TEST 4
General Chemistry
CH115
Fall 2008
UMass Boston

Name_____KEY _____
PLESE PRINT CLEARLY

The test has 12 questions some with many sections.

show all work.

Please make sure you have 5 pages including a cover and a periodic table before you start.

Do not write below this line

Question 1	10 points	
Question 2	10 points	
Question 3	5 points	
Question 4	5 points	
Question 5	5 points	
Question 6	5 points	
Question 7	10 points	
Question 8	5 points	
Question 9	5 points	
Question 10	5 points	
Question 11	19 points	
Question 12	16 points	
Total	100 points	

1.Which electrons will experience the greater effective nuclear charge: (5points)

Electrons in n=3 shell of Ar.
Electrons in n=3 shell of Kr.

Answer _Kr_____

Which n = 3 electrons from above examples will be close to the nucleus and why? (5points)

The Kr electrons will be closer
There are10 electrons being polled by 18 protons in Ar but there are 10 electrons being pulled by 36 protons in Kr bringing them closer to the nucleus.

2. Based on their positions in the periodic table predict which atom will have a larger first ionization energy N or O.

(5points)

Answer: _____N_____

Explain why: (5 points)

In O the electron has to be removed from a pair in the 2p orbital. There is extra repulsion associated with two electrons in the same orbit making the first ionization energy of O to be lower than N. The resulting p orbital in O will have three unpaired electrons, which is a stable position and that too will make the removal of the paired electron to be favorable. So O will have lower first ionization energy.

3. Write the electron configuration of Sb^{2+} **or** Se^{2-} (5 points)

Sb^{2+} atomic number 51for Sb, and there are 49 electrons in the ion

[Kr] 4 d^{10}, $5s^{2}$, 5 p^{1}

Sc^{2-} atomic number for Se is 34, and there are 36 electrons in the ion

[Ar] $3d^{10}$, $4s^{2}$, 4 p^{6}

4. The oxide of which element can react with hydrochloric acid? (5 points)

N Se C S Na

5. Complete and balance the following reaction:
(5points)

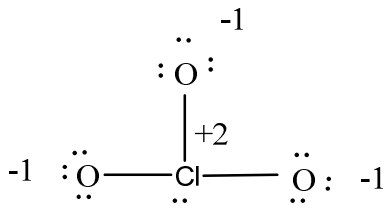
$2Na\ (s) + 2H_2O\ (l) \rightarrow 2\ NaOH\ (aq) + H_2(g)$

6. Which alkaline earth metal will not react with water or with steam? (5points)

Ba Mg Ca Be

7. Draw Lewis dot structures, showing all valence electrons, for each of the following. Your work should show a count of the total number of valence electrons. Give the formal charges on the atoms. (10points)

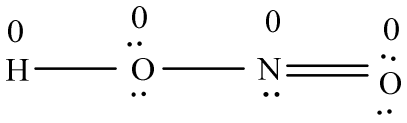
a. ClO_3^-



With a charge of -1

OR

b. HONO (The atoms are linked together in the given order.)



8. Which substance will have the most lattice energy: (5points)

MgF_2 CaF_2 ZrF_2

9. Considering the Lewis-dot representations of the following species, in which one would the central atom be considered to be electron deficient?
You not need to draw the Lewis structure (you can draw them roughly for your own understanding).

(5points)

CO_2 B F_3 XeF_2

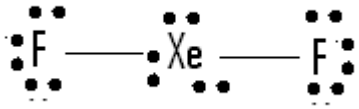
10. Judging from trends in electronegativity, which one of the following bonds would be most polar?

(5points)

Sn–Cl O–N Br–Br Cl–Br

11. Fill in Following for the molecule XeF_2

Lewis structure: (5points)



Just the name for following three, figure not required

Electron Domain geometry : Trigonal bi pyramidal _____ (4points)

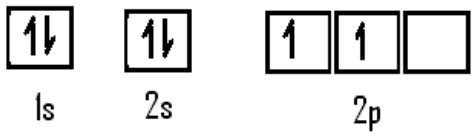
Molecular Geometry: ___Linear_____ (4 points)

Hybridization on the central atom: ____sp^3d_____ (4 points)

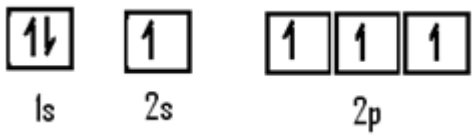
Does the molecule have a dipole moment: Yes No (2 points)

12. Starting with the orbital diagram of carbon describe the steps needed to construct hybrid orbital appropriate to describe the bonding of CH_4.

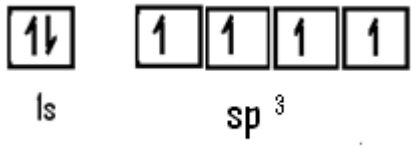
Orbital diagram of carbon (4 points)



Orbital diagram of exited state (4 points)



Orbital diagram of the hybrids (4 Points)



Draw the shape of **<u>one</u>** hybrid orbital (4 points)