ANSWER THE FOLLOWING QUESTIONS :

1-

a) Deduce the kinetic equation for a first order reaction . [12 mark]

b) The initial concentration of a substance is 0.2 mol l^{-1} and it decomposes with a rate constant

0.4 min $^{-1}$ at 340 K ; calculate the time required to drop to 0.12 mol l $^{-1}$. [8 mark]

2-

a) Explain the concept of activation energy, and deduce the Arrhenius equation. [12 mark]

b) Calculate the Arrhenius parameters for the decomposition of HI with rate constant = 0.8 and

0.2 l mol $^{-1}$ s $^{-1}$ at 507 and 537 ^oC respectively . [8 mark]

3-

a) Write the postulates of the transition state theory. [8 mark]

b) Explain the kinetics of a chain reaction . [12 mark]

4-

a) Discuss the effect of the ionic strength on the reaction rates . [12 mark]

b) For the reaction : $H_2O_2 + I^{-1} + H^{+1} = H_2O + HIO$

the rate constant is 2.2x10^{-2} l^{2}mol^{-2}s^{-1} at 25 ^oC and ionic strength = 0.05 mol kg^{-1}

Calculate the value of the rate constant at zero ionic strength.[8 mark]

BEST WISHES   Prof. Dr. H. M. AbuElnader
                           Prof. Dr. A. I. Ahmed

Mansoura University
Faculty of Science
Chemistry Department
Subject: Organic Chemistry
Course (s): Organic Synthesis &
Organometallic Chemistry (**C-332**)

First Term
Third Year Chem.
Date: Jan. 2011
Time Allowed: 3 hours
Full Mark: 63 Marks

ANSWER ALL QUESTIONS

1) Discuss the **synthetic applications** of the following reactions:

  i) The Michael Reaction.

  ii) The Alkylation of Ethyl acetoacetate (E A A) and its Derivatives.

2) (i) How can you prepare the following acids?. Give the structure and name of the products on treating these acids with PPA at ~ 100° .

  a) Phenylsuccinic acid.

  b) α–Benzylglutaric acid.

  (ii) Suggest a **Synthesis** and give the **Name** for compounds (A, B, C and D):

(A)   (B)   (C)   (D)

PLEASE TURN TO PAGE 2

3- Outline and show by equations the following:- (20 points each one 4 marks)

   a) The reaction of ferrocene with CH_3COCl / $AlCl_3$

   b) The reaction of cyclohexanone with $CH_3.CH_2.CH_2.MgI$.

   c) Sublimation of ferrocene with10 molecules of iodine.

   d) Pyrolysis of $(Me_3Si)_3Si.CO.Bu.^t$

   e) The reaction of *o*-bromoanisole with *n*-butyl lithium

4- Outline and show by equations the following: - (20 points)

   a) Elucidate the structure of silatoluene.

   b) Mechanism that account the addition of Grignard reagent to tetraphenylpropenone.

طبقات النفط ... كيمياء ... كلية البترول, البتروكيماويات

Chem 333

Answer **three only** of the Following Questions:

1. Discuss the following topics:-
 1.a. The alkylation process used for the production of the highest grade
    octane number motor fuel (iso-octane).   [8 Marks]
 1.b. Distillation products of crude petroleum.   [8 Marks]
 1.c. API gravity of petroleum.   [4 Marks]

2. Give short notes on :
 2.a. Sulphur compounds present in crude petroleum .   [8 Marks]
 2.b. The main differences between thermal and catalytic cracking. [6 Marks]
 2.c. Cetane number of diesel fuels.   [6 Marks]

3. Discuss each of the following :
 3.a. Specifications of the solvents used for extraction of aromatic
    Hydrocarbons from petroleum distillates.   [6 Marks]
 3.b. Hydrogen refining of petroleum distillates.   [6 Marks]
 3.c. Sweetening process in petroleum industries.   [8 Marks]

4. Show how the following petrochemical products can be obtained :
 4.a. Chloroprene and isoprene from acetylene.   [10Marks]
 4.b. Non-ionic surface active agents from ethylene oxide.   [6 Marks]
 4.c. Carbon black from natural gas.   [4 Marks]

