Final General Chemistry I (CHEM 101) I 12/6/12 8:30 am T,R Dr. Hahn combined Exam # _____

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) 200 pts on exam, worth 150 pts of 800 pts

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts per question, 52 pts pts total)

1) Which of the following have the same number of valence electrons? 1) B
A) Ar, Kr, Br B) As, Sb, Bi C) Rb, Sb, I D) Ga, Sn, Bi

2) Which of the following is a molecular (covalent) compound? 2) D
A) KCl B) RbBr C) $NaNO_3$ D) CH_3Cl E) $CuCl_2$

3) Which of the following represent the Lewis structure for N? 3) B
A) ·N: B) ·N: C) :N: D) N· E) N:

4) Identify HCl. 4) D
A) weak electrolyte, weak acid
B) nonelectrolyte
C) strong electrolyte, weak acid
D) strong electrolyte, strong acid
E) weak electrolyte, strong acid

5) How many H+ ions can the acid, H_2SO_4 , donate per molecule? 5) D
A) 0 B) 1 C) 3 D) 2

6) Give the temperature and pressure at STP. 6) A
A) 0°C and 1.00 atm
B) 300K and 1 torr Hg
C) 25°C and 30.00 in Hg
D) 0°C and 1 mm Hg
E) 0K and 1.00 atm

MC = 52 pts
SA = 90 pts
LA = 58 pts
Name = 1 pt.

7) Convert 1.25 atm to mm Hg. 7) B
A) 1000 mm Hg
B) 950 mm Hg
C) 875 mm Hg
D) 760 mm Hg
E) 1520 mm Hg

8) How many molecules of N_2O_4 are in 76.3 g N_2O_4? The molar mass of N_2O_4 is 92.02 g/mol. 8) B

A) 4.59×10^{25} N_2O_4 molecules
B) 4.99×10^{23} N_2O_4 molecules
C) 1.38×10^{24} N_2O_4 molecules
D) 7.26×10^{23} N_2O_4 molecules
E) 5.54×10^{25} N_2O_4 molecules

9) Give the approximate bond angle for a molecule with a tetrahedral shape. 9) D

A) 90° B) 105° C) 180° D) 109.5° E) 120°

10) Which of the following compounds is **soluble** in water? 10) C

A) $BaSO_4$
B) $PbCl_2$
C) CaS
D) $MgCO_3$
E) None of these compounds is soluble in water.

11) How many moles of NaCl are required to make 250 mL of a 3.00 M solution? 11) C

A) 0.250 moles B) 3 moles C) 0.750 moles D) 750 moles

12) Which of the following elements is a noble gas? 12) C

A) K B) O C) Ar D) Br E) N

13) Identify the species that has the smallest radius. 13) C

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

14) According to the following balanced reaction, how many moles of HNO_3 are formed from 8.44 moles of NO_2 if there is plenty of water present? 14) E

$$3\ NO_2(g) + H_2O(l) \rightarrow 2\ HNO_3(aq) + NO(g)$$

A) 8.44 moles HNO_3
B) 25.3 moles HNO_3
C) 2.81 moles HNO_3
D) 1.83 moles HNO_3
E) 5.63 moles HNO_3

15) A molecule containing a central atom with sp hybridization has a(n) _____ electron geometry. 15) B

A) tetrahedral
B) linear
C) trigonal bipyramidal
D) trigonal planar
E) bent

16) The outside temperature is 35°C, what is the temperature in K? 16) E

A) -238 K B) 95 K C) 31 K D) 63 K (E) 308 K

17) Which reaction below represents the first ionization of O? 17) A

(A) $O(g) \rightarrow O^+(g) + e^-$

B) $O(g) + e^- \rightarrow O^-(g)$

C) $O^+(g) + e^- \rightarrow O(g)$

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

E) $O^-(g) \rightarrow O(g) + e^-$

18) Identify the compound with ionic bonding. 18) C

A) He B) Li (C) NaCl D) S E) H_2O

19) Identify the charges of the protons, neutrons, and electrons. 19) A

(A) protons +1, neutrons 0, electrons -1

B) protons -1, neutrons 0, electrons +1

C) protons 0, neutrons +1, electrons -1

D) protons +1, neutrons -1, electrons 0

E) protons 0, neutrons -1, electrons +1

20) How many valence shell electrons does an atom of indium (In) have? 20) D

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

21) Describe the shape of a p orbital. 21) D

A) three connected balls

B) eight connected balls

C) four connected balls

(D) two connected balls

E) a ball

22) Place the following in order of **increasing** dipole moment. 22) C

I. BCl_3 II. BIF_2 III. $BClF_2$

Cl closer to F than I is to F

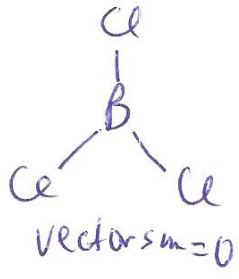
A) I < II < III

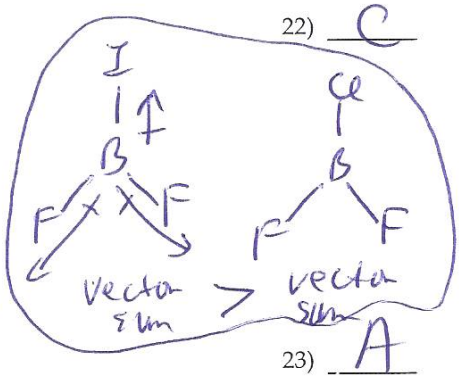
B) II < III < I

(C) I < III < II

D) I < II = III

E) II < I < III





23) A double covalent bond contains _____ of electrons. 23) A

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

24) Which of the following solutions will have the highest concentration of chloride ions? 24) D

A) 0.10 M $MgCl_2$
B) 0.10 M NaCl
C) 0.05 M $CaCl_2$
D) 0.10 M $AlCl_3$
E) All of these solutions have the same concentration of chloride ions.

25) How many silver atoms are contained in 3.75 moles of silver? 25) D

A) 6.23×10^{24} silver atoms
B) 6.50×10^{25} silver atoms
C) 1.61×10^{23} silver atoms
D) 2.26×10^{24} silver atoms
E) 2.44×10^{26} silver atoms

26) Place the following elements in order of **increasing** electronegativity. (hint : most electronegative element is F) 26) E

K Cs P

A) P < K < Cs
B) K < P < Cs
C) P < Cs < K
D) Cs < P < K
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. ~~(92 pts)~~ (90 pts)

27) 1. Fill in the blank or circle the correct choice (2 pts per blank , ~~50~~ 48 pts)

a. The element symbol for the element **calcium** Ca

b. The name of the element with the symbol **O** Oxygen (the letter O, not the number zero)

c. one mole of the element **Fr** weighs 223 grams and contains

d. 6.02×10^{23} atoms of **Fr**

e. An example of a (period) or (group) [circle one] is the column or row going from **Be to Ra**

f. An example of one of the elements which is a **transition metal**

is the element Co (fill in with the symbol for an element)

g. For the element **Co** the atomic mass is 58.9 and

h. the atomic number is 27

i. The charge for the ionic form of the element **Rb** is +1.

This number is the same as the { (group) or (period) [circle one] number}

j. The charge for the ionic form of the element **Br** is -1

This number is derived from the equation {(group) or (period) number minus 8}

k. What is the oxidation state of **Br** in **Br_2** 0

l. What is the oxidation state of elemental **K** 0

m. Principal quantum number is abbreviated n (a letter) and is correlated

n. with period numbers in the periodic table.

o Principal quantum numbers are also called the (shell, subshell, orbital) (circle one)

p The Principal quantum number gives (how far the electron is from the nucleus) (the shape of the electrons cloud around the nucleus) (circle one)

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

r. Maximum number of electrons in the **p** subshell is 6 (give # in blank)

s. The **p** block of the periodic table consists of Group (i) IIIA to Group (j) VIIIA.

(using the exact group number in the periodic table handed out with this exam)

left off -1 ea

t. For the angular momentum quantum number $\ell = 2$ the symbol is (s, p, d, f) (circle one)

0 1 2 3

u. The bigger atomic size (atomic radius) is the element(circle one) **(K)** or **(Ca)**

2. The formula weight (molecular weight) of $Al(NO_3)_3$ is (show work) (5 pts)

-1 each

Al = 27.0, N = 14.0, O = 16.0

NW = no work

NA = not attempted

$27 + [14.0 + 3(16)] \times 3 = 213.0\ g/mol$

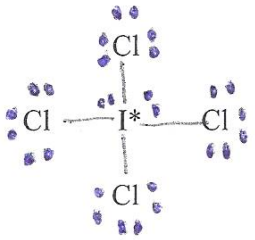
-1 each

NW + wrong answer -5

3. The definition of molarity (M) is (6 pts, 3 pts top, 3 pts bottom)

$$\text{molarity (M)} = \frac{\#\text{ moles of [(solute) or (solvent) or (solution)] (circle one)}}{\#\text{ liters of [(solute) or (solvent) or (solution)] (circle one)}}$$

4. For the following molecule given the following Lewis Dot structure, complete the following using the VSEPRT attached chart (14 pts, 2 pts per blank or choice)



number of electron pairs around the atom with the * 6

number of lone pairs around atom with the * 2

geometry of the electron pairs around the atom with the * octahedral

geometry of the molecule around the atom with the * square planar

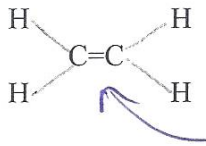
hybridization of the atom with the * sp^3d^2

