



Assiut University

Faculty of Science

Chemistry Department

May 2015

Time: 2 hr.

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Final Examination For 1<sup>st</sup> year Students (General Chemistry II, 105C).

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Section A

1- Answer only five of the following: (12.5 Marks)

- a) Explain by equation the addition reaction of chlorine to ethyne.
- b) On which atom is the formal charge in the hydroxide ion?
- c) Write the resonance hybrid of the acetate ion.
- d) Illustrate the type of bond on the following: HBr, ethylene.
- e) Complete: Propyne + HBr →.....
- f) Write a structural formula that shows all bonds of the following: i)  $\text{CH}_3\text{CCl}_2\text{CH}_3$  ii)  $(\text{CH}_3)_2\text{C}(\text{C}_2\text{H}_5)_2$   
iii)  $\text{C}_4\text{H}_6$  iv)  $\text{C}_2\text{H}_2$  v)  $\text{C}_4\text{H}_{10}$

2- Answer the following questions ( 12.5 Marks)

- a) Ozonolysis of an alkene produces equal amount of acetone and acetaldehyde, respectively. Deduce the alkene structure (3Marks).
- b) Draw the Newman projection of the most stable conformation of propane. (3Marks)
- c) Explain the free radical polymerization of ethylene to give polyethylene (4 Marks).
- d) In which compound is carbon more oxidized acetaldehyde or acetic acid (2.5 Marks).

انظر خلف الورقة من فضلك (Section B)

Examiner: Prof. Ali Ahmed Abdel-Hafez

(C)

**General Chemistry (2) (C-105) (Nonorganic Chemistry Part)**

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**Answer the following questions: (25 Marks)**

**First question:** Answer Only Three from the following: (12 Marks)

- (a) The following system is at equilibrium. In which direction (right or left) will the position shift with the following changes:



- (i) Lowering the temperature      (ii) Decreasing the pressure  
(iii) Adding more  $\text{N}_2\text{O}$       (iv) Increasing the pressure of NO

- (b) At  $986^\circ\text{C}$ ,  $K_C = 1.6$  for the reaction:

$\text{CO}_2\text{ (g)} + \text{H}_2\text{ (g)} \rightleftharpoons \text{H}_2\text{O (g)} + \text{CO (g)}$ . If you inject one mole of each  $\text{H}_2$ ,  $\text{CO}_2$ ,  $\text{H}_2\text{O}$  and  $\text{CO}$  simultaneously in a 20 liter box at time = 0 and allow them to equilibrate at  $986^\circ\text{C}$ . What will be the final concentrations?

- (c) What is the pH value of a solution prepared by dissolving 0.0155 mole  $\text{Ca(OH)}_2$  in water to give 735 ml aqueous solution?

- (d) A solution of 0.45 g of urea ( $\text{CH}_4\text{N}_2\text{O}$ ) in 22.5 g of water gave a boiling point elevation of  $0.17^\circ\text{C}$ . Calculate the molal elevation constant of water.

**Second question:** Answer Only Three from the following: (13 Marks)

- (a) A buffer solution consists of 0.24M  $\text{NH}_3$  and 0.2M  $\text{NH}_4\text{Cl}$ . What is the pH of this buffer? ( $K_b = 1.8 \times 10^{-5}$ )

- (b) Calculate the solubility of  $\text{Ag}_2\text{SO}_4$  in 1M aqueous  $\text{Na}_2\text{SO}_4$  solution. ( $K_{sp} = 1.4 \times 10^{-5}$ )

- (c) A solution is prepared from 10.6 g of unknown solute and 90 g of water. The vapor pressure of the solution at  $60^\circ\text{C}$  is 0.187 atm. Use Raoult's law to find the molecular weight of the solute. The vapor pressure of water at  $60^\circ\text{C}$  is 0.197 atm.

- (d) Find the osmotic pressure at  $15^\circ\text{C}$  of a solution of naphthalene ( $\text{C}_{10}\text{H}_8$ ) in benzene containing 14 g of naphthalene per liter of solution.