GOOD LUCK

Prof. Dr. O. M. Habib

| Mansoura University	First Term
Faculty of Science	3rd Level Chemistry students
Chemistry Department	Date: Jan. 2011
Subject: Chemistry	Time Allowed: 2 Hours
Course: Stereochemistry (Chem. 334)	Full Mark: 60 Marks

Answer **All** Questions, Each Question = **20** Marks

<u>Q. 1:</u> **A)** Which of the following formula represent a chiral molecule? Star each chiral carbon atom: **(3 Marks)**

i -   ii -   iii -
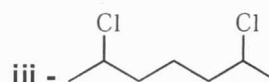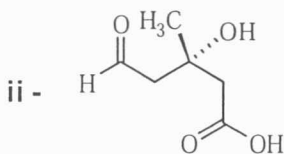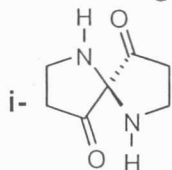
B) Write formulas for all the stereoisomer's of 2,4-hexadiene [$CH_3-CH=CH-CH=CH-CH_3$], then name these isomers using the (*E*) and (*Z*) system.   **(5 Marks)**

C) Identify, explain the different mechanistic pathways and determine the major product for the following two reactions.   **(6 Marks)**

i - CH_3ONa in CH_3OH, reflux   -----------

ii - CH_3ONa in CH_3OH, reflux   -----------
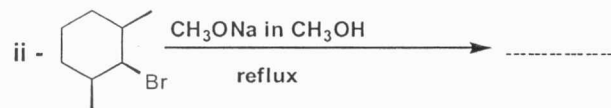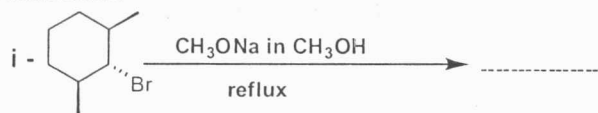
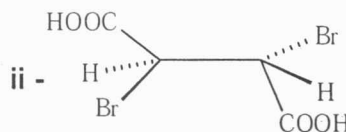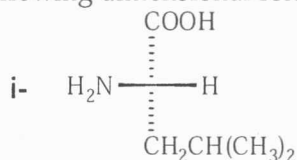<u>D)</u> For 1,3-dimethylcyclohexane: **(6 Marks)**

(i) Which stereoisomer exists in two equivalent chair conformations?

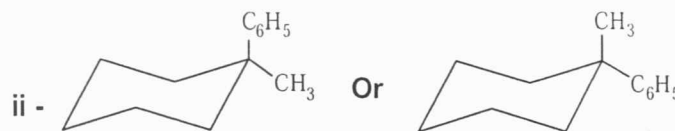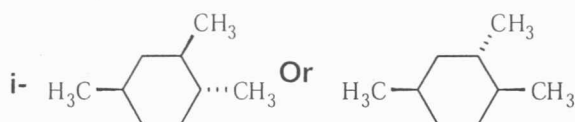**(ii)** Draw the chair conformation of this stereoisomer.

(iii) Draw the 1,3-dimethylcyclohexane stereoisomer that has two nonequivalent chair conformations, and specify which conformation is more stable.

<u>Q. 2:</u> **A)** Convert the following dimensional formulas to Fischer projection ones   **(4 Marks)**

i - H_2N——H with COOH (top) and $CH_2CH(CH_3)_2$ (bottom)

ii -   HOOC, H, Br, COOH, Br, H arrangement

<u>B)</u> Identify the more stable stereoisomer in each of the following pairs; give the reason of your choice   **(4 Marks)**

i - H_3C—(ring)—CH_3 with CH_3 **Or** H_3C—(ring)—CH_3 with CH_3

ii -   (ring) C_6H_5, CH_3 **Or**   (ring) CH_3, C_6H_5

<u>C)</u> When treated with C_2H_5OK in C_2H_5OH, diastereomer **I** give a mixture of *cis*-2-butene without loss of deuterium and *trans*-2-butene with loss of deuterium. While, diastereomer II give only *trans*-2-butene without loss of deuterium. How do you account for these findings?   **(6 Marks)**