$\delta+$ $\delta-$

The bond I--------Cl is a [(polar) or (nonpolar)] (circle one) bond

The molecule as a whole is a [(polar) or (nonpolar)] (circle one) molecule. vector = 0 sum

6. Show the conversion of the Carbon valence atomic orbital from the unhybridized carbon to the sp^2 hybridized carbon in C_2H_4. Use arrows to represent electrons (4 pts, 2 pt electron, 2 pts orbitals)



sp^2

sp^2 hybridized carbon (you need to show both the orbitals and the electrons in the orbitals)

1 1 1 1
sp^2 p

↑ hybridize (3 sp^2 orbitals)

1 1 1 1
2s 2p

↑ promote $\bar{e}$

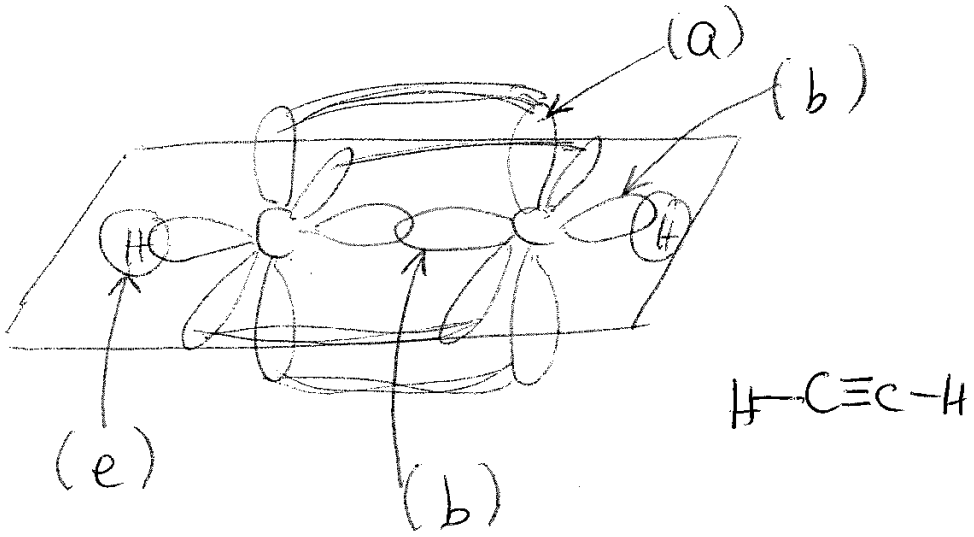
$\bar{e}$ −2pts

orbitals −2pt

unhybridized carbon 1 1 1 1
2s 2p

7. Given the diagram showing the orbitals, label the orbitals with the appropriate letter shown below by filling in the blank with the appropriate letter. You may not use all of the letter given and you may use the letters more than one time. (2 pts each blank, 8 pts total)

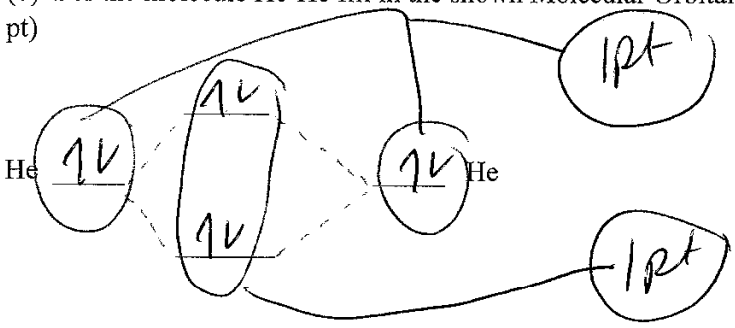
(a) carbon **p** orbital (b) carbon **sp** hybridized orbital (c) carbon **sp²** hybridized orbital (d) carbon **sp³** hybridized orbital (e) Hydrogen **s** orbital



8. (a) Give the electron configuration for one He atom using the $1s^2, 2s^2 \cdots$ notation (2 pts)

$He \rightarrow 1s^2$

(b). For the molecule He-He fill in the shown Molecular Orbital (MO) with arrows for electrons. (2 pt)



(c) The molecule He_2 is [(stable) or (unstable)] (circle one) molecule based on your filled in MO? (1 pt)

graded absolutly not consistent w your (b)

Part III. Long Answer (58 pts) NW − W = (−10) (same as bad attempt)

1. Please show all work for full credit and you will get partial credit for any work shown. Both parts refer to the same balanced reaction. (30 pts) for # 1 bad attempt −10 attempt −7

$H_2SO_4 + 2\,NaOH \rightarrow Na_2SO_4 + 2\,H_2O$

(15 pt) a. For the above balanced chemical reaction (assuming complete reaction, assuming all reagent are completly soluble in water and a large excess of the other reactant), if you start the reaction with 39.5 grams of NaOH (molar mass NaOH = 40.01 g NaOH / mol NaOH) how many grams of Na_2SO_4 (molar mass Na_2SO_4 = 142.07 g Na_2SO_4 / mol Na_2SO_4) would you get?

$$39.5\ g\ NaOH \times \frac{1\ mol\ NaOH}{40.01\ g\ NaOH} \times \frac{1\ mol\ Na_2SO_4}{2\ mol\ NaOH} \times \frac{142.07\ g\ Na_2SO_4}{1\ mol\ Na_2SO_4}$$

(3pt) (3pt) (3pt) (3pt)

$= 70.1\ g\ Na_2SO_4$ (3pt)

upside down −1 pt

math −1 pt

(15pt) b. For the above balanced chemical reaction, if you have 83.7 mL of 0.25 M solution of NaOH how many **moles** of H_2O will you make assuming complete reaction and a large excess of the other reactant. (15 pts)

(4pt)

$$83.7\ mL\ soln\ NaOH \times \frac{0.25\ mol\ NaOH}{1000\ mL\ soln\ NaOH} \times \frac{2\ mol\ H_2O}{2\ mol\ NaOH} =$$

(4pt) (4pt)

$0.0209\ mol\ H_2O$ (4pt)

upside down −1 pt

math −1 pt

28 pts total

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

each -2 pt

$1s^2, 2s^2, 2p^4$

missing half -3 pt

b. Give the **valence** electron configuration for the same element using the same notation (7 pts)

not valence -3

$2s^2, 2p^4$

Consistent OK w@

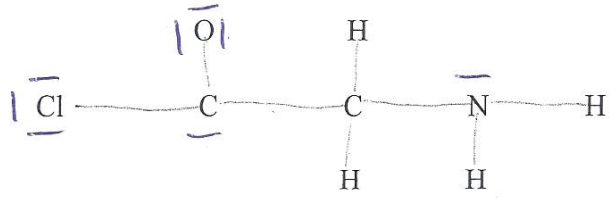
c. Give the Lewis Dot Structure for the molecule ~~$C_2OCl_2NH_2$~~ C_2H_4ONCl for which I have provided the formula and framework below by:

(1). Give the total number of valence electrons for the molecule 30 (7 pts)
(show work for fullcredit)

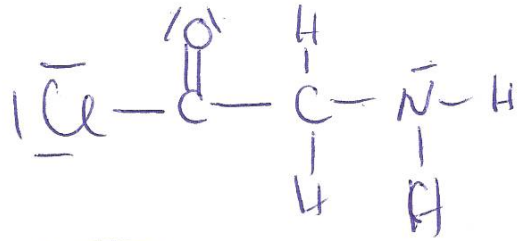
C-4, O-6, Cl-7, N-5, H-1

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

(2). Complete the Lewis Dot Structure **Hint: This Lewis Dot structure nas one double bond**. (you may have an expanded octet) Elements in period 1 & 2 cannot expand its octet. The formula for the Lewis Dot structure is: C_2H_4ONCl (7 pts)



16 x 2 = 32
too many e



15 x 2 = 30 e

attempt -2 pt.
bad attempt -4 pt

correct trial structure — OK.

Final General Chemistry I (CHEM 101) II 12/6/12 8:30 am T,R Dr. Hahn combined Exam # _____

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) 200 pts exam, worth 150 pts of 800 pts

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts per question, 52 pts pts total)

MC = 52 pts
SA = 90 pts
LA = 58 pts
Name = 1 pt.

1) Describe the shape of a p orbital. 1) D
A) four connected balls
B) three connected balls
C) a ball
D) two connected balls
E) eight connected balls

2) Identify HCl. 2) C
A) nonelectrolyte
B) strong electrolyte, weak acid
C) strong electrolyte, strong acid
D) weak electrolyte, strong acid
E) weak electrolyte, weak acid

3) Identify the compound with ionic bonding. 3) A
A) NaCl B) S C) H_2O D) He E) Li

4) How many moles of NaCl are required to make 250 mL of a 3.00 M solution? 4) B
A) 750 moles B) 0.750 moles C) 0.250 moles D) 3 moles

5) Place the following in order of **increasing** dipole moment. 5) C

I. BCl_3 II. BIF_2 III. $BClF_2$

A) II < III < I
B) I < II = III
C) I < III < II
D) I < II < III
E) II < I < III

6) How many valence shell electrons does an atom of indium (In) have? 6) A
A) 3 B) 1 C) 49 D) 2

7) The outside temperature is 35°C, what is the temperature in K? 7) C
A) 95 K B) 31 K C) 308 K D) 63 K E) -238 K

8) Give the approximate bond angle for a molecule with a tetrahedral shape. 8) D
A) 105° B) 180° C) 90° D) 109.5° E) 120°

9) Which of the following elements is a noble gas? 9) D

A) O B) K C) N D) Ar E) Br

10) How many H^+ ions can the acid, H_2SO_4, donate per molecule? 10) B

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

11) Which of the following compounds is **soluble** in water? 11) B

A) $PbCl_2$

B) CaS

C) $MgCO_3$

D) $BaSO_4$

E) None of these compounds is soluble in water.