(Atomic weights: H = 1, C = 12, N = 14, O = 16, S = 32, Ag = 107.87)

----- Good Luck -----

**Examiner: Dr. Hossieny Ibrahim**



Assiut University Faculty of Science Chemistry Department	Second Semester Final Examination General Chemistry (2) (C-105) Nonorganic Chemistry Part First Level (Credit Hours System)	May 2015 Time allowed: 1 hour
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**Answer the following questions: (25 Marks)**

**First question: Answer Only Two from the following: (9 Marks)**

- a) A mixture of 0.5 mol  $H_2$  and 0.5 mol  $I_2$  was placed in a 1.0 L stainless steel flask at  $430^\circ C$ . Calculate the concentrations of  $H_2$ ,  $I_2$  and  $HI$  at equilibrium. The equilibrium constant ( $K_c$ ) is 54.3 at this temperature for the reaction:



- b) Use Le-Chatelier's principle to predict how each of the changes would affect this equilibrium.



- (i) adding  $O_2$  (g) to the system      (ii) adding  $SO_3$  (g) to the system  
(iii) lowering the temperature      (iv) decreasing the pressure
- c) At the start of a reaction, there are 0.249 mol  $N_2$ ,  $3.21 \times 10^{-2}$  mol  $H_2$  and  $6.42 \times 10^{-4}$  mol  $NH_3$  in a 3.5 L reaction vessel at  $200^\circ C$ . If the equilibrium constant ( $K_c$ ) is 0.65 at this temperature for the reaction:  $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$   
Predict, which way the reaction will proceed?

**Second question: Answer Only Two from the following: (8 Marks)**

- a) Calculate the solubility of silver chloride (in g/L) in  $6.5 \times 10^{-3}$  M silver nitrate solution.  
[Atomic weights of Ag = 107.9, Cl = 35.45 and ( $K_{sp}$  of AgCl =  $1.6 \times 10^{-10}$ )]
- b) Define each of the following terms:  
Raoult's law – The molality – The osmotic pressure
- c) What is the pH of:  
(i) 0.0011 M solution of  $Ba(OH)_2$       (ii) 0.5M  $CH_3COOH$ . ( $K_a = 1.8 \times 10^{-5}$ )  
(iii) a solution containing 0.30 M  $HCOOH$  and 0.52 M  $HCOONa$ ? ( $K_a = 1.8 \times 10^{-4}$ )

**Third question: Answer Only Two from the following: (8 Marks)**

- a) It is found experimentally that the solubility of calcium sulfate ( $CaSO_4$ ) is 0.67 g/L.  
Calculate the value of  $K_{sp}$  for calcium sulfate. (At.Wt. : Ca = 40.08, S = 32.06, O = 16)
- b) What is the pH value of a 0.40 M ammonia ( $NH_3$ ) solution? ( $K_b$  for  $NH_3 = 1.8 \times 10^{-5}$ )
- c) A solution contains 3.75 g of a nonvolatile hydrocarbon in 95 g of acetone. The boiling points of pure acetone and the solution are  $55.9^\circ C$  and  $56.5^\circ C$  respectively.  
What is the molar mass of the hydrocarbon? (For acetone the  $K_b = 1.71^\circ C/m$ )
- d) A solution of unknown substance in water at 300 K gives rise to an osmotic pressure of 3.85 atm. What is the molarity of the solution? ( $R = 0.082 \text{ atm.L.mol}^{-1}.K^{-1}$ )

----- Good Luck -----

Examiners: Dr. Ahmed Mohamed Kamal

&

Dr. Hossieny Sameeh Mohamed

Assiut University  
Faculty of Science  
Chemistry Department

date: 30/05/2012

Time: 60 min.