I: CH_3 / H—D / H—Br / CH_3

II: CH_3 / D—H / H—Br / CH_3

I   **II**
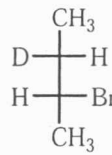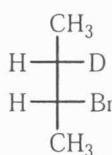
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D) Draw Newman projection formulas for the three most stable conformations of each of the following:

i- $(CH_3)_3C-C(CH_3)_3$ looking down the C_2-C_3 bond.   **ii-** 3-hydroxy-propanoic acid ($HO-CH_2CH_2COOH$)

Which one of these conformations is more stable than the other two? Why?   **(6 Marks)**

Q. 3: A) Determine if the following pairs of formulas represent enantiomers, diastereoisomers or identical **(4 Marks)**

i - H_3CH_2C⋯⋯ — Br   **&**   Br— ... —$CH_2C\equiv CH$ ($CH_2CH_2CH=CH_2$ / CH_2CH_3)

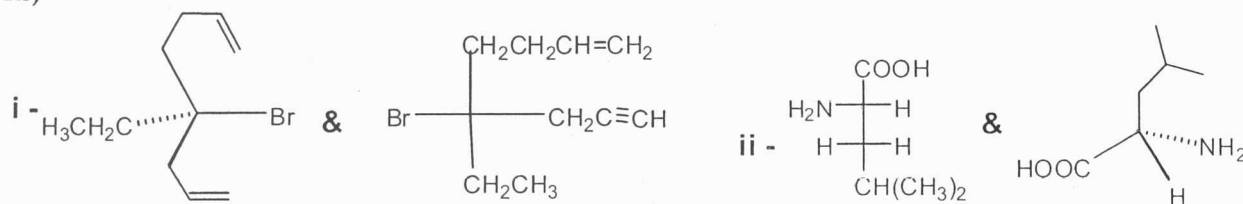**ii -** (Fischer) $COOH$, H_2N—H, H—H, $CH(CH_3)_2$ **&** $HOOC$⋯ ⋯NH_2 / H

B) Predict the product(s) and discuss the stereochemistry of the products for the free radical monobromination reaction of *(R)*-2-chlorobutane at C_2 carbon atom.   **(4 Marks)**

C) Write equations showing the stereochemistry of product(s) of the following reactions: **(6 Marks)**

i -   (structure) $\xrightarrow{\text{HBr}}$ ----------

ii -   (structure with H, H, C_2H_5, C_2H_5) $\xrightarrow[\text{ii - } H_3O^+]{\text{i - MCPBA}}$ ----------

D) Draw all conformational structures and indicate the most stable one of each of the following compounds, give the reason of your answer.   **(6 Marks)**

i – *Trans*-1,2-dibromocyclohexane   **ii-** *Cis*-1-chloro-2-methylcyclohexane

With my Best Wishes Dr. Ebrahim Abdel-Galil

Mansoura University Faculty of Science Chemistry Department Code: Chem.341 Subject : Electrochemistry	كلية العلوم جامعة المنصورة	First Term Third Level Program : Chemistry Date : Jan 2011 Time Allowed : 2 hours Full Mark : 60 Marks

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Answer All Questions   الأسئلة على الوجهين

First Question: (15 Mark)

[A] <u>Tick (√) or (X) for the following statements :</u>   (4Mark)

(1) For non spontaneous cell reaction E has a +ve value while ΔG has a –ve value   (   )

(2) Any reversible cell can be used as a standard cell   (   )

(3) The cell : $Na(Hg) (a_{Na = 1}) \mid Na^+ (a_{Na+}) \mid (a_{Na = 2}) (Hg) Na$
is an example of an electrode concentration cell with transference   (   )

(4) The cell : $Pt, H_{2(g)} (P_1 \, atm) \mid HCl (a) \mid (P_2 \, atm) H_{2 (g)}, Pt$
is an example of chemical cell without transference   (   )

(5) Liquid junction potential (E_j) equal zero when $t_+ = t_-$ (   )

(6) The cell : $H_{2 (g)} (1 atm) \mid HCl (a_1) \mid Ag \, Cl_{(s)} \mid Ag\text{-} Ag \mid Ag \, Cl_{(s)} \mid HCl (a_2) \mid H_{2 (g)} (1 atm)$
is an example of electrolyte concentration cell without transference   (   )

(7) Cell emf is the sum of the cell electrode potentials   (   ).