12) Which of the following is a molecular (covalent) compound? 12) D

A) $NaNO_3$ B) RbBr C) $CuCl_2$ D) CH_3Cl E) KCl

13) How many molecules of N_2O_4 are in 76.3 g N_2O_4? The molar mass of N_2O_4 is 92.02 g/mol. 13) B

A) 1.38×10^{24} N_2O_4 molecules

B) 4.99×10^{23} N_2O_4 molecules

C) 4.59×10^{25} N_2O_4 molecules

D) 7.26×10^{23} N_2O_4 molecules

E) 5.54×10^{25} N_2O_4 molecules

14) Which of the following have the same number of valence electrons? 14) A

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

15) Which of the following represent the Lewis structure for N? 15) E

A) ·N: B) N: C) :N: D) N· E) :N·

16) Which of the following solutions will have the highest concentration of chloride ions? 16) D

A) 0.10 M NaCl

B) 0.10 M $MgCl_2$

C) 0.05 M $CaCl_2$

D) 0.10 M $AlCl_3$

E) All of these solutions have the same concentration of chloride ions.

17) Identify the species that has the smallest radius. 17) C

A) anion B) neutral

C) cation D) they are all the same size

18) According to the following balanced reaction, how many moles of HNO_3 are formed from 8.44 moles of NO_2 if there is plenty of water present? 18) A

$$3\ NO_2(g) + H_2O(l) \rightarrow 2\ HNO_3(aq) + NO(g)$$

A) 5.63 moles HNO_3
B) 8.44 moles HNO_3
C) 2.81 moles HNO_3
D) 1.83 moles HNO_3
E) 25.3 moles HNO_3

19) Place the following elements in order of **increasing** electronegativity. (hint : most electronegative element is F) 19) D

K Cs P

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

20) Identify the charges of the protons, neutrons, and electrons. 20) D

A) protons +1, neutrons −1, electrons 0
B) protons −1, neutrons 0, electrons +1
C) protons 0, neutrons +1, electrons −1
D) protons +1, neutrons 0, electrons −1
E) protons 0, neutrons −1, electrons +1

21) Which reaction below represents the first ionization of O? 21) D

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

22) Convert 1.25 atm to mm Hg. 22) D

A) 760 mm Hg
B) 1000 mm Hg
C) 1520 mm Hg
D) 950 mm Hg
E) 875 mm Hg

23) Give the temperature and pressure at STP. 23) D

A) 300K and 1 torr Hg
B) 0K and 1.00 atm
C) 25°C and 30.00 in Hg
D) 0°C and 1.00 atm
E) 0°C and 1 mm Hg

24) How many silver atoms are contained in 3.75 moles of silver? 24) D

A) 6.50×10^{25} silver atoms
B) 2.44×10^{26} silver atoms
C) 6.23×10^{24} silver atoms
D) 2.26×10^{24} silver atoms
E) 1.61×10^{23} silver atoms

25) A molecule containing a central atom with sp hybridization has a(n) _____ electron geometry. 25) B

A) trigonal bipyramidal
B) linear
C) trigonal planar
D) tetrahedral
E) bent

26) A double covalent bond contains _____ of electrons. 26) A

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

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answer the question. (92 pts)

48 pts

27) 1. Fill in the blank or circle the correct choice (2 pts per blank , ~~50~~ pts)

a. The element symbol for the element **silicon** Si

b. The name of the element with the symbol **C** Carbon

c. one mole of the element **Zr** weighs 91,2 grams and contains

d. 6.02×10^{23} atoms of **Zr**

e. An example of a (period) or (group) [circle one] is the column or row going from **Rb to Xe**

f. An example of one of the elements which is a **halogen**

is the element Cl (fill in with the symbol for an element)

g. For the element **Cu** the atomic mass is 63,5 and

h. the atomic number is 29

i. The charge for the ionic form of the element **Be** is +2.

This number is the same as the { (group) or (period) [circle one] number}

j. The charge for the ionic form of the element **Te** is −2

This number is derived from the equation {(group) or (period) number minus 8}

k. What is the oxidation state of **F** in $\mathbf{F_2}$ 0

l. What is the oxidation state of elemental **Li** 0

m. Principal quantum number is abbreviated n (a letter) and is correlated

n. with Period numbers in the periodic table.

o Principal quantum numbers are also called the (shell, subshell, orbital) (circle one)

p The Principal quantum number gives (how far the electron is from the nucleus) (the shape of the electrons cloud around the nucleus) (circle one)

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

r. Maximum number of electrons in the **d** subshell is 10 (give # in blank)

s. 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 exam)

left off -1pt

t. For the angular momentum quantum number $\ell = 1$ the symbol is (s, p, d, f) (circle one)

u. The bigger atomic size (atomic radius) is the element(circle one) **(S) or (O)**

1pt ea

NW = no work

NA = not attempted

2. The formula weight (molecular weight) of $Ca_3(PO_4)_2$ is (show work) (5 pts)

Ca = 40.08 P = 30.97 O = 16.0

$3(40.08) + 2[30.97 + 4(16.0)] = 310.18\ g/mol$

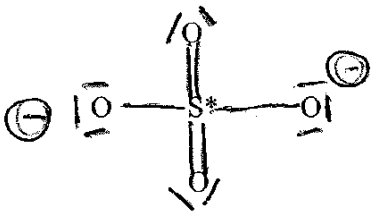
1pt each

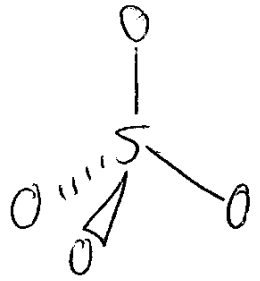
NW + wrong answer -5

3. The definition of molarity (M) is (6 pts, 3 pts top, 3 pts bottom)

$$\text{molarity (M)} = \frac{\#\text{ moles of [(solute) or (solvent) or (solution)] (circle one)}}{\#\text{ liters of [(solute) or (solvent) or (solution)] (circle one)}}$$

4. For the following molecule given the following Lewis Dot structure, complete the following using the VSEPRT attached chart (14 pts, 2 pts per blank or choice)





number of electron pairs around the atom with the * 4

number of lone pairs around atom with the * 0

geometry of the electron pairs around the atom with the * tetrahedral

geometry of the molecule around the atom with the * tetrahedral

hybridization of the atom with the * sp^3

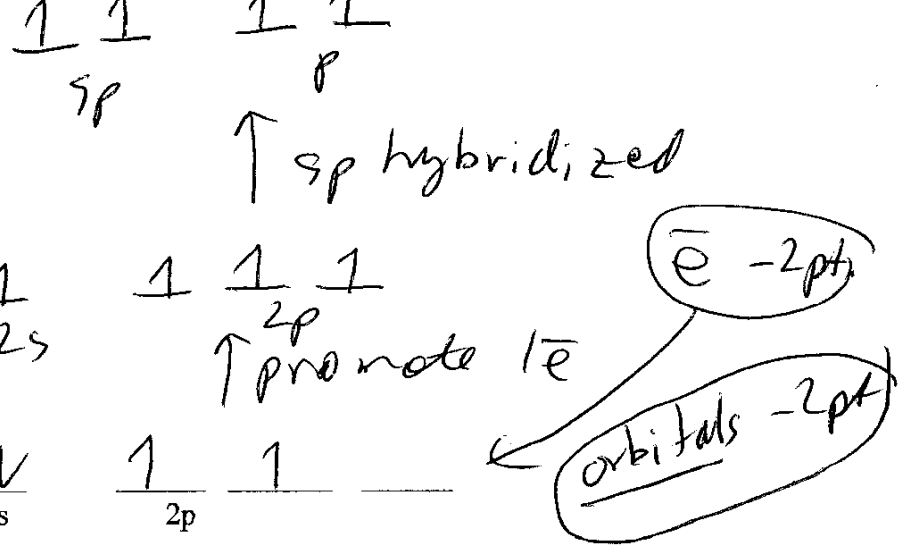
The bond S-----O is a [(polar) or (nonpolar)] (circle one) bond

The molecule as a whole is a [(polar) or (nonpolar)] (circle one) molecule. vector sum = 0

6. Show the conversion of the Carbon valence atomic orbital from the unhybridized carbon to the sp hybridized carbon in C_2H_2 Use arrows to represent electrons (4 pts, 2 pts electron, 2 pts orbitals)

H—C≡C—H

sp hybridized carbon (you need to show both the orbitals and the electrons in the orbitals)

