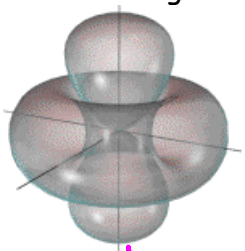
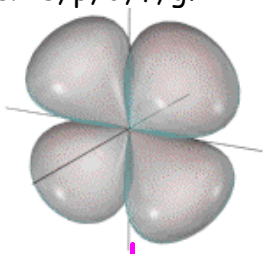
Chem 111 **Summer 2012** **Key II** **Whelan**

Question 1 (6 Points)

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



d



d

p

Question 2 (6 Points)

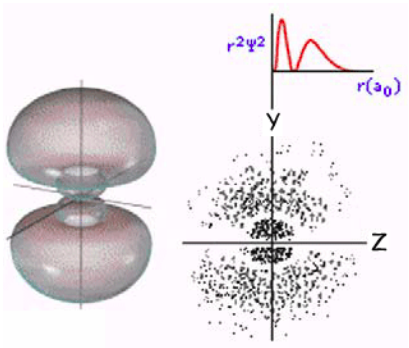
The orbital depicted on the left is:

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

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

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

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



Question 3 (8 Points)

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

a. **S** $1s^2 2s^2 2p^6 3s^2 3p^4$

b. **F^-** $1s^2 2s^2 2p^6$

c. **Mg^{2+}** $1s^2 2s^2 2p^6$

d. **Mn** $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5$

Question 4 (8 Points)

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

a. **Kr** $[Ar]\,4s^2 3d^{10} 4p^6$

b. **Cu** $[Ar]\,4s^1 3d^{10}$

c. **Fe^{2+}** $[Ar]\,3d^6$

d. **Br^-** $[Ar]\,4s^2 3d^{10} 4p^6$

Question 5 (2 Points)

The element with the electronic configuration **$[Xe]6s^2 5d^{10} 4f^{14} 6p^3$** has 5 **valence** electrons.

Question 6 (3 Points)

Give the symbol for the **diamagnetic** element(s) in **period 4**? Ca, Zn, Kr

Question 7 (5 Points)

Using only the periodic table given with this exam rank the following elements **from 1 to 5** in order of **increasing ionization** (**1** being the **smallest** ionization energy and **5** the **largest** ionization energy:

4 Al 2 Ca 5 P 1 Rb 3 Ga

Question 8 (3 Points)

Using only the periodic table given with this exam **arrange** the following elements in order of **increasing electron affinity**: **oxygen, fluorine, sulfur**

sulfur — **Smallest**

oxygen

fluorine — **Largest**

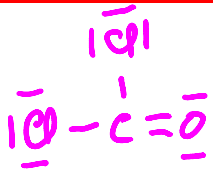
Question 9
12 Points

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

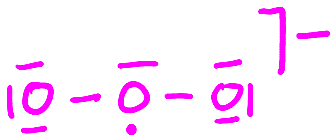
N_2

XeF_2

Cl_2CO



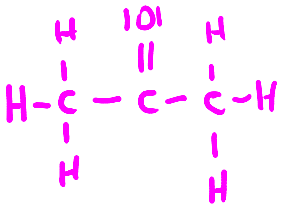
O_3^-



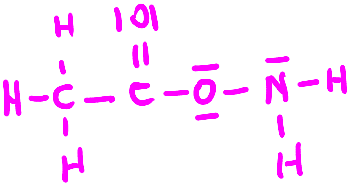
Question 10
8 Points

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

CH_3COCH_3



CH_3COONH_2



Question 11
9 Points
(6 Points)

Draw all **reasonable** resonance structure for **O_3**.

(3 Points)

Circle the best answer:

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

The **O** to **O** bond **energy** in **kJ.mol^{-1}** is expected to be:

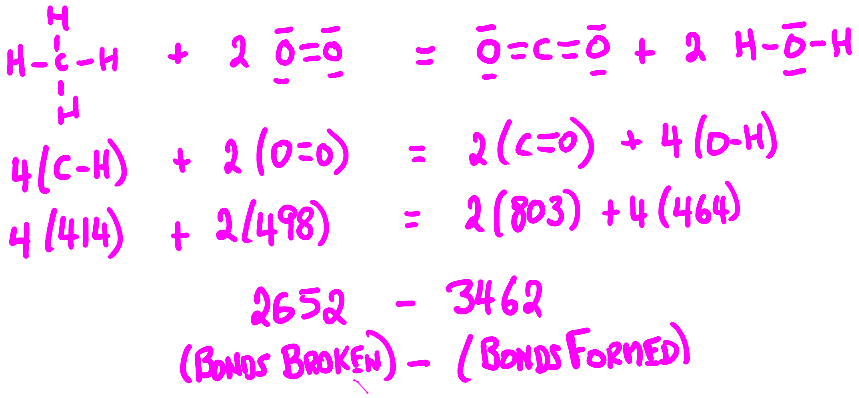
- o = 498
- o < 138
- o = 138
- o > 498
- (o) > 138

Question 12
6 Points

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

$$CH_4(g) + 2\ O_2(g) = CO_2(g) + 2\ H_2O(g)$$

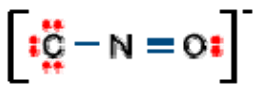
Show Work



-810 kJ.mol^{-1}

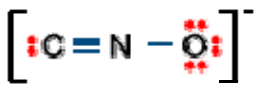
Question 13
8 Points

Assign formal charges to the elements in each of the Lewis structures below.



A

C: -3
N: +1
O: +1



B

C: -1
N: +1
O: -1

The **best** Lewis structure for **CNO** – is: **B**

Question 14
6 Points

What is the **electron-pair geometry** for **N** in NH_3? **TETRAHEDRON** …

There are **1** **lone pair(s)** around the central atom, so the **molecular geometry** of NH_3 is **TRIGONAL PYRAMID**.

Question 15
6 Points

What is the **electron-pair geometry** for **I** in IF_3 **TRIGONAL BIPYRAMID** … There are **2** **lone pair(s)** around the central atom, so the **molecular geometry** of IF_3 is **T-SHAPED**.

Question 16
4 Points

The planet **Whelanus** – far, far away in the galaxy – is somewhat like earth. Same order of elements, same order of filling orbitals, except that Hund's rule is different. Instead of 2 electrons per orbital there are **3**. This makes for a very different looking periodic table. On Whelanus give the symbols for the first 2 noble gases! **Li** **P**

Do Not Write Below This

Exam II Score	