(8) Using glass electrode in measuring solution pH, ordinary potentiometer cannot be used   (   )

[B] <u>Give reason :</u>   (6 Mark)

(1) Amalgam electrode sometimes is preferred than the metal electrode.

(2) Glass electrode is preferred than other electrodes for measuring solution pH.

(3) Chemical cells with transference are not suitable for thermodynamic calculations.

(4) Cd- Weston cell proved to be the best standard cell.

[C] <u>Taking :</u> $E^o_{Cu^{2+}/Cu} = 0.337 \, V$; $E^o_{Ag^+/Ag} = 0.800 \, V$; $\partial E/\partial T = 4.18 \, V/\, deg$

construct a cell of the electrode pair, write electrode and cell reactions and calculate at 25°C:
E^o_{cell} , ΔG^o, equilibrium constant K ; ΔH ; ΔS (5 Mark)

Second Question: (15 Mark)

[A] <u>Complete :</u>   (4 Mark)

(1) The standard electrode potential is ---

(2) $Sb / Sb_2O_3/ OH^-$ is called ----------------------and can be used for measuring---------------

(3) A Pt electrode immersed in a solution containing Fe^{+++} / Fe^{++} ions is called -------------

(4) In chemical cell emf is due to ---------------------, while in concentration cell it is due to---------------

[B] Discuss in detail chemical cell without transference illustrating how it can be used for determination of standard electrode potential (E^o) and activity coefficient (γ)   (8 Mark)

[C] <u>Define:</u>   (3 Mark)

(1) Transport number   (2) Liquid junction potential .

Third Question: (15 Mark)

Tick (√) for the correct answer :   (2 Mark)

(1) Overpotential η is given by :
   (i) $\eta = E_{irreversible} + E_{reversible}$ (   )
   (ii) $\eta = E_{irreversible} - E_{reversible}$ (   )
   (iii) $\eta = E_{reversible} - E_{irreversible}$ (   )

(2) Concentration overpotential η_C :
   (i) Increases with increase of temperature   (   )
   (ii) Decreases with increase of temperature   (   )
   (iii) Do not change with increase of temperature

(3) Fuel cells is considered :
   (i) Primary cells   (   )
   (ii) Secondary cells   (   )
   (iii) Neither (i) or (ii)   (   )

(4) For an electrode at equilibrium :
   (i) Rate of oxidation = rate of reduction   (   )
   (ii) Rate of oxidation > rate of reduction   (   )
   (iii) Rate of oxidation < rate of reduction   (   )

[B] Give reason: (6 Mark)
   (1) There is no metal giving low oxygen overpotential.
   (2) Decomposition potential for halogen acids are different.
   (3) During electrolysis of K_2SO_4 , H_2 and O_2 are evolved.
   (4) Hydrogen overpotential at Pt electrode is very low while at Hg it is very high.

[C] Write in detail on cathodic evolution of hydrogen.   (7 Mark)

Fourth Question: (15 Mark)

[A] Complete :   (6 Mark)
   (1) Concentration overpotential is due to ---
   (2) The voltage at which the current begins to flow free is known as --------------------------------
   (3) Exchange current i_o can be obtained either -------------------------------or------------------------
   (4) The process where an electron leaves the metal surface is expressed by --------------------------
   (5) For metals, the greater adsorption energy is the -------------and the more readily ----------------------------
   (6) ---------------- cells cannot be recharged, and is considered -------------------- cells; while---------------------
       can be can be --------------------- and is considered -------------------------------

[B] Deduce mathematically the Butler-Volmer equation for a polarized electrode (Electrode kinetics for
   irreversible electrode). Illustrate the form of this equation under conditions of :
   (i) High overvoltage ($\eta > 0.05$V, Tafel equation).   (ii) Low overvoltage ($\eta < 0.02$ V).   (9 Mark)

Good Luck : Prof.Dr. M.A.Morsi ; Prof.Dr. Ahlam M.A.Helmy

Mansoura University		...... ' Term
Faculty of Science		3rd Year Chemistry
Chemistry Department		Date : January 2011
Subject: Analytical		Time Allowed : 2 hours
Course (s):.Chemistry (C 311)		Full Mark : 80 Marks

ANSWER THE FOLLOWING QUESTIONS .

