\text{ClC}_2\text{H}_3\text{O}$  (6 pts)



Name \_\_\_\_\_ (print) Name \_\_\_\_\_ (sign)

Please show work for partial 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. (II) If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam)

**Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts per question, 28 pts total)**

- 1) Which of the following statements is TRUE? 1) \_\_\_\_\_  
A) A covalent bond is formed through the transfer of electrons from one atom to another.  
B) A covalent bond has a lower potential energy than the two separate atoms.  
C) It is not possible for two atoms to share more than two electrons.  
D) Single bonds are shorter than double bonds.  
E) A pair of electrons involved in a covalent bond are sometimes referred to as "lone pairs."
- 2) Which reaction below represents the electron affinity of Li? 2) \_\_\_\_\_  
A)  $\text{Li}^+(\text{g}) + \text{e}^- \rightarrow \text{Li}(\text{g})$   
B)  $\text{Li}^+(\text{g}) \rightarrow \text{Li}(\text{g}) + \text{e}^-$   
C)  $\text{Li}(\text{g}) \rightarrow \text{Li}^+(\text{g}) + \text{e}^-$   
D)  $\text{Li}(\text{g}) + \text{e}^- \rightarrow \text{Li}^-(\text{g})$   
E)  $\text{Li}(\text{g}) + \text{e}^- \rightarrow \text{Li}^+(\text{g})$
- 3) How many valence shell electrons does an atom of indium have? 3) \_\_\_\_\_  
A) 2                      B) 3                      C) 49                      D) 1
- 4) Place the following elements in order of increasing electronegativity. (hint: most electronegative element is F) 4) \_\_\_\_\_  
K              Cs              P  
A)  $\text{P} < \text{K} < \text{Cs}$   
B)  $\text{Cs} < \text{P} < \text{K}$   
C)  $\text{Cs} < \text{K} < \text{P}$   
D)  $\text{P} < \text{Cs} < \text{K}$   
E)  $\text{K} < \text{P} < \text{Cs}$
- 5) Which of the following have the same number of valence electrons? 5) \_\_\_\_\_  
A) Rb, Sb, I              B) Ar, Kr, Br              C) Ga, Sn, Bi              D) As, Sb, Bi
- 6) The vertical height of a wave is called 6) \_\_\_\_\_  
A) amplitude  
B) wavelength  
C) area  
D) median  
E) frequency

- 7) Describe the shape of a p orbital. 7) \_\_\_\_\_  
 A) eight connected balls  
 B) four connected balls  
 C) two connected balls  
 D) three connected balls  
 E) a ball
- 8) Which of the following occur as the energy of a photon of electromagnetic radiation increases? 8) \_\_\_\_\_  
 A) the wavelength increases  
 B) the wavelength gets shorter.  
 C) the frequency decreases.  
 D) the speed increases.  
 E) None of the above occur as the energy of a photon increases.
- 9) Which of the following represent the Lewis structure for N? 9) \_\_\_\_\_  
 A)  $\cdot\ddot{N}:$       B)  $\cdot\dot{N}:$       C)  $:\ddot{N}:$       D)  $\ddot{N}:$       E)  $N\cdot$
- 10) Identify the species that has the smallest radius. 10) \_\_\_\_\_  
 A) neutral      B) anion  
 C) cation      D) they are all the same size
- 11) A double covalent bond contains \_\_\_\_\_ of electrons. 11) \_\_\_\_\_  
 A) 0 pairs      B) 2 pairs      C) 3 pairs      D) 4 pairs      E) 1 pair
- 12) Give the numbers for  $m_l$  for a d orbital. 12) \_\_\_\_\_  
 A) 1, 2, 3, 4, 5      B) 0, 1, 2, 3, 4      C) -2, -1, 0, 1, 2      D) 1, 2, 3
- 13) Which reaction below represents the first ionization of O? 13) \_\_\_\_\_  
 A)  $O^+(g) + e^- \rightarrow O(g)$   
 B)  $O(g) \rightarrow O^+(g) + e^-$   
 C)  $O^-(g) + e^- \rightarrow O^{2-}(g)$   
 D)  $O^-(g) \rightarrow O(g) + e^-$   
 E)  $O(g) + e^- \rightarrow O^-(g)$
- 14) Identify the compound with ionic bonding. 14) \_\_\_\_\_  
 A) NaCl      B) H<sub>2</sub>O      C) Li      D) He      E) S

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answer the question. (42 pts)

1. Principal quantum number is abbreviated (a) \_\_\_\_\_ (2 pts) (a letter) and is correlated with (b) \_\_\_\_\_ (2 pts) numbers in the periodic table.

