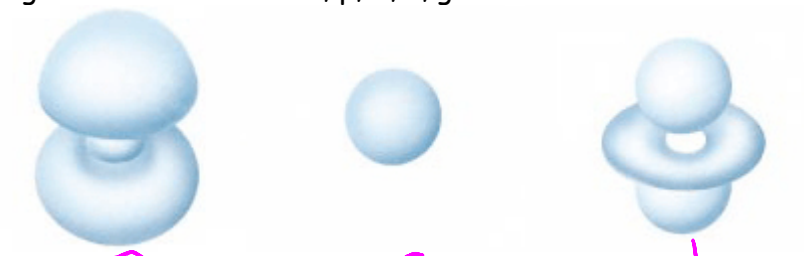
Chem 111 **Summer 2011** **Key II** **Whelan**

Question 1 (6 Points)

Label the following orbital's as either: s, p, d, f, g?



p _____ s _____ d _____

Question 2 (6 Points)

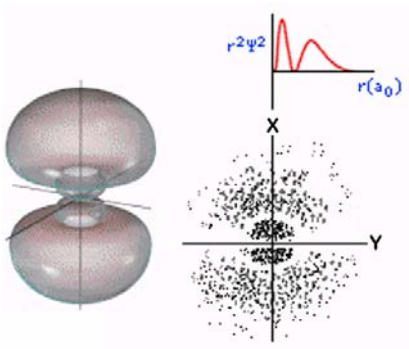
The orbital depicted on the left is:

a. What **type** of orbital? p

b. Its **n** value is? 3

c. Its **specific** designation is? $3p_x$

(x, y, z, xy, xz, yz, x^2-y^2, z^2)



Question 3 (4 Points)

Give the **complete** electronic configuration for the following:

a. **Cl** $1s^2 2s^2 2p^6 3s^2 3p^5$

b. **Ga^{3+}** $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10}$

Question 4 (8 Points)

Give the **noble gas** configuration for the following

a. **Ar** $[Ne]3s^2 3p^6$

b. **Ni^{2+}** $[Ar]3d^8$

c. **Cr** $[Ar]4s^1 3d^5$

d. **Br** $[Ar]4s^2 3d^{10} 4p^5$

Question 5 (4 Points)

How many **Valence electrons** are associated with the **Noble Gases**? 2 and 8

Question 6 (3 Points)

How many **paramagnetic** elements are there in **period 4**? 15

Question 7 (4 Points)

Using only the periodic table given with this exam rank the following elements **from 1 to 4** in order of **increasing electron affinity** (**1** being the **smallest** electron affinity and **4** the **largest** electron affinity:

2 Na 4 N 3 P 1 K

Question 8 (6 Points)

Using only the periodic table given with this exam **arrange** the following elements in order of **increasing size**: **chlorine, aluminum, gallium (Ga)**

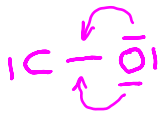
chlorine (**Smallest**) aluminum gallium (**Largest**)

Question 9
12 Points

Draw the **best** Lewis Dot structure for the following molecules

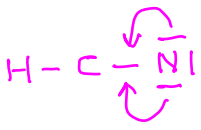
CO

C: 4
O: 6
10
1xBP −2
8
3xLP −6
2
1xLP −2
0



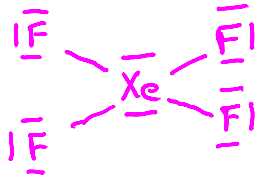
HCN

H 1
C 4
N 5
10
2xBP −4
6
3xLP −6
0



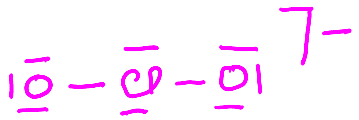
XeF_4

Xe 8
F 4x7
36
4xBP −8
28
12xLP −24
4
2xLP −4
0



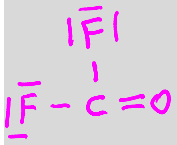
ClO_2^-

Cl 7
O 2x6
1
20
2xBP −4
16
6xLP −12
4
2xLP −4
0



Question 10
4 Points

Draw the **best** Lewis Dot structure for **F_2CO** on the rough work paper provided and answer the following questions based on your drawing.



With regards to the **central atom**:

a. The number of **lone pairs** 0
b. The number of **single bonds** 2
c. The number of **double bonds** 1

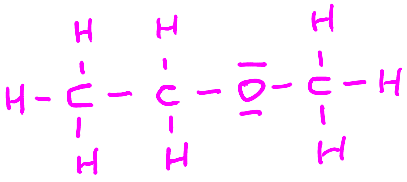
The central atom:

1) **Obeys** the Octet Rule
2) Has an **incomplete** Octet
3) Has an **expanded** Octet

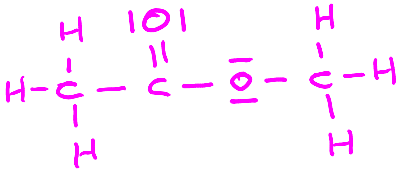
Question 11
8 Points

Draw the **best** Lewis Dot structure for the following organic molecules

$CH_3CH_2OCH_3$



CH_3COOCH_3



Question 12
9 Points
(6 Points)

Draw all **reasonable** resonance structure for **NO_2F**.

(3 Points)

Circle the best answer:

Average bond length table is on the front page of this exam.

The **N** to **O** bond **length** in **pm** is expected to be:

1. = 136 **2.** < 115 **3.** = 115 **4.** > 115

Question 13
6 Points

Using **average bond energies** (given on the front of this exam), **estimate** the **enthalpy change** for the following reaction:

$$2\ CO(g) + O_2(g) = 2CO_2(g)$$

Show Work

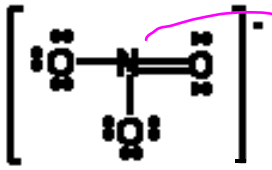
$2\ C\equiv O + O=O = 2\ O=C=O$

$2(C\equiv O) + O=O = 4(C=O)$

$\Delta H = 2(1075) + 498 - 4(803)$

-564 **kJ.mol^{-1}**

Question 14
4 Points



$5 - 0 - \frac{1}{2}(8) = 1$

Based on the Lewis structure given, the formal charge on the central nitrogen atom is: **+1**

Question 15
4 Points

A

B

C

Assign **formal charges** to **each** of the **resonance structures depicted** for SCO. Based on these numbers is there a structure that you prefer? If so circle the letter of that structure.

Question 16
6 Points

What is the **electron-pair geometry** for **Cl** in **ClO_2^-**? Tetrahedron ...

There are 2 **lone pair(s)** around the central atom, so the **molecular geometry** of **ClO_2^-** is Bent/Angular (109°).

Question 17
6 Points

What is the **electron-pair geometry** for **S** in **SF_4** Trigonal bipyramid ...

There are 1 **lone pair(s)** around the central atom, so the **molecular geometry** of **SF_4** is See-saw.