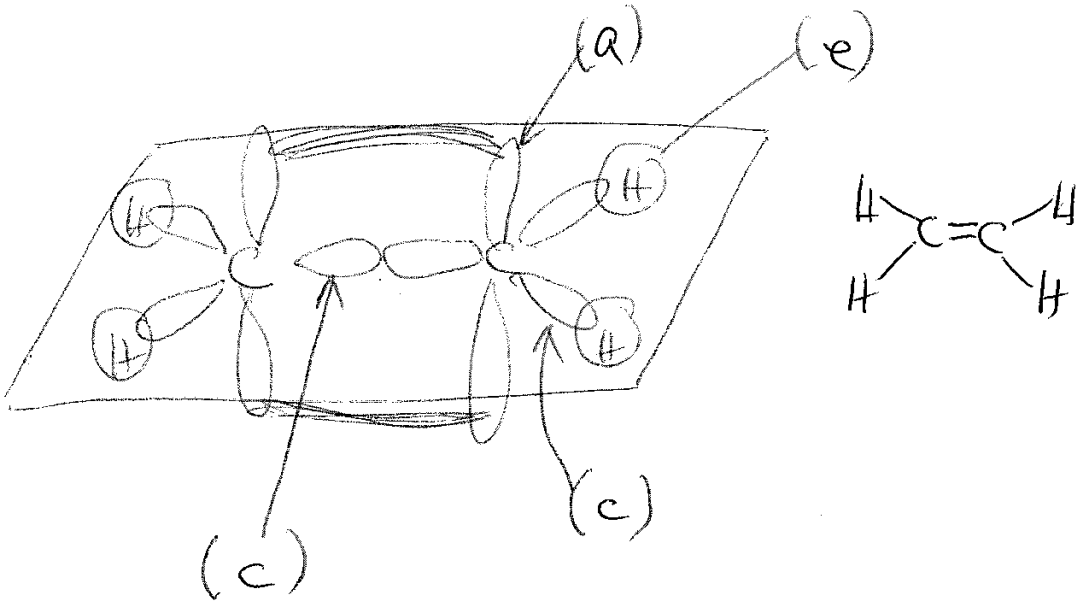


unhybridized carbon 1V 1 1 ___ ___

2s 2p

7. Given the diagram showing the orbitals, label the orbitals with the appropriate letter shown belo by filling in the blank with the appropriate letter. You may not use all of the letter given and yo may use the letters more than one time. (2 pts each blank, 8 pts total)

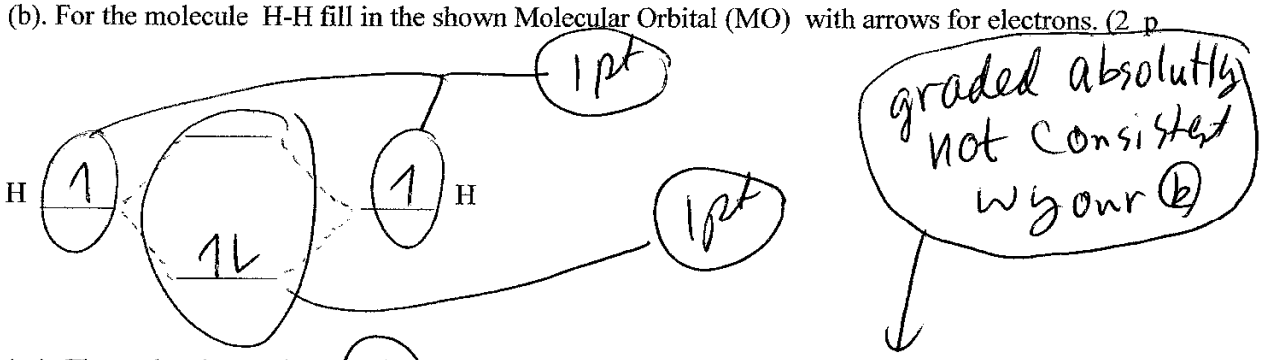
(a) carbon **p** orbital (b) carbon **sp** hybridized orbital (c) carbon **sp²** hybridized orbital (d) carbon **sp³** hybridized orbital (e) Hydrogen **s** orbital



8. (a) Give the electron configuration for one H atom using the $1s^2, 2s^2 \ldots$ notation (2 pts)

$1s^1$

(b). For the molecule H-H fill in the shown Molecular Orbital (MO) with arrows for electrons. (2 p



(c). The molecule H_2 is [(stable) or (unstable)] (circle one) molecule based on your filled in MO? (1 pt)

Part III. Long Answer (58 pts)

NW - correct #answer = -10 pt same as bad attempt

1. Please show all work for full credit and you will get partial credit for any work shown. Both parts refer to the same balanced reaction. (30 pts)

for #1 attempt 1 — bad attempt -10 pt

$2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$

a. For the above balanced chemical reaction (assuming complete reaction, assuming all reagent are completly soluble in water and a large excess of the other reactant), if you start the reaction with 107.4 grams HNO_3 (molar mass HNO_3 = 63.02 g HNO_3 / mol HNO_3) how many grams of $Ca(NO_3)_2$ (molar mass $Ca(NO_3)_2$= 102.09 g $Ca(NO_3)_2$ / mol $Ca(NO_3)_2$) would you get? (15 pt)

$$107.4\ g\ HNO_3 \times \frac{1\ mol\ HNO_3}{63.02\ g\ HNO_3} \times \frac{1\ mol\ Ca(NO_3)_2}{2\ mol\ HNO_3} \times \frac{102.09\ g\ Ca(NO_3)_2}{1\ mol\ Ca(NO_3)_2}$$

(3pt) (3pt) (3pt)

upside down -1 pt

$$= 86.99\ g\ Ca(NO_3)_2$$

(3pt)

math -1 pt

b. For the above balanced chemical reaction, if you have 32.9 mL of 0.10 M solution of HNO_3, how many **moles** of H_2O will you make assuming complete reaction and a large excess of the other reactant. (15 pts)

(15pt) (4pt)

$$32.9\ mL\ HNO_3 \times \frac{0.10\ mol\ HNO_3}{1000\ mL\ HNO_3\ soln} \times \frac{2\ mol\ H_2O}{2\ mol\ HNO_3} =$$

(4pt) (4pt)

$$3.29 \times 10^{-3}\ mol\ H_2O$$

(3pt)

upside down -1 pt

math -1 pt

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

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

28 pts total

-1 pt each part

b. Give the **valence** ~~electron~~ configuration for the same element using the same ~~notation~~. (7 pts)

$4s^2, 4p^3$

consistent w above OK

not valence -3 pt

missing half -3 pt

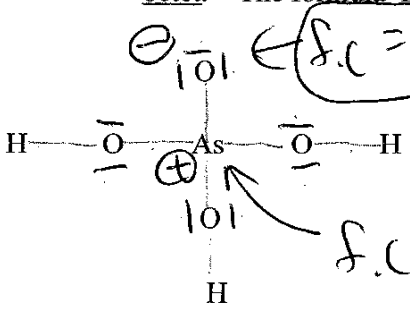
c. Give the Lewis Dot Structure for the molecule **H_3AsO_4** for which I have provided the formula and framework below by:

(1). Give the total number of valence electrons for the molecule 32 (7 pts) (show work for fullcredit)

$3(1) + 5 + 4(6) = 32$

H As O

(2). Complete the Lewis Dot Structure **Hint: This Lewis Dot structure has one double bond.** (you may have an expanded octet) Elements in period 1 & 2 cannot expand its octet. The formula for the ~~Lewis Dot structure~~ is: **H_3AsO_4** (7 pts)



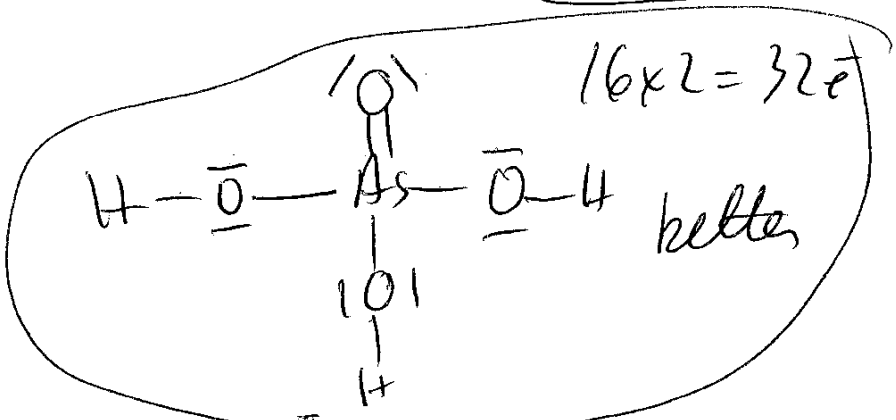
$\ominus$ 101 $\in$ f.c. $= 6 - \frac{2}{2} - 6 = -1$ $16 \times 2 = 32$

attempt -2pt

bad attempt -4pt

f.c. $= 5 - \frac{8}{2} = +1$

correct trial structure OK



$16 \times 2 = 32e^-$

better

Final General Chemistry I (CHEM 101) I 12/6/12 955 am T,R Dr. Hahn combined Exam # _____

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. I If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) 200 pts on exam, worth 150 pts of 800 pts

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

2) Give the approximate bond angle for a molecule with a linear shape. 2) D
A) 109.5° B) 90° C) 120° D) 180° E) 105°

3) The outside temperature is 35°C, what is the temperature in K? 3) E
A) 31 K B) 63 K C) –238 K D) 95 K E) 308 K

4) How many H^+ ions can the acid, H_2SO_4, donate per molecule? 4) B
A) 1 B) 2 C) 3 D) 0

5) Which of the following is an ionic compound? 5) C
A) NO_2 B) CF_4 C) LiCl D) PCl_3 E) $SeBr_2$

6) Identify a cation. 6) C
A) An atom that has gained an electron. B) An atom that has gained a proton.
C) An atom that has lost an electron. D) An atom that has lost a proton.