Principal quantum numbers are also called the (c) (shell, subshell, orbital) (circle one) (2 pts)

The Principal quantum number gives (d) (how far the electron is from the nucleus) (the shape of the electrons cloud around the nucleus) (circle one) (2 pts) The angular momentum quantum number is abbreviated (e) \_\_\_\_\_ (2 pts) is also called the subshell

magnetic quantum number is abbreviated (f) \_\_\_\_\_ (2 pts) (a letter symbol)

In the **d** subshell, there are (g) \_\_\_\_\_ (give # in blank) orbitals. (3 pts)

Maximum number of electrons in the **d** subshell is (h) \_\_\_\_\_ (give # in blank) (3 pts)

The **p** block of the periodic table consists of Group (i) \_\_\_\_\_ to Group (j) \_\_\_\_\_.

(using the exact group number in the periodic table handed out with this exam) (3 pts each, 6 pts)

2. For principal quantum number **6** the possible angular momentum quantum numbers are (3 pts)
- 

3. For angular momentum quantum number **2** the possible magnetic quantum numbers are (3 pts)
- 

4. For the angular momentum quantum number  $l = 3$  the symbol is (s, p, d, f) (circle one) (3 pts)

5. Periodic Properties:

- a. The bigger atomic size (atomic radius) is the element (circle one) (Sr) or (Rb) (3 pt)
- b. The smaller ionization energy is for the element (circle one) (Mg) or (Ca) (3 pt)
- c. The more reactive element is (circle one) (Na) or (Li) (3 pt)

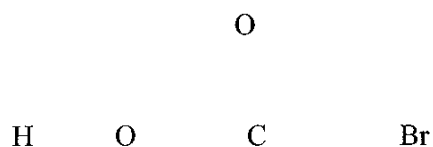
Part III. Long Answer (29 pts)

1. a. Give the electron configuration for the element **Se** using the  $1s^2, 2s^2$  nomenclature (7 pts)
  
- b. Give the **valence** electron configuration for the same element using the same notation. (6 pts)
  
- c. Give the **orbital diagram** for the **valence** electrons of the element including showing the electrons as up or down arrows. (6 pts)

2. Give the Lewis Dot Structure for the molecule  $\text{CO}_2\text{HBr}$  for which I have provided the formula and frame by:

a. Give the total number of valence electrons for the molecule \_\_\_\_\_ (4 pts)  
(show work for full credit)

b. Complete the Lewis Dot Structure **Hint: Lewis Dot structure has one double bond.**  
Elements in period 1 & 2 cannot expand its octet. The formula for the Lewis Dot structure is:  $\text{CO}_2\text{HBr}$  (6 pts)



Name \_\_\_\_\_ (print) Name \_\_\_\_\_ (sign)

Please show work for partial 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)

**Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts per question, 28 pts total)**

- 1) Which reaction below represents the electron affinity of Li? 1) \_\_\_\_\_  
 A)  $\text{Li}^+(\text{g}) + \text{e}^- \rightarrow \text{Li}(\text{g})$   
 B)  $\text{Li}(\text{g}) \rightarrow \text{Li}^+(\text{g}) + \text{e}^-$   
 C)  $\text{Li}(\text{g}) + \text{e}^- \rightarrow \text{Li}^+(\text{g})$   
 D)  $\text{Li}^+(\text{g}) \rightarrow \text{Li}(\text{g}) + \text{e}^-$   
 E)  $\text{Li}(\text{g}) + \text{e}^- \rightarrow \text{Li}^-(\text{g})$
- 2) Which of the following statements is TRUE? 2) \_\_\_\_\_  
 A) It is not possible for two atoms to share more than two electrons.  
 B) A pair of electrons involved in a covalent bond are sometimes referred to as "lone pairs."  
 C) A covalent bond has a lower potential energy than the two separate atoms.  
 D) Single bonds are shorter than double bonds.  
 E) A covalent bond is formed through the transfer of electrons from one atom to another.
- 3) What are the possible values of  $l$  if  $n = 6$ ? 3) \_\_\_\_\_  
 A) 0, 1, 2, 3, 4, or 5  
 B) -4, -3, -2, -1, 0, +1, +2, +3, or +4  
 C) -5, -4, -3, -2, -1, 0, +1, +2, +3, +4, or +5  
 D) 6
- 4) Which of the following have the same number of valence electrons? 4) \_\_\_\_\_  
 A) Ar, Kr, Br  
 B) Rb, Sb, I  
 C) As, Sb, Bi  
 D) Ga, Sn, Bi
- 5) A triple covalent bond contains \_\_\_\_\_ of electrons. 5) \_\_\_\_\_  
 A) 3 pairs  
 B) 4 pairs  
 C) 2 pairs  
 D) 1 pair  
 E) 0 pairs
- 6) How many valence electrons does a neutral tellurium atom have? 6) \_\_\_\_\_  
 A) 4  
 B) 52  
 C) 6  
 D) 2
- 7) Which of the following represent the Lewis structure for Cl? 7) \_\_\_\_\_  
 A)  $\cdot\ddot{\text{Cl}}:$   
 B)  $:\ddot{\text{Cl}}:$   
 C)  $\cdot\ddot{\text{Cl}}:$   
 D)  $\text{Cl}\cdot$   
 E)  $:\ddot{\text{Cl}}:$
- 8) Describe the shape of a s orbital. 8) \_\_\_\_\_  
 A) two connected balls  
 B) four connected balls  
 C) eight connected balls  
 D) a ball  
 E) three connected balls

- 9) Which reaction below represents the first ionization of O? 9) \_\_\_\_\_
- A)  $O(g) \rightarrow O^+(g) + e^-$   
 B)  $O^-(g) \rightarrow O(g) + e^-$   
 C)  $O^+(g) + e^- \rightarrow O(g)$   
 D)  $O^-(g) + e^- \rightarrow O^{2-}(g)$   
 E)  $O(g) + e^- \rightarrow O^-(g)$
- 10) Which of the following occur as the wavelength of a photon of electromagnetic radiation increases? 10) \_\_\_\_\_
- A) the energy increases  
 B) the frequency decreases  
 C) Planck's constant decreases  
 D) the speed decreases  
 E) None of the above occur as the wavelength of a photon increases.
- 11) The number of cycles that pass through a stationary point is called 11) \_\_\_\_\_
- A) frequency  
 B) area  
 C) amplitude  
 D) median  
 E) wavelength
- 12) Identify the species that has the smallest radius. 12) \_\_\_\_\_
- A) anion  
 B) neutral  
 C) cation  
 D) they are all the same size
- 13) Place the following elements in order of **decreasing** electronegativity. (hint : the most electronegative element is F) 13) \_\_\_\_\_
- S            Cl            Se
- A)  $Se > Cl > S$   
 B)  $Se > S > Cl$   
 C)  $Cl > S > Se$   
 D)  $S > Cl > Se$   
 E)  $Cl > Se > S$
- 14) Identify the compound with covalent bonding. 14) \_\_\_\_\_
- A) He            B)  $H_2O$             C) S            D) Li            E) NaCl



Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answer the question. (42 pts)

1. Principal quantum number is abbreviated (a) \_\_\_\_\_ (2 pts) (a letter) and is correlated with (b) \_\_\_\_\_ (2 pts) numbers in the periodic table.

Principal quantum numbers are also called the (c) (shell, subshell, orbital) (circle one) (2 pts)

The Principal quantum number gives (d) (how far the electron is from the nucleus) (the shape of the electrons cloud around the nucleus) (circle one) (2 pts) The angular momentum quantum number is abbreviated (e) \_\_\_\_\_ (2 pts) is also called the subshell

magnetic quantum number is abbreviated (f) \_\_\_\_\_ (2 pts) (a letter symbol)

In the f subshell, there are (g) \_\_\_\_\_ (give # in blank) orbitals. (3 pts)

Maximum number of electrons in the f subshell is (h) \_\_\_\_\_ (give # in blank) (3 pts)

The d block of the periodic table consists of Group (i) \_\_\_\_\_ to Group (j) \_\_\_\_\_.

