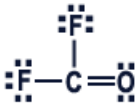
Chem 110 **Fall 2010** **Exam II** **Whelan**

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

Question 1 (8 Points) To answer the questions, interpret the following Lewis diagram for F_2CO



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

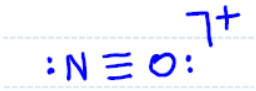
b) The number of **single** bond **2**

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

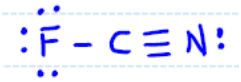
d) The number of **equivalent Lewis** structures **1**

Question 2 (9 Points) Draw a Lewis structure for each of the following where the central atom obeys the **octet rule**.

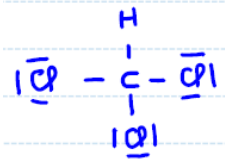
NO^+



FCN

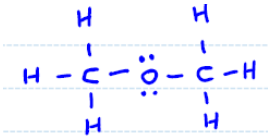


$CHCl_3$

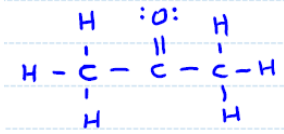


Question 3 (9 Points) Draw a Lewis structure for each of the following **organic molecules**.

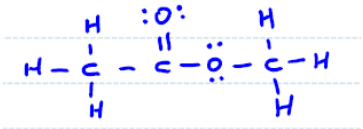
CH_3OCH_3



CH_3COCH_3



CH_3COOCH_3



Question 4 (6 Points) **NO_2^-** has resonance structures – draw them.

Question 5 (8 Points)

What is the name of the compound with the formula:

a) N_2O_5 **Dinitrogen pentoxide**

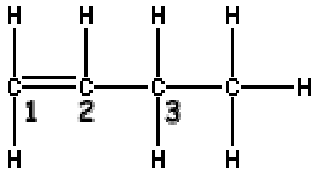
b) CCl_4 **Carbon tetrachloride**

What is the formula for:

a) **Carbon monoxide** **CO**

b) **Disulfur decafluoride** S_2F_{10}

Question 6 (6 Points)



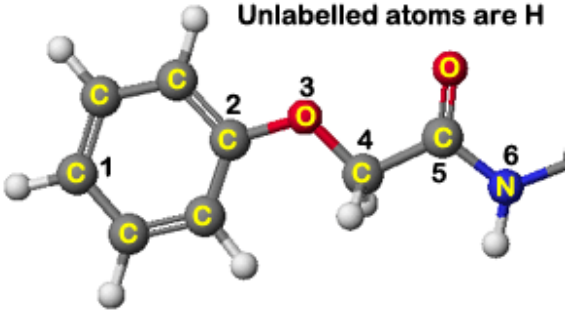
What is the bond angle about:

a) **1**: 120°

b) **2**: 120°

c) **3**: ~ 109°

Question 7 (6 Points)



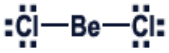
What is the **bond angle** about the following atoms?

C1 120°

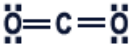
N6 ~ 109°

C5 120°

Question 8 (16 Points)

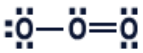


A

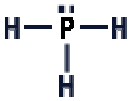


B

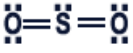
C



D



E



F

The following questions relate to the Lewis Structures depicted above

a) The molecules that **disobey** the **Octet Rule**: **A, F**

b) **C, D and E** – the one with the **smallest** bond angle: **C**

c) The **molecular geometry** of **D**: **Angular (120°)**

d) The **molecular geometry** of **E**: **Trigonal pyramid**

e) The **molecules** with a bond angle of **180°**: **A, B**

f) **B, D and E** – the one that is **non polar**: **B**

g) **C – Polar** or **non polar**? **Polar**

h) The **Electron Pair Geometry** of **F**: **Trigonal planar**

Question 9 (4 Points) $ClO^-(aq) + H_2O(l) \Leftrightarrow HClO(aq) + OH^-(aq)$ $K = 2.86 \times 10^{-7}$ at 298K.

Assuming that you start with just ClO^-, and that no $HClO$ or OH^- is initially present, which of the following best describes the equilibrium system?

a) The forward reaction is favored at equilibrium.

b) Appreciable quantities of all species are present at equilibrium.

c) **The reverse reaction is favored at equilibrium.**

Question 10 (6 Points) Write the **equilibrium constant expression**, K, for the following reactions:

a) $NH_3(aq) + H_2O(l) \Leftrightarrow NH_4^+(aq) + OH^-(aq)$ $K = [NH_4^+][OH^-]/[NH_3]$

b) $2\ H_2S(g) \Leftrightarrow 2\ H_2(g) + S_2(g)$ $K = [H_2]^2[S_2]/[H_2S]^2$

c) $AgCl(s) \Leftrightarrow Ag^+ + Cl^-$ $K = [Ag^+][Cl^-]$

Question 11 (6 Points) Consider the following system at equilibrium at 698 K:

$$2\ HI(g) \Leftrightarrow H_2(g) + I_2(g)$$

When some **HI(g)** 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 I_2 will:

a) **Increase**

b) Remain the **same**

c) **Decrease**

Question 12 (6 Points) Consider the following system at equilibrium at 298 K:

$$HCN(aq) + H_2O(l) \Leftrightarrow H_3O^+(aq) + CN^-(aq)$$

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 CN^- will:

a) **Increase**

b) Remain the **same**

c) **Decrease**

Question 13 (6 Points) Consider the following system at equilibrium at 573 K:

$$2\ NO(g) + Cl_2(g) \Leftrightarrow 2\ NOCl(g) + 18.4\ kcal$$

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:

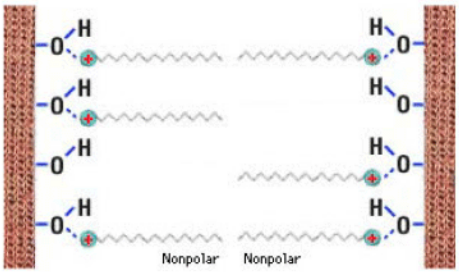
a) **Increase**

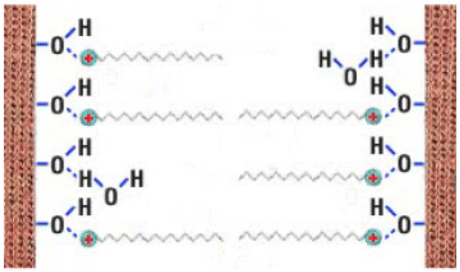
b) Remain the **same**

c) **Decrease**

Question 14
4 Points

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





a) Fabric softeners

b) Micelle actions

c) Membranes

d) The dissolution process

e) Detergents

f) EDTA use in salad dressings

g) Lead poisoning

h) Chelating therapy.

Exam II Score