MC = 52 pts
SA = 90 pts
CA = 58 pts
Name = 1 pt

7) Convert 1.25 atm to mm Hg. 7) C
A) 760 mm Hg
B) 1000 mm Hg
C) 950 mm Hg
D) 875 mm Hg
E) 1520 mm Hg

8) Determine the mass of an object that has a volume of 88.6 mL and a density of 9.77 g/mL. 8) A
A) 866 g B) 1100 g C) 907 g D) 298 g E) 568 g

9) Which of the following compounds is **<u>insoluble</u>** in water? 9) C
A) $MgSO_4$
B) BaS
C) Hg_2I_2
D) $(NH_4)_2CO_3$
E) All of these compounds are soluble in water.

10) Which of the following represent the Lewis structure for Cl? 10) C

A) ·Cl: B) ·Cl: C) :Cl: D) :Cl: E) Cl·

11) Identify the compound with covalent bonding. 11) C

A) He B) Li C) H_2O D) NaCl E) S

12) A molecule containing a central atom with sp^2 hybridization has a(n) _____ electron geometry. 12) A

A) trigonal planar
B) linear
C) trigonal bipyramidal
D) bent
E) tetrahedral

13) How many iron atoms are contained in 354 g of iron? 13) A

A) 3.82×10^{24} Fe atoms
B) 2.62×10^{25} Fe atoms
C) 9.50×10^{22} Fe atoms
D) 4.69×10^{24} Fe atoms
E) 2.13×10^{26} Fe atoms

14) How many valence electrons does a neutral tellerium atom have? 14) D

A) 4 B) 52 C) 2 D) 6

15) Determine the molarity of a solution formed by dissolving 97.7 g LiBr in enough water to yield 750.0 mL of solution. (molar mass of LiBr = 86.845 g LiBr/mol LiBr) 15) B

A) 1.18 M B) 1.50 M C) 0.768 M D) 0.130 M E) 2.30 M

16) How many moles of N_2O_4 are in 76.3 g N_2O_4? The molar mass of N_2O_4 is 92.02 g/mol. 16) D

A) 7.02×10^3 moles
B) 1.00 mole
C) 1.21 moles
D) 0.829 moles
E) 1.42×10^{-4} moles

17) Which reaction below represents the **electron affinity** of Li? 17) D

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

18) What volume will 0.780 moles of He occupy at STP? 18) A

A) 17.5 L B) 43.7 atm C) 22.4 L D) 15.6 L E) 70.0 L

19) Identify the species that has the smallest radius. 19) B

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

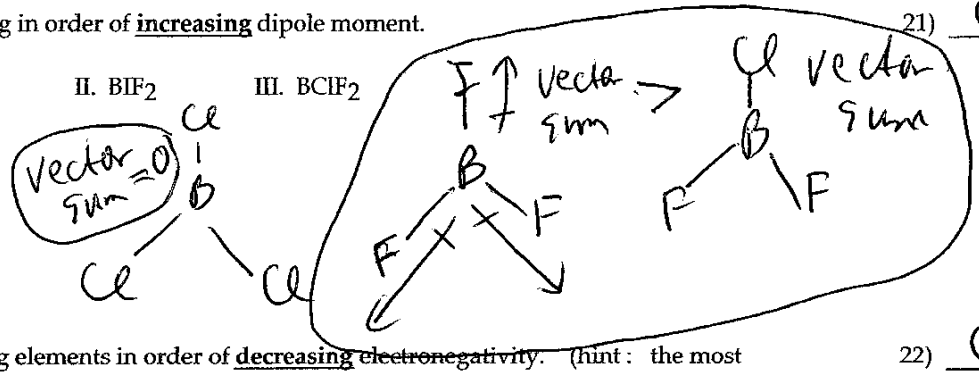
20) Which of the following elements is an alkali metal? 20) C

A) Xe B) Ca C) Li D) Zn E) F

21) Place the following in order of **increasing** dipole moment. 21) E

I. BCl_3 II. BIF_2 III. $BClF_2$

A) I < II < III
B) II < I < III
C) II < III < I
D) I < II = III
E) I < III < II



22) Place the following elements in order of **decreasing** ~~electronegativity~~. (hint: the most electronegative element is F) 22) C

S Cl Se

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

23) What is the volume of 0.175 mol of O_2 at 7.78 atm and 415K? 23) A

A) 0.766 L B) 1.53 L C) 565 L D) 25.0 L E) 24.5 L

24) Which of the following have the same number of valence electrons? 24) B

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

25) Give the name for H_2SO_4. 25) B

A) sulfurous acid
B) sulfuric acid
C) persulfuric acid
D) persulfurous acid
E) hyposulfurous acid

26) Determine the concentration of a solution prepared by diluting 20.0 mL of a 0.200 M NaCl to 250.0 mL. ($M_1V_1 = M_2V_2$) 26) E

A) 0.0320 M B) 0.00800 M C) 2.50 M D) 0.160 M E) 0.0160 M

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answer the question. ~~(42 pts)~~ (90 pts)

27) 1. Fill in the blank or circle the correct choice (2 pts per blank, ~~50~~ 48 pts)

a. The element symbol for the element **argon** Ar

b. The name of the element with the symbol **P** phosphorus

c. one mole of the element **Os** weighs 190.23 grams and contains

d. 6.02×10^{23} atoms of **Os**

e. An example of a (period) or (group) [circle one] is the column or row going from **O to Po**

f. An example of one of the elements which is a **alkali metal**

is the element K (fill in with the symbol for an element)

g. For the element **La** the atomic mass is 138.9 and

h. the atomic number is 57

i. The charge for the ionic form of the element **Fr** is +1.

This number is the same as the {(group) or (period) [circle one] number}

j. The charge for the ionic form of the element **Se** is −2

This number is derived from the equation {(group) or (period) number minus 8}

k. What is the oxidation state of **H** in H_2 0

l. What is the oxidation state of elemental **Mg** 0

m. Principal quantum number is abbreviated n (a letter) and is correlated

n. with period numbers in the periodic table.

o Principal quantum numbers are also called the (shell, subshell, orbital) (circle one)

p The Principal quantum number gives (how far the electron is from the nucleus) (the shape of the electrons cloud around the nucleus) (circle one)

q. In the **s** subshell, there are 1 (give # in blank) orbitals.

r. Maximum number of electrons in the **s** subshell is 2 (give # in blank)

s. 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)

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

u. The bigger atomic size (atomic radius) is the element(circle one) (C) or (F)

left off, -1 pt

2. The formula weight (molecular weight) of $Mg(NO_3)_2$ is (show work) (5 pts)

1pt each

$Mg = 24.3$, $N = 14.0$, $O = 16.0$

$24.3 + 2(14.0) + 6(16.0) = 148.3$ g/mol

NW + wrong answer # -5

1pt each

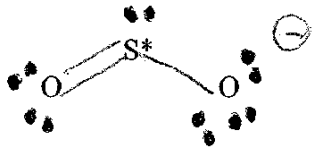
NW = no work

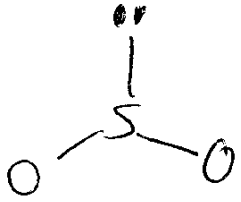
NA = not attempted

3. The definition of molarity (M) is (6 pts, 3 pts top, 3 pts bottom)

$$\text{molarity (M)} = \frac{\#\text{ moles of [(solute) or (solvent) or (solution)] (circle one)}}{\#\text{ liters of [(solute) or (solvent) or (solution)] (circle one)}}$$

4. For the following molecule given the following Lewis Dot structure, complete the following using the VSEPRT attached chart (14 pts, 2 pts per blank or choice)





number of electron pairs around the atom with the * 3

number of lone pairs around atom with the * 1

geometry of the electron pairs around the atom with the * trigonal planar

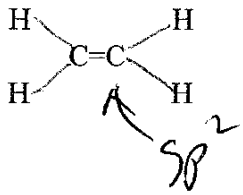
geometry of the molecule around the atom with the * bent

hybridization of the atom with the * sp^2

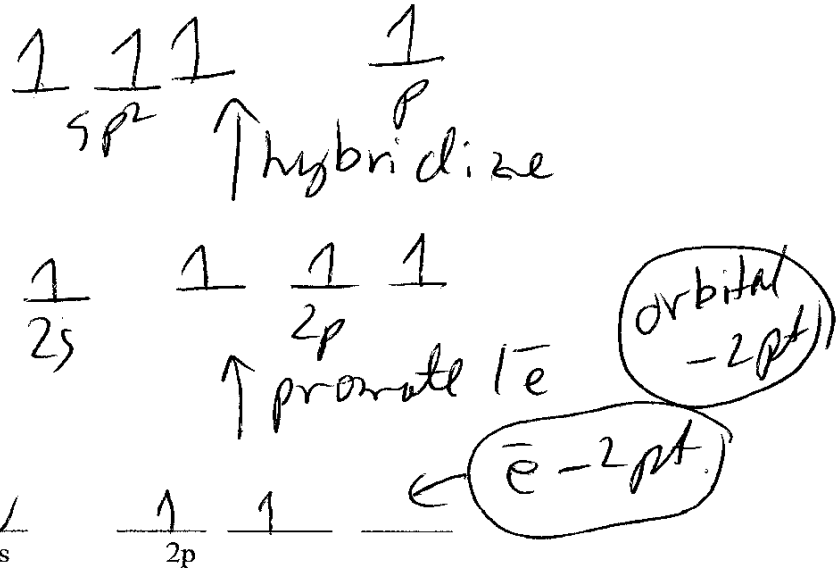
The bond S-----O is a [(polar) or (nonpolar)] (circle one) bond