(using the exact group number in the periodic table handed out with this quiz) (3 pts each, 6 pts)

2. For principal quantum number 4 the possible angular momentum quantum numbers are (3 pts)

- 
3. For angular momentum quantum number 2 the possible magnetic quantum numbers are (3 pts)

- 
4. For the angular momentum quantum number  $l = 1$  the symbol is (s, p, d, f) (circle one) (3 pts)

5. Periodic Properties:

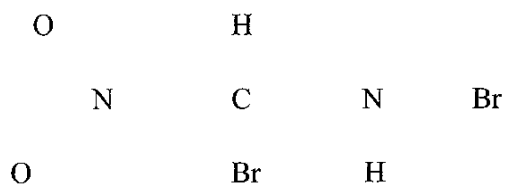
- a. The bigger atomic size (atomic radius) is the element (circle one) (O) or (Se) (3 pt)
- b. The smaller ionization energy is for the element (circle one) (C) or (Ge) (3 pt)
- c. The more reactive element is (circle one) (Cs) or (Na) (3 pt)



2. Give the Lewis Dot Structure for the molecule  $\text{CN}_2\text{O}_2\text{H}_2\text{Br}_2$  for which I have provided the formula and frame by:

a. Give the total number of valence electrons for the molecule \_\_\_\_\_ (4 pts)  
(show work for full credit)

b. Complete the Lewis Dot Structure **Hint: Lewis Dot structure has one double bond.**  
Elements in period 1 & 2 cannot expand its octet. The formula for the Lewis Dot structure is:  $\text{CN}_2\text{O}_2\text{H}_2\text{Br}_2$  (6 pts)



Name \_\_\_\_\_ (print) Name \_\_\_\_\_ (sign)

Please show work for partial 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)

**Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts per question, 28 pts total)**

- 1) Which reaction below represents the first ionization of O? 1) \_\_\_\_\_  
 A)  $O^-(g) \rightarrow O(g) + e^-$   
 B)  $O^-(g) + e^- \rightarrow O^{2-}(g)$   
 C)  $O^+(g) + e^- \rightarrow O(g)$   
 D)  $O(g) \rightarrow O^+(g) + e^-$   
 E)  $O(g) + e^- \rightarrow O^-(g)$
- 2) Which of the following have the same number of valence electrons? 2) \_\_\_\_\_  
 A) As, Sb, Bi                      B) Rb, Sb, I                      C) Ga, Sn, Bi                      D) Ar, Kr, Br
- 3) Which of the following represent the Lewis structure for Cl? 3) \_\_\_\_\_  
 A)  $Cl\cdot$                       B)  $:\ddot{Cl}:$                       C)  $:\ddot{Cl}:$                       D)  $\cdot\ddot{Cl}:$                       E)  $\cdot\ddot{Cl}:$
- 4) How many valence electrons does a neutral tellerium atom have? 4) \_\_\_\_\_  
 A) 4                      B) 6                      C) 52                      D) 2
- 5) Place the following elements in order of **decreasing** electronegativity. (hint : the most electronegative element is F) 5) \_\_\_\_\_  
 S                      Cl                      Se  
 A)  $S > Cl > Se$   
 B)  $Cl > S > Se$   
 C)  $Cl > Se > S$   
 D)  $Se > Cl > S$   
 E)  $Se > S > Cl$
- 6) The number of cycles that pass through a stationary point is called 6) \_\_\_\_\_  
 A) median  
 B) amplitude  
 C) area  
 D) wavelength  
 E) frequency

