Assiut University Faculty of Science Chemistry Department		Dec: 2019 Time: 2 hrs Marks: 50
Final Exam. of Physical and Inorganic Chemistry (250 - CH)		

Section I (Inorganic Chemistry)

(25 Marks)

Answer the following questions

1.a) Explain the reasons for **Five only** from the following:

i The unexpected high boiling point of H_2O.

ii .NO_2 is an acidic oxide

iii.SF_6 is known but OF_6 is not

iv. Concentrated solution of HF acid is not kept in glass bottle.

v. Cesium ions conduct electricity more than lithium ions..

vi.NH_3 is a poisonous gas .

b) How you can prepare **three only** from the following:
superphosphate, water gas, NH_3, HI,.

c) In each pairs of acids, state which is stronger and why?
HF and HBr, $HClO_2$ and HIO_2, H_2SO_4 and H_2SO_3.

2.a) Choose the correct answer and comment:

i) In which species does **nitrogen** exhibit its highest oxidation state

(NH_3 ,NO_2^- ,N_2) .

ii)Which one of the following species contains an **even** number of

electrons: (NO_2,NH_4^+, NO)

iii) The species which contains **diamagnetic** properties is (NO, O_2, N_2)

b)Give **three examples** of Freon's and how do they damage the environment?

c)What are the types of hardness of water ?How we can remove this problem?

See the Next Page

Section II (Physical Chemistry: C-250, (Marks: 25)

Answer the following questions

I) 1) If the system absorbs heat, $Q_p .and. \Delta H^{\#0}$ will be Choose the correct answer: (Mark: 5)

:

a) Negative, b) Positive, c) ∞

2) if $\Delta H .and. \Delta q$ are negative the reaction will be:

a) endothermic b) exothermic, c) revbersible d) irreversible

3) For irreversible Isothermal processing of an ideal gas:

$\Delta G^{\#0}$=.... a) $\succ 0.00$ b) $\prec 0.00$ c) ΔR

4) $\Delta E = ... - .....$ a) $Q - H$, b) $Q - W$, c) nRT, d) $nRdT$

5) $\Delta H = \Delta E + ...$ a) ΔF, b) ΔR, c) ΔW, d) ΔC_p

II) complete the following: (Mark: 5)

1) $\ln K = . \frac{-\Delta H}{R}(\frac{1}{T}) + ...$

2) under isothermal expansion of ideal gas, ΔS=....

3) $\frac{-d(LnK_{eq})}{dT} = ...$ 4) $\frac{-d(LnK_{eq})}{d(\frac{1}{T})} = ...$ 5) $\int_{H_1}^{H_2} dH = \int_{E_1}^{E_2} dE + ... + ...$

III -a) Show, how can you calculate the work done (W) in each operation, maximum work (W_{max}), and efficiency (η) during Carnot cycle (Mark:6)

b) calculate the efficiency $\eta(\%)$ at:

T_1 (k)	0.0	45	60	100	200	300
T_2 (k)	300	50	40	80	400	0.0
$\eta(\%)$						

IV) Think a hypothetical reaction between gases: How you can determine the relation between $\Delta G^{\#}$.,..$\Delta G^{\#0}$,,.and..K_{eq} (Mark: 3)

V) When gaseous ozone (O_3) is formed from molecular oxygenby the reaction: $\frac{3}{2}O_2 \longleftrightarrow O_3$ What is K_{eq} (Mark: 3)

if : $\Delta G^{\#0}. = 39.1 Kcal.mol$, $R = 1.98..al/mol.\deg$ at: 300, 400, and 500 K

VI)) The equilibrium constants (K_C)) for the reaction: $2HI_{(g)} \xleftrightarrow{K_{eq}} H_{2(g)} + I_{2(g)}$

are: $K_{P1} = 2.18x10^{-2}$ at $T_1 = 764K$ and $K_{P2} = 1.64x10^{-2}$ at $T_2 = 667K$

Find: 1) $\Delta H^{\#0}$,...$\Delta G_1^{\#0}{}_1$...*and*....$\Delta G_2^{\#0}$ for the reaction. (Mark: 3)

Good Luck

Exams: 1) Prof. Dr. Amna S A Zidan, 2) Prof. Dr. Seddique M Ahmed

Assiut University
Faculty of Science
Chemistry Department

Jan:2020
Time:3 hrs

Physical Chemistry Examination (C-230) for Second Level Students

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Answer the following questions:

1) Answer Only Three from the following: **(16.5 Marks)**

a) Derive Kinetic equation for determination the specific rate constant for the following reactions: A+B $\xrightarrow{K_2}$ products

b) Discuss the collision theory of Bimolecular reaction.

c) Discuss the half change method for determining the order of reaction.

d) At 378.5 C° the half life period for the first order thermal decomposition of ethylene oxide is 363 min. and the energy of activation of the reaction is 52,000 cal/mol. From these date estimate the time required for ethylene oxide to be 75% decomposed at 450C°(R=1.987)

2) Answer Only Seven from the following: **(33.5 Marks)**

a) A chemist compressed an ideal gas against a constant external pressure of 380mmHg, the volume changes from 200 to 50 liters. Determine the internal energy change that took place knowing that 1.7K cal of heat have been evolved.

b) Discuss the temperature dependence of entropy.

c) At 760mm/Hg, 780gm of benzene is vaporized at its boiling point of 80C° Calculate: i) W_{rev} , ii) q , iii)ΔH , iv)ΔE , the heat of condensation is -7.6 cal/ mol, M.wt of benzene=78gm/mol.

d) ΔH_{fus} of formic acid=1590cal/mol at its melting point 9.9C° and ΔH_{cond}= -5600cal/mol at its boiling point 90C°. Calculate the change in entropy that takes place when 3 mole of solid formic is melted at its melting point and changed to vapor at its boiling point , all under constant pressure of 1 atm , C_p of formic acid=19.6 cal/mol-deg.

e) Phosgene is formed at25C° according to: $CO_{(g)} + Cl_{2(g)} \longleftrightarrow COCl_{2(g)}$. Calculate $\Delta G°$ and the equilibrium constant for this reaction, knowing that: $\Delta G°CO$=-32.8 K cal/mol , $\Delta G°Cl_2$=0 , $\Delta G°COCl_2$=-50.3K cal/mol and R=1.98 cal/mol -K.

f) Calculate the equilibrium constant at 28C° for the reaction: $S^{+3}/2O_2 \longleftrightarrow SO_3$, the heat of formation of SO_3 at 25C° is -94.5K cal/mol and the standard moler entropy change for S , O_2 , SO_3 are7.62 , 49.0 and 61.24 cal/mol-K , respectively.

g) Determine the equilibrium constant for the following reaction at 25C°: $Mg^{2+} + Sn_{(s)} \longrightarrow Mg_{(s)} + Sn^{2+}$ knowing that the cell potential , $\Delta E°$, is equal to -2.23V and Faraday=23.06 cal/volt.

h) For the vaporization process: $H_2O_{(L)} \longleftrightarrow H_2O_{(g,\ 1atm)}$ ΔH=9590 cal/mole and ΔS=25.7 cal/mol-deg , prove that the normal boiling point of water is 100C°.

Examiners: Prof.Dr.Y.Temerk ; Prof.Dr.A.El-Awad

Chemistry Department
Faculty of Science
Assiut University

January 2019
Time: 3 hours

Organic Chemistry Examination for Second Level Students
(Aromatic and Heterocyclic Chemistry 212 C)

Section A (Aromatic Compounds **(25 Points)**

Write the name of all compounds

Answer the following questions:

1-A- What mining by: (give examples):---------- (5 marks)

Keto & Enol form, Phenone, Anhydride, Hydrazone, Mezo, Xylene.

B- Comperative between the following pairs

1- Electophilic & Nucluophilic substitution.

2- Amide & Emide.

2) A-Give examples for the following reactions ***(Three only)--(5 marks):***

1- Condensation reaction. 2- Oxidation & Reduction reaction

3- Rearrangment reaction. 4- Polymerization reaction.

