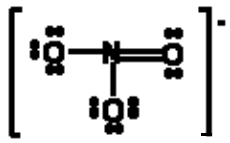
Chem 110 **Fall 2012** **Exam II** **Whelan**

SID | | | | | | | | | Last Key First Answer

Question 1 **8 Points**

To answer the questions, interpret the following Lewis diagram for NO_3^-



a) The number of **lone pair** on central atom 0

b) The number of **single** bond(s) 2

c) The number of **double** bond(s) 1

d) The number of **equivalent Lewis** structures 3

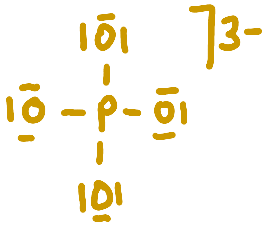
Question 2 **8 Points**

Draw a Lewis structure for each of the following where the central atom obeys the **octet rule**.

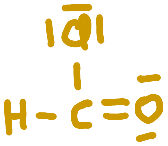
HNC (N is the central atom)

CO

PO_4^{3-}



HClCO Cl=Chlorine



Question 3 **6 Points**

On the rough work paper provided – draw a Lewis structure for **CO_3^{2-}** in which the central **C** atom obeys the octet rule, and answer the questions on the right based on your drawing.

a) The number of **unshared pairs** (**lone pairs**) on the central C atom is: 0

b) The central C atom forms 2 **single** bonds.

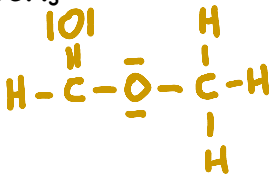
c) The central C atom forms 1 **double** bonds.

Question 4 **8 Points**

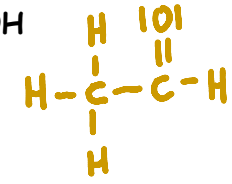
Draw a Lewis structure for each of the following **organic molecules**.

C_2H_2

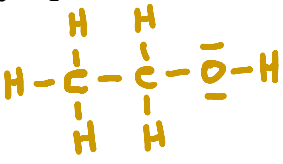
$HCOOCH_3$



CH_3COH

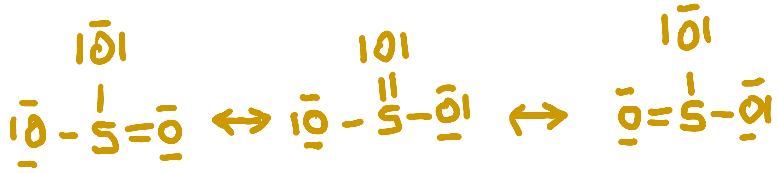


CH_3CH_2OH



Question 5
6 Points

SO_3 has resonance structures – draw them.



Question 6
8 Points

What is the **name** of the compound with the formula:

a) CF_4 Carbon tetrafluoride

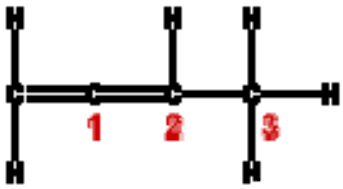
b) SCl_6 Sulfur hexachloride

What is the **formula** for:

a) **Boron trichloride** BCl_3

b) **Carbon monoxide** CO

Question 7
6 Points



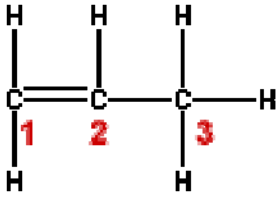
What is the **molecular geometry** about:

a) **Atom 1**: Linear

b) **Atom 2**: Trigonal planar

c) **Atom 3**: Tetrahedron

Question 8
6 Points



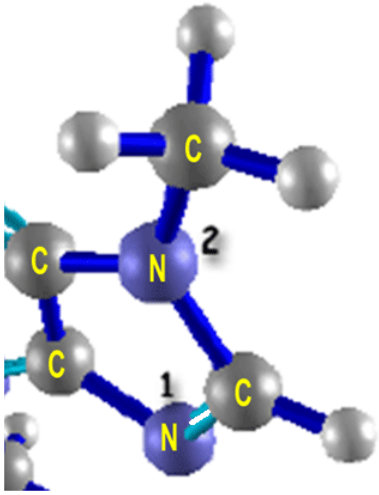
What is the **predicted bond angle** about:

a) **Atom 1**: 120°

b) **Atom 2**: 120°

c) **Atom 3**: ~109°

Question 9
6 Points



What is the **predicted bond angle** about the following atoms?