- 7) Which of the following occur as the wavelength of a photon of electromagnetic radiation increases? 7) \_\_\_\_\_
- A) the speed decreases
  - B) the energy increases
  - C) Planck's constant decreases
  - D) the frequency decreases
  - E) None of the above occur as the wavelength of a photon increases.
- 8) Which reaction below represents the electron affinity of Li? 8) \_\_\_\_\_
- A)  $\text{Li(g)} + e^- \rightarrow \text{Li}^-(\text{g})$
  - B)  $\text{Li(g)} \rightarrow \text{Li}^+(\text{g}) + e^-$
  - C)  $\text{Li}^+(\text{g}) \rightarrow \text{Li(g)} + e^-$
  - D)  $\text{Li}^+(\text{g}) + e^- \rightarrow \text{Li(g)}$
  - E)  $\text{Li(g)} + e^- \rightarrow \text{Li}^+(\text{g})$
- 9) Identify the compound with covalent bonding. 9) \_\_\_\_\_
- A) Li
  - B)  $\text{H}_2\text{O}$
  - C) NaCl
  - D) S
  - E) He
- 10) Describe the shape of a s orbital. 10) \_\_\_\_\_
- A) two connected balls
  - B) four connected balls
  - C) a ball
  - D) eight connected balls
  - E) three connected balls
- 11) Which of the following statements is TRUE? 11) \_\_\_\_\_
- A) A covalent bond has a lower potential energy than the two separate atoms.
  - B) Single bonds are shorter than double bonds.
  - C) It is not possible for two atoms to share more than two electrons.
  - D) A covalent bond is formed through the transfer of electrons from one atom to another.
  - E) A pair of electrons involved in a covalent bond are sometimes referred to as "lone pairs."
- 12) What are the possible values of  $l$  if  $n = 6$ ? 12) \_\_\_\_\_
- A) 0, 1, 2, 3, 4, or 5
  - B) 6
  - C) -5, -4, -3, -2, -1, 0, +1, +2, +3, +4, or +5
  - D) -4, -3, -2, -1, 0, +1, +2, +3, or +4
- 13) Identify the species that has the smallest radius. 13) \_\_\_\_\_
- A) cation
  - B) anion
  - C) neutral
  - D) they are all the same size
- 14) A triple covalent bond contains \_\_\_\_\_ of electrons. 14) \_\_\_\_\_
- A) 3 pairs
  - B) 4 pairs
  - C) 0 pairs
  - D) 1 pair
  - E) 2 pairs

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answer the question. (42 pts)

1. Principal quantum number is abbreviated (a) \_\_\_\_\_ (2 pts) (a letter) and is correlated with (b) \_\_\_\_\_ (2 pts) numbers in the periodic table.

Principal quantum numbers are also called the (c) (shell, subshell, orbital) (circle one) (2 pts)

The Principal quantum number gives (d) (how far the electron is from the nucleus) (the shape of the electrons cloud around the nucleus) (circle one) (2 pts) The angular momentum quantum number is abbreviated (e) \_\_\_\_\_ (2 pts) is also called the subshell

magnetic quantum number is abbreviated (f) \_\_\_\_\_ (2 pts) (a letter symbol)

In the **p** subshell, there are (g) \_\_\_\_\_ (give # in blank) orbitals. (3 pts)

Maximum number of electrons in the **p** subshell is (h) \_\_\_\_\_ (give # in blank) (3 pts)

The **p** block of the periodic table consists of Group (i) \_\_\_\_\_ to Group (j) \_\_\_\_\_.

(using the exact group number in the periodic table handed out with this quiz) (3 pts each, 6 pts)

2. For principal quantum number **3** the possible angular momentum quantum numbers are (3 pts)

- 
3. For angular momentum quantum number **3** the possible magnetic quantum numbers are (3 pts)

- 
4. For the angular momentum quantum number  $\ell = 0$  the symbol is (s, p, d, f) (circle one) (3 pts)

5. Periodic Properties:

- a. The bigger atomic size (atomic radius) is the element(circle one) (Cl) or (F) (3 pt)
- b. The smaller ionization energy is for the element (circle one) (C) or (F) (3 pt)
- c. The more reactive element is (circle one) (Li) or (Rb) (3 pt)

Part III. Long Answer (29 pts)

1. a. Give the electron configuration for the element **Ge** using the  $1s^2, 2s^2$  nomenclature (7 pts)
- b. Give the valence electron configuration for the same element using the same notation. (6 pts)
- c. Give the orbital diagram for the valence electrons of the element including showing the electrons as up or down arrows. (6 pts)

2. Give the Lewis Dot Structure for the molecule **COF<sub>2</sub>NH** for which I have provided the formula and frame by:

a. Give the total number of valence electrons for the molecule \_\_\_\_\_ (4 pts)  
(show work for full credit)

b. Complete the Lewis Dot Structure **Hint: Lewis Dot structure has one double bond.**  
Elements in period 1 & 2 cannot expand its octet. The formula for the Lewis Dot structure is: **COF<sub>2</sub>NH** (6 pts)