The molecule as a whole is a [(polar) or (nonpolar)] (circle one) molecule. vector sum ≠ 0

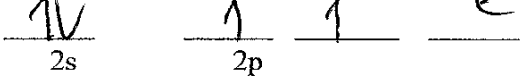
6. Show the conversion of the Carbon valence atomic orbital from the unhybridized carbon to the sp^2 hybridized carbon in C_2H_4. Use arrows to represent electrons (4 pts, 2 pt electron, 2 pts orbitals)



sp^2 hybridized carbon (you need to show both the orbitals and the electrons in the orbitals)

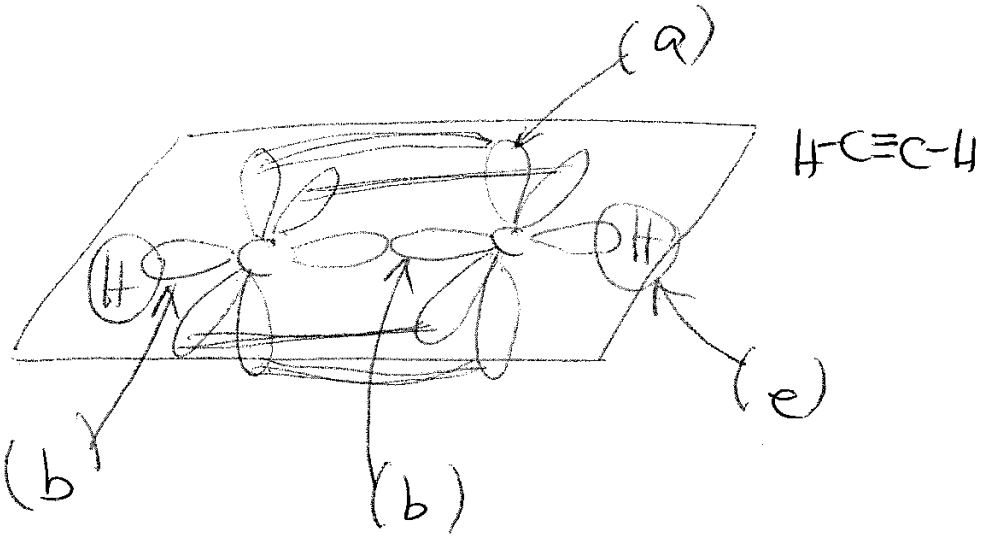


unhybridized carbon



7. Given the diagram showing the orbitals, label the orbitals with the appropriate letter shown belo by filling in the blank with the appropriate letter. You may not use all of the letter given and yo may use the letters more than one time. (2 pts each blank, 8 pts total)

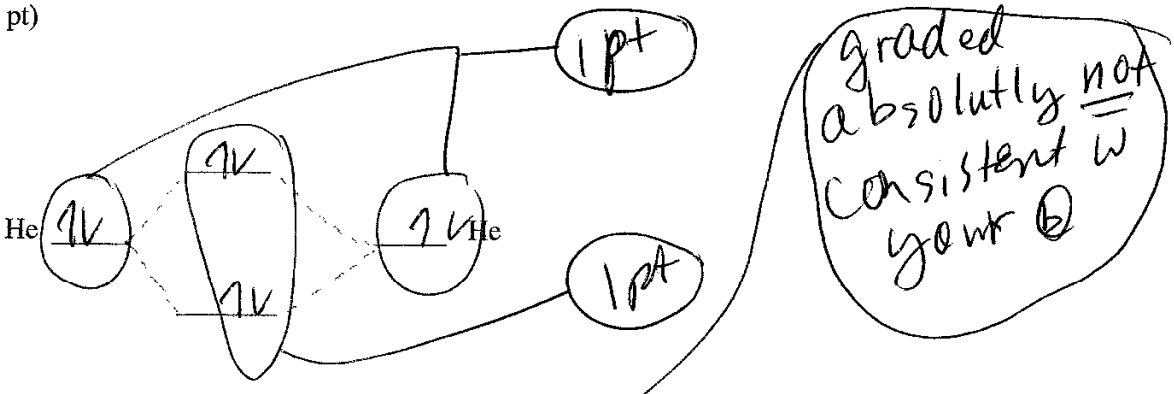
(a) carbon **p** orbital (b) carbon **sp** hybridized orbital (c) carbon **sp²** hybridized orbital (d) carbon **sp³** hybridized orbital (e) Hydrogen **s** orbital



8. (a) Give the electron configuration for one He atom using the $1s^2, 2s^2 \ldots$ notation (2 pts)

$He \rightarrow 1s^2$

(b). For the molecule He-He, fill in the shown Molecular Orbital (MO) with arrows for electrons. (2 pt)



(c). The molecule He_2 is [(stable) or (unstable)] (circle one) molecule based on your filled in MO? (1 pt)

NW - wcorrect # answer = -10 same as bad attempt

Part III. Long Answer (58 pts)

1. Please show all work for full credit and you will get partial credit for any work shown. Both parts refer to the same balanced reaction. (30 pts) for #1 attempt -7pt bad attempt -10pt

$2HCl + Sr(OH)_2 \rightarrow SrCl_2 + 2\,H_2O$

15pt

a. For the above balanced chemical reaction (assuming complete reaction, assuming all reagents are completly soluble in water and a large excess of the other reactant), if you start the reactio with 29.7 grams $Sr(OH)_2$ (molar mass $Sr(OH)_2$ = 121.64 g $Sr(OH)_2$ / mol $Sr(OH)_2$) how many grams of H_2O (molar mass H_2O = 18.02 g H_2O / mol H_2O) would you get?

$$29.7\text{ g } Sr(OH)_2 \times \frac{\text{mol } Sr(OH)_2}{121.64\text{ g } Sr(OH)_2} \times \frac{2\text{ mol } H_2O}{1\text{ mol } Sr(OH)_2} \times \frac{18.02\text{ g } H_2O}{1\text{ mol } H_2O} = 8.74\text{ g } H_2O$$

3pt 3pt 3pt 3pt 3pt

upside down -1pt math -1pt

15pt

b. For the above balanced chemical reaction, if you have 12.5 mL of 1.0 M solution of HCl how many **moles** of H_2O will you make assuming complete reaction and a large excess of the other reactant. (15 pts)

$$12.5\text{ mL HCl soln} \times \frac{1.0\text{ mol HCl}}{1000\text{ mL HCl soln}} \times \frac{2\text{ mol } H_2O}{2\text{ mol HCl}} = 0.0125\text{ mol } H_2O$$

4pt 4pt 4pt 3pt

upside down -1pt math -1pt

28pt

2. a. Give the electron configuration for the element **Cl** sing the $1s^2$, $2s^2$

nomenclature (7 pts) Cl

$1s^2, 2s^2, 2p^6, 3s^2, 3p^5$ ~1pt each

b. Give the **valence** electron configuration for the same element using the same notation. (7 pts)

$3s^2, 3p^5$ Consistent w/ your@ OK

not valence -3

missing half -3

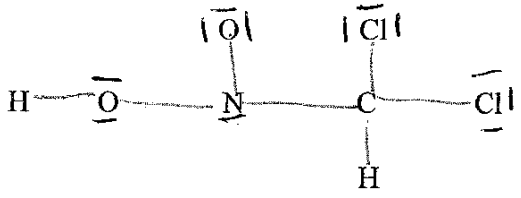
c. Give the Lewis Dot Structure for the molecule $NO_2\ H_2CCl\ 2^{\oplus}$ for which I have provided the formula and framework below by:

(1). Give the total number of valence electrons for the molecule 36 (7 pts)
(show work for fullcredit)

N-5, O-6, H-1, C-4, Cl-7 1pt each

$5 + 2(6) + 2(1) + 4 + 2(7) - 1 = 36$ 1pt

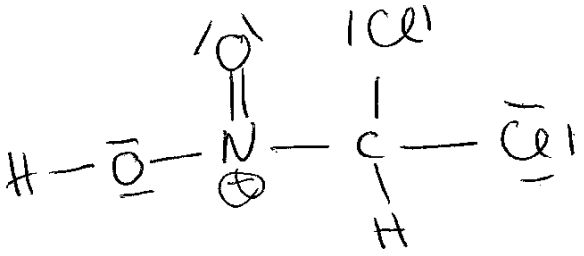
(2). Complete the Lewis Dot Structure **Hint: ~~This Lewis Dot structure~~ has one double bond.** (you may have an expanded octet) Elements in period 1 & 2 cannot expand its octet. The formula for the Lewis Dot structure is: $NO_2\ H_2CCl\ 2^{+}$ (7 pts)



19x2 = 38

attempt -2pt

bad attempt -4pt



18x2 = 36

Correct Trial structure OK

Final General Chemistry I (CHEM 101) II 12/6/12 955 am T,R Dr. Hahn combined Exam # _____

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. I If I cannot read your work, I obviously cannot grade it. (1 pts print and sign exam) (200 pts on exam, worth 150 pts of 800 pts)

Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts per question, ~~28~~ pts total) 52 pts total

1) Which of the following compounds is **insoluble** in water? 1) A
A) Hg_2I_2
B) $MgSO_4$
C) BaS
D) $(NH_4)_2CO_3$
E) All of these compounds are soluble in water.