a) **Atom 1** 120°

b) **Atom 2** ~109°

Question 10
8 Points

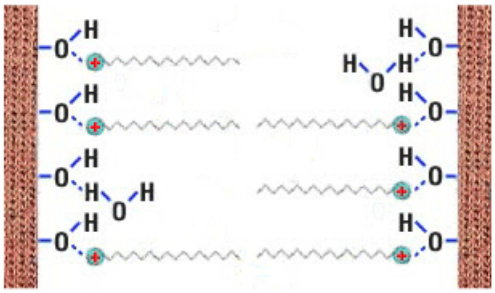
The **electron-pair geometry** around the **Xe** atom in XeO_3? Tetrahedron –

There is/are 1 **lone pair(s)** around the central atom, so the **molecular geometry** of the XeO_3 molecule is predicted to be Trigonal pyramid.

XeO_3 is Polar. (Polar/Nonpolar)

Question 11
4 Points

In our discussion on the **consequences of molecular polarity**, the depiction below was used to discuss:



a) Membranes
b) Micelle actions
c) Fabric softeners
d) The dissolution process
e) Chelating therapy.
f) Detergents

Question 12
4 Points

$N_2(g) + 3\ H_2(g) \Leftrightarrow 2\ NH_3(g)$ K = **3.5×10^8** at 298K.

Assuming you start with **N_2** and **H_2** and no **NH_3**, **circle** those of the following that **best** describes the **equilibrium system?**

a) The **reverse** reaction is favored at equilibrium.
b) **Appreciable** quantities of **all species** are present at equilibrium.
c) The **forward** reaction is favored at equilibrium.
d) **Very little N_2** will be present at equilibrium.

Question 13
4 Points

Write the **equilibrium constant expression**, K, for the following reactions:

a) $CO(g) + Cl_2(g) \Leftrightarrow COCl_2(g)$ K = $\dfrac{[COCl_2]}{[CO][Cl_2]}$

b) $H_3O^+(aq) + F^-(aq) \Leftrightarrow HF(aq) + H_2O(l)$ K = $\dfrac{[HF]}{[H_3O^+][F^-]}$

Question 14
6 Points

Consider the following system at equilibrium at 500 K:

$PCl_3(g) + Cl_2(g) \Leftrightarrow PCl_5(g)$

If the **volume** of the equilibrium system is suddenly **increased** at constant temperature::

The reaction must:

a) Run in the **forward** direction.
b) Run in the **reverse** direction.
c) Remain the **same**.

The concentration of **Cl_2** will:

a) **Increase**
b) Remain the **same**
c) **Decrease**

Question 15
6 Points

Consider the following system at equilibrium at 298 K:

$HNO_2(aq) + H_2O(l) \Leftrightarrow H_3O^+(aq) + NO_2^-(aq)$

When some **OH^-** is **added** to the equilibrium system at constant temperature:

The reaction must:

a) Run in the **forward** direction.
b) Run in the **reverse** direction.
c) Remain the **same**.

The concentration of **HNO_2** will:

a) **Increase**
b) Remain the **same**
c) **Decrease**

Question 16
6 Points

Consider the following **exothermic** reaction at equilibrium at 573 K:

$$2\ NO(g) + Cl_2(g) \Leftrightarrow 2\ NOCl(g)$$

If the **temperature** of the equilibrium system is suddenly **increased**:

The reaction must:

a) Run in the **forward** direction.
b) Run in the **reverse** direction.
c) Remain the **same**.

The concentration of Cl_2 will:

a) **Increase**
b) Remain the **same**
c) **Decrease**

Exam II Score