1-a) Choose 5 only and the right answer from the following ;   (10 Marks)

1] Factors affecting electrodeposition:

a] Current density, voltage applied b] pH, complexing agent, C] Type of electrode, d] Stirring time, solvent , temperature   e] All from a to d

2] Solubility S mol/ L of sparingly soluble salt increase in solution containing :

a] Pure water b] Common ions c] Salt effect d] Organic solvent .

3] Determination of Ba^{2+} in gravimetric analysis by precipitating agent as ;

a] Sulphate , b] Chromate , c] Oxalate d} Carbonate. Knowing that S BaSO$_4$ = 2.4 ppm Ba CO$_3$= 14ppm, Ba CrO$_4$ =2.8 ppm and

Ba OX =74 ppm .

4] Thermal analyses TG ..depend upon :

a] Temperature .rate, b] Nature of thermocouple, c] Covering or uncovering sample& Grinding the sample d] All from a to d .

5] Cu^{2+} ppt. as CuS by H$_2$S K$_{sp}$ =6.3 x 10^{-36} in medium:

a] Acidic   b] Basic,   c] Natural ,   d] All from a to d .

6] Al (OH)$_3$ washing in Gravimetric analysis by;

a] water b] Dilute HCl acid c] NaOH solution d] NH$_4$ NO$_3$ solution.

b) Calculate the pH at which Cd^{2+} can precipitated completely as Cd (OH)$_2$ and Al^{3+} as Al(OH)$_3$,knowing

that K$_{sp}$ for Cd (OH)$_2$, Al(OH)$_3$ = 6 x10^{-15} and 1x10^{-36} respectively.   (7 Marks).

C) Define each of the following terms :   (8Marks)

1- Thermal gravimetry TG, DTg , DTA and DSC 2- Coat- Red fern equation 3- α (TG) 3- Faraday's 2nd law. 4-α & Yield %.

d) Give an explanation and show importance of the following: (10 Marks).

1-Using volatilization methods in gravimetric analyses, give 5 application.

2- The condition must be fulfilled to get complete ppt. gives examples.

2- a) Calculate the solubility of CaF$_2$ in :   (10 marks)

1]Distilled water   2] KNO$_3$ of concentration 0.2 M   3] 0.1 M Na F.   Knowing that K$_{sp CaF2}$= 4x10^{-11}

P.O →

b)Complete <u>5 only</u> of the following :   (10 Marks)

2-Washing solution must be ……….. &………..&……. &……and …..

3-Volatilization method used for determination of ……. in steel and nitrogen in…….. and using HF acid for determination of….

4- Choice of precipitant   must be …… and curried out in solution contains …..

5- From Thermal gravimetry TG can be determine…………… and …………. using ……….. equation and …….

6- Determination of Ni $^{2+}$ in gravimetric analysis using ….. in …….. medium.

7- Organic precipitations have ……… and……… ….. at   certain …

3- a) Define 5 <u>ONLY</u> of the following :   (5 marks)

1-log f ±, µ (ionic strength)   2-Gravimetric factor, K sp   3- Super –saturation, relative Super – saturation,   4-X $_u$,S   5- Colloidal stat.   6-Post precipitation, Occlusion.

b) Give the name of precipitating agent, precipitate form , washing solution and weighing form of the following ions ,when determined by Gravimetric analysis;

 Salicylate & Cl $^-$ & Cu $^{2+}$ & Ni $^{2+}$ & Co^{2+} & Pb $^{2+}$ (12 Marks)

c) The sample of phosphours are weight 0.6538 and precipitated as MgNH $_4$ PO $_4$ and ignited as Mg $_2$P$_2$ O$_7$ .If the   weight of substance after ignition is 0.2446 gm. 1] Calculate % of P and P $_2$O $_5$ in the sample.

2] Wt of MgNH$_4$PO$_4$ .6 H $_2$O Atomic wt Mg =22 , P =31, O =16 ,N =14 and H=1.   (8 Marks)

Good Luck : Prof. Dr. I Kenawy