Name:

**Final Exam. Of organic chemistry For Science Student 1<sup>st</sup> level (s (105- C)**

**Answer the following questions: :**

(الأسئلة في ثلاث صفحات)

( Total marks : 25 )

**I- Select the correct answer of the following:**

(10 marks)

**1) If a central carbon atom is  $sp^2$  hybridized, what shape of molecule results?**

trigonal planar

trigonal bipyramidal

octahedral

a)

b)

c)

**2) The bond in between an oxygen atom and another oxygen atom is:**

a) Metallic

b) covalent

c) Ionic

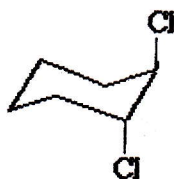
**3) In the correct Lewis structure for ammonia, how many unshared pairs of electrons will nitrogen have ?**

a) 1

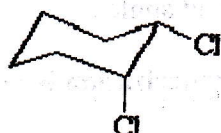
b) 2

c) 3

**4) Which diagram of 1,4-dichlorocyclohexane has both chlorine atoms equatorial?**



a)



b)



c)

**5) The most stable conformational isomer of cis-1-bromo-2-chlorocyclohexane will have...**

a) both halide atoms in equatorial positions.

b) the chlorine atom in an axial position and the bromine atom in an equatorial position.

c) halide atoms in equatorial positions.

**6) How many dichlorinated isomers can be formed by the halogenation of  $CH_3CH_2CH_2CH_3$  with  $Cl_2$  in the presence of light ?**

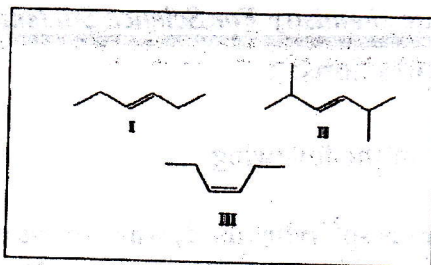
a) 3

b) 5

c) 2



7) Rank the alkenes in order of increasing boiling point.



- a) I>II>III      b) I>III>II      c) III>II>I
- 8) Addition of HCl or HBr to an unsymmetrical alkene is regioselective and follows Markovnikov's rule because:
- Steric crowding favors only one product.
  - The two possible carbocation intermediates react at different rates.
  - One of the two possible carbocations is more stable than the other.
- 9) What is the idea bond angle for the carbon in HCCH ?
- The carbon atoms in HCCH will have a  $109.5^\circ$  bond angle
  - The carbon atoms in HCCH will have a  $120^\circ$  bond angle.
  - The carbon atoms in HCCH will have a  $180^\circ$  bond angle.
- 10) Which statement on the process of cationic polymerization is false?
- Peroxides are used as an initiator.
  - The reaction terminates by the loss of a proton.
  - The reaction normally uses an acid catalyst.

II- Complete the following sentence :

(6 marks)

- The hybridization of water molecule is.....While in  $\text{CH}_2\text{O}$  molecule is.....
- Ozonolysis of this alkene  $(\text{CH}_3)_2\text{C}=\text{CH}_2$  gave equal amount of.....&.....
- The bond of  $\text{CaCl}_2$  molecule is ..... While in  $\text{C}_2\text{H}_4$  molecule is.....
- Isotopes of an element differ in the number of .....in their nuclei.
- Polymers are .....molecules with ..... molecular weight, built from a small repeating units are called.....
- $\text{C}_n\text{H}_{2n}$  is the molecular formula of..... While  $\text{C}_{n\text{H}2n-2}$  is the molecular formula of.....

C 8 /

III- Answer the following :

(9 marks)

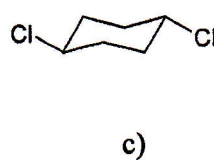
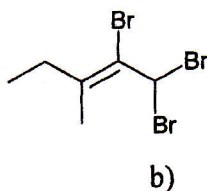
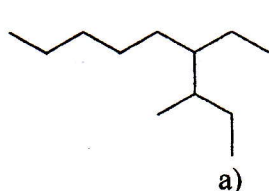
a) What alcohol is obtained from this reaction?



b) What is the meaning of 3 in sp<sup>3</sup> orbitals.

c) Using correct arrow formalism, write the contributors to the resonance hybrid of the structure carbonate ion CO<sub>3</sub><sup>2-</sup>. Indicate any formal charges.

d) Provide IUPAC names for the following compounds. Don't forget E/Z or cis/trans.



e) On what atom is the formal charge in the nitrate ion NO<sub>3</sub><sup>-</sup>?

f) In which compound is carbon more oxidized, acetaldehyde CH<sub>3</sub>CHO or acetic acid CH<sub>3</sub>COOH, and why?