2) Identify the compound with covalent bonding. 2) B
A) Li B) H_2O C) He D) NaCl E) S

3) Identify a cation. 3) D
A) An atom that has gained an electron. B) An atom that has gained a proton.
C) An atom that has lost a proton. D) An atom that has lost an electron.

4) The outside temperature is 35°C, what is the temperature in K? 4) A
A) 308 K B) 63 K C) 31 K D) 95 K E) –238 K

5) How many valence electrons does a neutral tellerium atom have? 5) A
A) 6 B) 52 C) 2 D) 4

6) Which of the following represent the Lewis structure for Cl? 6) C
A) Cl· B) ·Cl: C) :Cl: D) ·Cl: E) :Cl:

7) How many moles of N_2O_4 are in 76.3 g N_2O_4? The molar mass of N_2O_4 is 92.02 g/mol. 7) B
A) 1.42×10^{-4} moles
B) 0.829 moles
C) 1.00 mole
D) 7.02×10^{3} moles
E) 1.21 moles

MC = 52 pts
SA = 90 pts
LA = 58 pts
name = 1 pt

8) Which reaction below represents the **electron affinity** of Li? 8) D
A) $Li^+(g) \rightarrow Li(g) + e^-$
B) $Li^+(g) + e^- \rightarrow Li(g)$
C) $Li(g) + e^- \rightarrow Li^+(g)$
D) $Li(g) + e^- \rightarrow Li^-(g)$
E) $Li(g) \rightarrow Li^+(g) + e^-$

9) Determine the molarity of a solution formed by dissolving 97.7 g LiBr in enough water to yield 750.0 mL of solution. (molar mass of LiBr = 86.845 g LiBr/mol LiBr) 9) E

A) 2.30 M B) 0.130 M C) 0.768 M D) 1.18 M E) 1.50 M

10) What volume will 0.780 moles of He occupy at STP? 10) C

A) 22.4 L B) 70.0 L C) 17.5 L D) 43.7 atm E) 15.6 L

11) How many H^+ ions can the acid, H_2SO_4 , donate per molecule? 11) C

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

12) What is the volume of 0.175 mol of O_2 at 7.78 atm and 415K? 12) C

A) 565 L B) 1.53 L C) 0.766 L D) 24.5 L E) 25.0 L

13) How many iron atoms are contained in 354 g of iron? 13) B

A) 4.69×10^{24} Fe atoms

B) 3.82×10^{24} Fe atoms

C) 2.13×10^{26} Fe atoms

D) 2.62×10^{25} Fe atoms

E) 9.50×10^{22} Fe atoms

14) A triple covalent bond contains _____ of electrons. 14) E

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

15) Convert 1.25 atm to mm Hg. 15) A

A) 950 mm Hg

B) 1000 mm Hg

C) 1520 mm Hg

D) 760 mm Hg

E) 875 mm Hg

16) Which of the following have the same number of valence electrons? 16) C

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

17) Place the following elements in order of **decreasing** electronegativity. (hint : the most electronegative element is F) 17) A

S Cl Se

A) Cl > S > Se

B) Se > Cl > S

C) S > Cl > Se

D) Se > S > Cl

E) Cl > Se > S

18) Determine the concentration of a solution prepared by diluting 20.0 mL of a 0.200 M NaCl to 250.0 mL. ($M_1V_1 = M_2V_2$) 18) D

A) 0.160 M B) 0.0320 M C) 2.50 M D) 0.0160 M E) 0.00800 M

19) Which of the following elements is an alkali metal? 19) D

A) Zn B) Ca C) Xe D) Li E) F

20) Give the name for H_2SO_4. 20) E

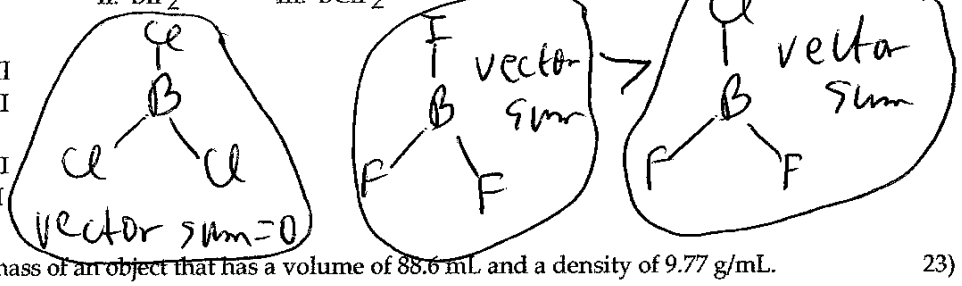
A) persulfuric acid
B) sulfurous acid
C) persulfurous acid
D) hyposulfurous acid
E) sulfuric acid

21) Identify the species that has the smallest radius. 21) C

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

22) Place the following in order of **increasing** dipole moment. 22) A

I. BCl_3 II. BIF_2 III. $BClF_2$



A) I < III < II
B) I < II < III
C) I < II = III
D) II < I < III
E) II < III < I

23) Determine the mass of an object that has a volume of 88.6 mL and a density of 9.77 g/mL. 23) A

A) 866 g B) 907 g C) 568 g D) 1100 g E) 298 g

24) Which of the following is an ionic compound? 24) A

A) LiCl B) NO_2 C) CF_4 D) $SeBr_2$ E) PCl_3

25) A molecule containing a central atom with sp^2 hybridization has a(n) _____ electron geometry. 25) A

A) trigonal planar
B) trigonal bipyramidal
C) linear
D) tetrahedral
E) bent

26) Give the approximate bond angle for a molecule with a linear shape. 26) A

A) 180° B) 105° C) 120° D) 109.5° E) 90°

Part II Short Answer: Write the word or phrase or circle the choice that best completes each statement or answer the question. ~~(42 pts)~~ 90 pts

27)

1. Fill in the blank or circle the correct choice (2 pts per blank , ~~50~~ 48 pts)

a. The element symbol for the element **helium** He

b. The name of the element with the symbol **S** sulfur

c. one mole of the element **Hg** weighs 200.59 grams and contains

d. 6.02×10^{23} atoms of **Hg**

e. An example of a (period) or (group) [circle one] is the column or row going from **Na to Ar**

f. An example of one of the elements which is a **alkaline earth metal**

is the element Ca (fill in with the symbol for an element)

g. For the element **W** the atomic mass is 183.8 and

h. the atomic number is 74

i. The charge for the ionic form of the element **Ra** is +2.

This number is the same as the { (group) or (period) [circle one] number}

j. The charge for the ionic form of the element **At** is -1

This number is derived from the equation {(group) or (period) number minus 8}

k. What is the oxidation state of **O** in $\mathbf{O_2}$ 0

l. What is the oxidation state of elemental **Ca** 0

m. Principal quantum number is abbreviated n (a letter) and is correlated

n. with period numbers in the periodic table.

o Principal quantum numbers are also called the (shell, subshell, orbital) (circle one)

p The Principal quantum number gives (how far the electron is from the nucleus) (the shape of the electrons cloud around the nucleus) (circle one)

q. In the **f** subshell, there are 7 (give # in blank) orbitals.

r. Maximum number of electrons in the **f** subshell is 14 (give # in blank)

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

left off -1pt

(using the exact group number in the periodic table handed out with this exam)

t. For the angular momentum quantum number ℓ = **3** the symbol is (s, p, d, f) (circle one) 0 1 2 3

u. The bigger atomic size (atomic radius) is the element(circle one) **(N)** or **(P)**

1pt ea

2. The formula weight (molecular weight) of $Sr_3(PO_4)_2$ is (show work) (5 pts)

NW = no work
NA = not attempted

Sr = 87.6, P = 30.97, O = 16.0

$3(87.6) + (30.97)(2) + (16.0)(8) = 452.74\ g$

mol

$Sr_3(PO_4)_2$

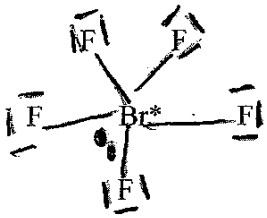
1pt

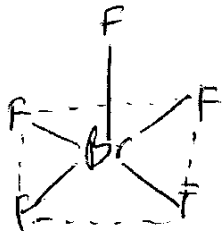
NW+ wrong # -5

3. The definition of molarity (M) is (6 pts, 3 pts top, 3 pts bottom)

$$\text{molarity (M)} = \frac{\#\text{ moles of [(solute) or (solvent) or (solution)] (circle one)}}{\#\text{ liters of [(solute) or (solvent) or (solution)] (circle one)}}$$

4. For the following molecule given the following Lewis Dot structure, complete the following using the VSEPRT attached chart (14 pts, 2 pts per blank or choice)





number of electron pairs around the atom with the * 6

number of lone pairs around atom with the * 1

geometry of the electron pairs around the atom with the * Octahedral

geometry of the molecule around the atom with the * Square pyramidal

hybridization of the atom with the * sp^3d^2

The bond Br--------F is a [(polar) or (nonpolar)] (circle one) bond

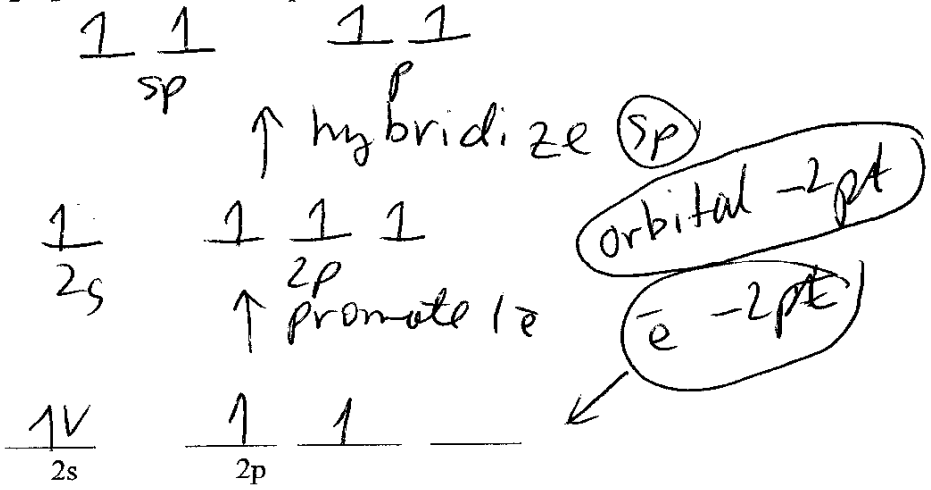
The molecule as a whole is a [(polar) or (nonpolar)] (circle one) molecule.