**Good Luck**

Prof.Dr. Ragaa Abo El- Wafa

## The Answer

I-

1	2	3	4	5	6	7	8	9	10

II-

a)	b)	c)	d)	e)	f)

III-

a) The alcohol is obtained from the reaction.

b) The meaning of 3 in  $sp^3$  orbitals.



(8)

c) The resonance hybrid of the structure carbonate ion  $\text{CO}_3^-$

10	9	8	7	6	5	4	3	2	1

d) IUPAC names for the following compounds.				(d)	(e)
a)					
b)					
c)					

e) The formal charge in the nitrate ion  $\text{NO}_3^-$

f) The compound which is carbon more oxidized, acetaldehyde  $\text{CH}_3\text{CHO}$  or acetic acid  $\text{CH}_3\text{COOH}$

*The End*



Second Semester Final Examination  
Subject: General Chemistry (C-100)  
Students: First level" Credit Hours System"

Section (A) (25 Marks)

**First Question:** Answer only three from the following: (12.5 Marks)

- (a) State Boyle's law and derive it from kinetic gas equation.
- (b) Compare between lyophobic and lyophilic colloids.
- (c) (i) How can you prepare colloidal solution by reduction method.  
(ii) What is meant by only three from the following?

Critical temperature– Viscosity–Electro-osmosis–Oxidation

- (d) Put true (✓) or false (x) and give reason for only three from the following.
  - (i) Copper metal will displace hydrogen from acid solution.
  - (ii) Crystalline solids are anisotropic.
  - (iii) The vapor pressure increase as temperature decrease.
  - (iv) The hydrogen gas has Z-P curve above the ideal behavior.

**Second Question:** Answer only two from the following: (12.5 Marks)

- (a) (i) 25.8 liter of a gas has a pressure 690 torr and a temp. 17°C. What will be the volume if the pressure is changed to 1.85 atm. and the temp. 345K.  
(ii) What is the potential of a half-cell consists of zinc electrode in 0.01M ZnSO<sub>4</sub> solution at 25°C. ( $E^\circ = -0.763$  V)
- (b) (i) Two moles of NH<sub>3</sub> are enclosed in five liter flask at 27°C. Calculate pressure exerted by using ideal gas equation and Van der Waals equation.  
( $a=2.253 \text{ L}^2\text{atm.mol}^{-2}$ ,  $b= 0.0428 \text{ Lmol}^{-1}$ ,  $R= 0.0821 \text{ Latm.mol}^{-1}\text{K}^{-1}$ )  
(ii) Calculate the standard ( $E^\circ$ ) of the following cell:  
$$\text{Fe}^{2+}(\text{aq}) + \text{Sn}(\text{s}) \longrightarrow \text{Sn}^{2+}(\text{aq}) + \text{Fe}(\text{s})$$
  
Where  $E^\circ$  for Fe/Fe<sup>2+</sup> = -0.44V,  $E^\circ$  for Sn/Sn<sup>2+</sup> = 0.14V
- (c) (i) Consider the reaction:  $\text{Mn}(\text{s}) + 2\text{Ag}^+(\text{aq}) \longrightarrow \text{Mn}^{2+}(\text{aq}) + 2\text{Ag}(\text{s})$   
Where  $E^\circ$  for Ag/Ag<sup>+</sup> = +0.8V,  $E^\circ$  for Mn/Mn<sup>2+</sup> = -1.18V
  - 1- Write anode and cathode reactions
  - 2- Write cell representation
  - 3- Predict whether the reaction feasible or not
- (ii) Two gases have molar mass 64 and 100 respectively if diffusion rate of the first is 15 mLs<sup>-1</sup>, what is the diffusion rate for the second gas?

(5)

**Section (B) (25 Marks)**

**Answer the following questions:**

**First question:**

**(12 Marks)**

**(a) Put Yes (✓) or No (x) for each of the following:**

**(4 Marks)**

- (i) The molecular shape of  $\text{BF}_3$  is linear.
- (ii) The hybrid orbitals for S in  $\text{SF}_6$  are  $\text{sp}^3\text{d}^2$ .
- (iii) For Paschen series  $n_1=3$ ,  $n_2= 3, 4, 5, \dots$
- (iv) The oxidation number of Mn in  $\text{KMnO}_4$  is +7.

**(b) Give reasons for the following:**

**(2 Marks)**

- (i) The bond angle in  $\text{NH}_3$  is less than that of  $\text{CH}_4$  molecule.
- (ii)  $\text{He}_2$  molecule does not exist while  $\text{He}_2^+$  exists.

**(c) Draw Lewis structures and assign formal charge to each of the following:**

**(i)  $\text{HNO}_3$**

**(ii)  $\text{CO}_3^{-2}$**

**(6 Marks)**

**Second question:**

**(13 Marks)**

**(a) Draw the energy level diagrams for  $\text{O}_2^-$  and  $\text{N}_2^+$  molecules. Calculate the bond order and predict the magnetic properties for each one.**

**(4 Marks)**

**(b) Choose the correct answer:**

**(4 Marks)**

**(i) The Lyman series of hydrogen spectrum appears in..... region.**

**(a) ultraviolet**

**(b) visible**

**(c) infrared**

**(ii) The de Broglie equation for the electron is .....**

**(a)  $\lambda = hm / C$**

**(b)  $\lambda = h / mC$**

**(c)  $\lambda = mC / h$**

**(iii) The hybridization of C in  $\text{CO}_2$  molecule is .....**

**(a)  $\text{SP}^3$**

**(b)  $\text{SP}$**

**(c)  $\text{SP}^2$**

**(iv) Bond order in  $\text{N}_2$  molecule is ..... the bond order in  $\text{F}_2$  molecule.**

**(a) higher than**

**(b) lower than**

**(c) equal to**

**(c) Using VSEPR theory, predict the electron domain geometries and molecular shapes for  $[\text{PF}_6]^-$  and  $\text{H}_2\text{O}$ .**

**(5 Marks)**

**(Atomic No. B = 5, C = 6, N = 7, O = 8, F = 9, P = 15, S = 16)**

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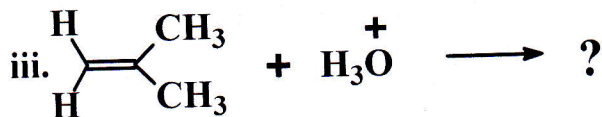
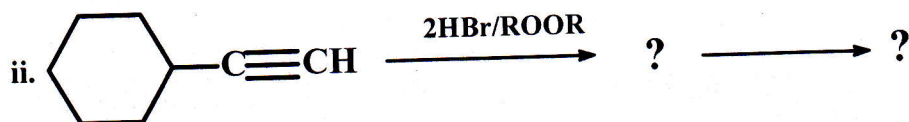
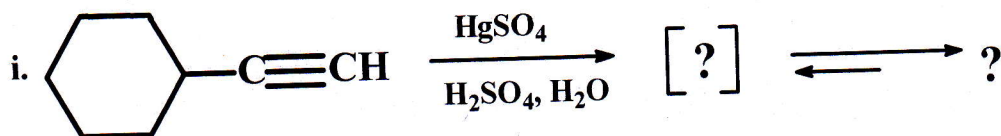
**Good Luck**