6. Show the conversion of the Carbon valence atomic orbital from the unhybridized carbon to the sp hybridized carbon in C_2H_2. Use arrows to represent electrons (4 pts, 2 pt electron, 2 pts orbitals)

H—C≡C—H

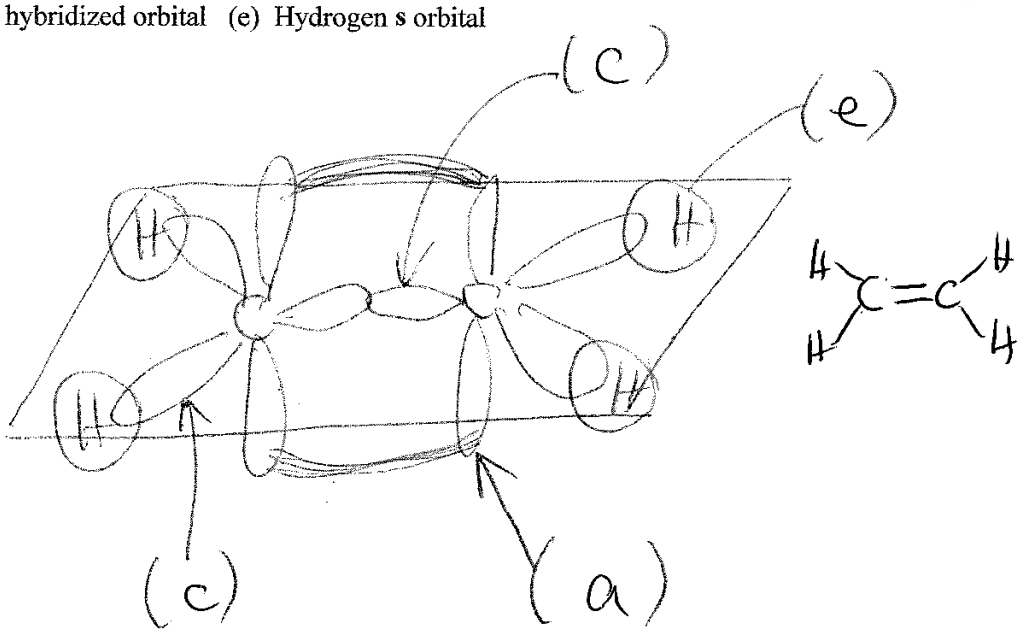
sp hybridized carbon (you need to show both the orbitals and the electrons in the orbitals)

unhybridized carbon



7. Given the diagram showing the orbitals, label the orbitals with the appropriate letter shown belo by filling in the blank with the appropriate letter. You may not use all of the letter given and yo may use the letters more than one time. (2 pts each blank, 8 pts total)

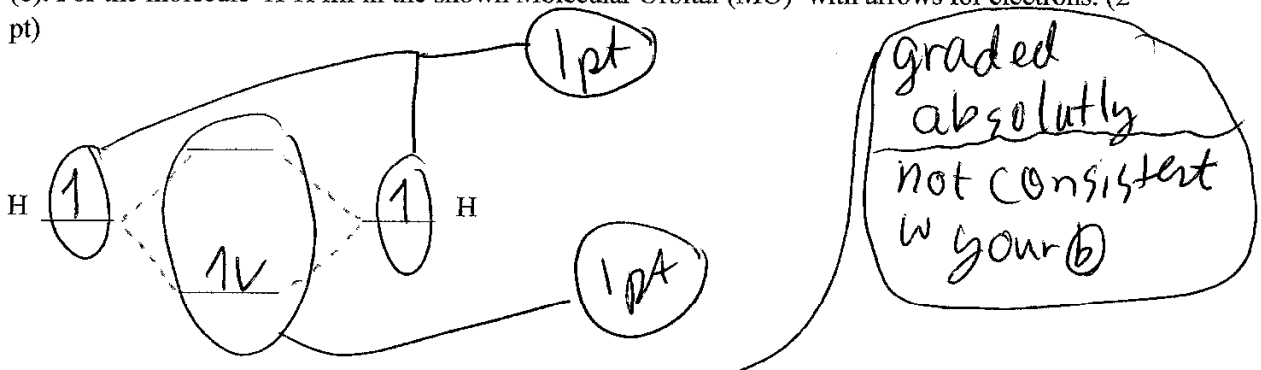
(a) carbon **p** orbital (b) carbon **sp** hybridized orbital (c) carbon **sp²** hybridized orbital (d) carbon **sp³** hybridized orbital (e) Hydrogen **s** orbital



8. (a) Give the electron configuration for one H atom using the $1s^2, 2s^2 \cdots$ notation (2 pts)

$H \rightarrow 1s^1$

(b). For the molecule H-H fill in the shown Molecular Orbital (MO) with arrows for electrons. (2 pt)



(c). The molecule H_2 is [(stable) or (unstable)] (circle one) molecule based on your filled in MO? (1 pt)

Part III. Long Answer (58 pts)

NW - w correct # answer = (-10) same as bad attempt

1. Please show all work for full credit and you will get partial credit for any work shown. Both parts refer to the same balanced reaction. (30 pts)

For #1 attempt -7pt

bad attempt -10pt

$H_2SO_4 + 2\,KOH \rightarrow K_2SO_4 + 2\,H_2O$

(15pt) a. For the above balanced chemical reaction (assuming ~~complete reaction, assuming all~~ reagent are completly soluble in water and a large excess of the other reactant), if you start the reactio with 16.8 grams H_2SO_4 (molar mass H_2SO_4 = 98.09 g H_2SO_4 / mol H_2SO_4) how many grams of H_2O (molar mass H_2O = 18.02 g H_2O / mol H_2O) would you get?
(15 pts, show work)

$16.8\ g\ H_2SO_4 \times \frac{1\ mol\ H_2SO_4}{98.09\ g\ H_2SO_4} \times \frac{2\ mol\ H_2O}{1\ mol\ H_2SO_4} \times \frac{18.02\ g}{1\ mol\ H_2O} = 6.17\ g\ H_2O$

3pt 3pt 3pt 3pt 3pt

upside down -1pt

math -1pt

(15pt) b. For the above balanced ~~chemical~~ reaction, if you have 125.2 mL of 1.5 M solution of KOH how many **moles** of H_2O will you make assuming complete reaction and a large excess of the other reactant. (15 pts)

$125.2\ mL\ KOH\ solution \times \frac{1.5\ mol\ KOH}{1000\ mL\ KOH\ soln.} \times \frac{2\ mol\ H_2O}{2\ mol\ KOH} = 0.19\ mol\ H_2O$

4pt 4pt 4pt 3pt

upside down -1pt

math -1pt

28 pts total

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

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

b. Give the **valence** electron configuration for the same element using the same notation. (7 pts)

$4s^2, 4p^4$ Missing half -3 pt

not valence -3 pt

Consistent w/your@OK

C_2H_3OFSe

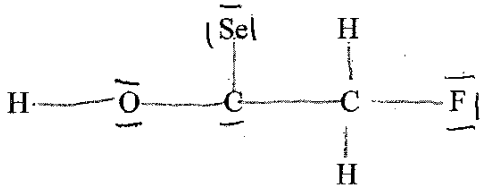
c. Give the Lewis Dot Structure for the molecule ~~C_2OSH_3F~~ for which I have provided the formula and framework below by:

(1). Give the total number of valence electrons for the molecule 30 (7 pts)
(show work for fullcredit)

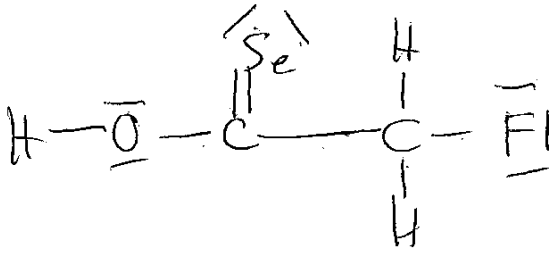
$2(4) + 6 + 6 + 3(1) + 7 = 30$
C O Se H

(2). Complete the Lewis Dot Structure **Hint: This Lewis Dot structure has one double bond**. (you may have an expanded octet) Elements in period 1 & 2 cannot expand its octet. The formula for the Lewis Dot structure is: ~~C_2OSH_3F~~ (7 pts)

$16 \times 2 = 32$ ← C_2H_3OFSe



attempt -2 pt
bad attempt -4 pt



$15 \times 2 = 30$

correct trial structure OK