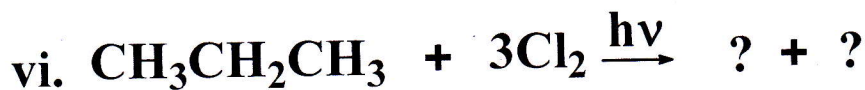
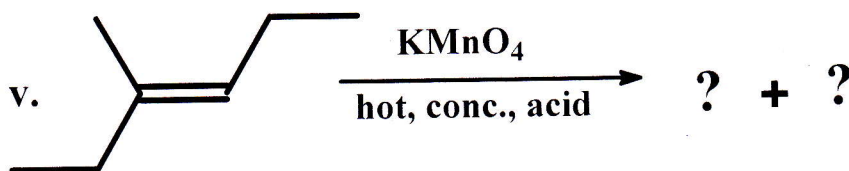
**Examiners: Prof. Dr. Z. A. Ahmed and Dr. H. Ibrahim**



Answer the following QUESTIONS: ..... (25 marks)

1. Complete the following equations:....each space with one mark.....(total 10 marks)





provide the major products only

**II. Chose the correct answer (under line correct answer: .....(10 marks)**

i. Which of the following is the best reaction sequence to accomplish as anti-Markovnikov addition of water to an alkene.

- A) water + dilute acid                      B) water +  $\text{HgSO}_4 + \text{H}_2\text{SO}_4$   
 C) oxymercuration-demercuration        D) hydroboration-oxidation  
 E) none of the above

ii. Which molecular formula represents pentene?:

- (1)  $\text{C}_4\text{H}_8$ ;      (2)  $\text{C}_4\text{H}_{10}$ ;      (3)  $\text{C}_5\text{H}_{10}$ ;      (4)  $\text{C}_5\text{H}_{12}$

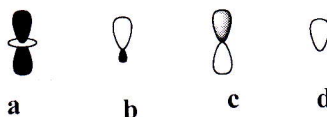
iii. A molecule of ethene is similar to a molecule of methane in that they both have the same:

- (1) Structural formula;                      (2) molecular formula;  
 (3) number of carbon atoms;              (4) number of hydrogen atoms

iv. The compound  $\text{CH}_3\text{COOCH}_3$  is classified as:

- (1) an acid;      (2) an alcohol;      (3) an ester;      (4) a hydrocarbon.

v. The shape of  $\text{SP}^3$  orbital is:



vi. The ozonolysis of an unsymmetrical, unbranched alkene forms:

- a. A single aldehyde      b. An aldehyde and a ketone      c. Two different ketones

vii.  $\text{C}_2\text{H}_4 + \text{H}_2 \rightarrow \text{C}_2\text{H}_6$

The above reaction is an example of:

- (1) Addition;                      (2) Substitution;  
 (3) Elimination;                      (4) Condensation

viii. The No. of bonding electrons in  $\text{ClO}_3^-$  is: 8      b. 12      c. 10      d. 6

ix. Which of the following is nonpolar molecule:

- a.  $\text{H}_2\text{O}$       b.  $\text{CO}_2$       c.  $\text{CH}_3\text{CO}_2\text{H}$       d.  $\text{CH}_3\text{COCH}_3$

x. Which will be the most polar bond?

- i. C-C      ii. C-Br      iii. C-Si      iv. C-Cl



(3)

**III. All the following sentences are wrong. Rewrite with correct manner:(5 marks)**

1.  $\sigma$  Bond in methane was created by overlapping of  $SP^3$ - $SP^3$  orbitals.
2. Eclipsed structure of ethane is more stable than staggered structure in Neumann projection.
3. The most of the reactions of alkenes are nucleophilic substitution
4. Hydration of propene in the presence of  $BH_3$  produced 2-propanol.
5. Addition of bromine to propene in the presence of water produced 1- bromopropane

*Good luck*

*Prof. Dr. Adel M. Kamal El-Dean  
Prof. Dr. Yasser El-Ossaily*