B- Give one method to prepare the following compounds ***Two only:***

Gamexane* Salicylic acid. * Glycozal

3) *A- How do you convert* : (**Two only**)---------- (**5** marks):

1- Acetylene → Saccarine. 2- Aniline → Benzonitrile

3- Benzene → *m*-nitro-nitrobenzene

4)- *A- complete the following equations* **(Three only)**-------- (**5** marks)

1- Phthalic anhydride + 2. phenole $+H_2SO_4$ → a + NaOH → b

2- Aniline $+ CH_3COCl$ → a $+ Br_2$ → b $+ H_2SO_4$ 70 % → c + d

3- Benzoic acid $+ SOCl_2$ → a + b + c

4- Toluene $+ Cl_2$ (sun light) →

5 *- A- Write the name of the following compounds* ***.....(5 marks).***

1) 2) 3)

4) 5) 6)

B- Draw the structural formula of the following compounds:

Methyl salcylate * *p*- Bromo-acetanilide

2,6-naphthoquinone * Ter. butylchloride

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Section B (Heterocyclic Chemistry) **(25 points)**

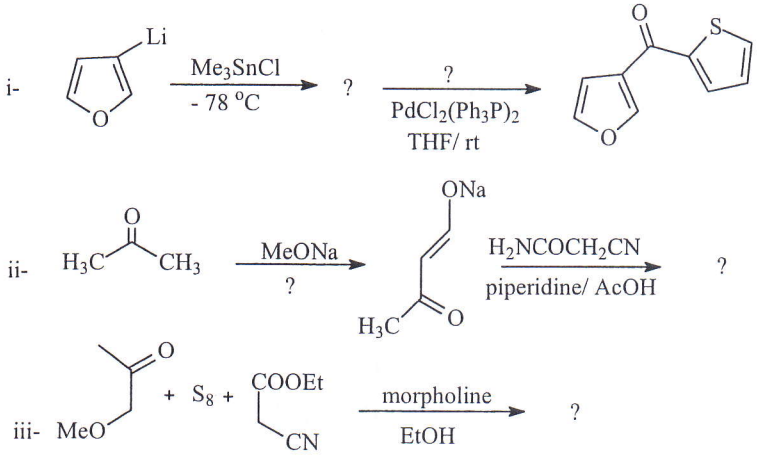
Answer the following questions

1- Draw the structural formulae of Three only of the following heterocycles: **(5 points)**

i- 2-Bromomethyl-3-pyrrole. **ii- 2,3-Dimethylquioxaline.**

iii- 2-Acetyl-3-aminoquinoline **iv- 2-Phenyl-1,3,5oxadiazole.**

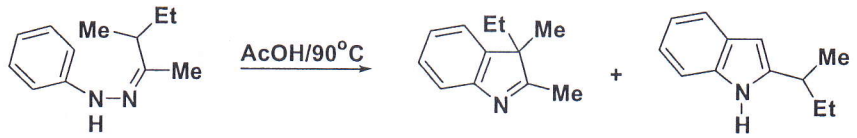
2 -Provide the missing products and reagents for the following transformations: **(5 points)**



3- Write on the following, give examples **(5 points)**

i- Vilsmeir reaction. **ii- Suzuki coupling**

4- Suggest detailed mechanism for the following reacti **(5 points)**



90% trace

5- Show by equations how you synthesize the following heterocycle **(5 Points)**

a- Ranitidine **b- Vitamin B6 (Pyridoxine)**

Assiut University

Faculty of Science

Chemistry Department

January, 2020

Time: 2 hr.

Final Examination for Applied Industrial Chemistry Students

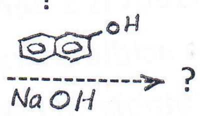
(Chem 202C, Organic Chemistry)

Section A (Aromatic Chemistry) (25 Marks)

1) a) Complete four only of the following equations: (9 Marks)

i) $C_6H_5SO_3H$ + H_2O/ Δ ----------------> ?

ii) $C_6H_5NH_2$ + $NaNO_2$/HCl ---------> ?



iii) C_6H_5OH + CH_3COCl -------------> ?

iv) $C_6H_5SO_2Cl$ + HNR_2 -------------> ?

v) C_6H_5CHO + H_2NR ------------> ?

b) Starting with benzene outline the syntheses of three only of the following compounds: (6 Marks)

i) Phenol ii) Benzoic acid iii) Acetophenon

iv) m-Bromo benzenesulfonic acid

2) a) Predict the expected product would be obtained of three only of the following reactions: (6 Marks)

i) Benzene with $CH_3Cl/AlCl_3$ ii) Benzoic acid with Soda lime

iii) Acetophenone with Zn(Hg)/ HCl v) Toluene with $3Br_2$

b) i) Which is more basic: aniline or methyl amine ? (2Marks)

ii) Which is more acidic: phenol or 2,4,6-trinitrophenol ? (2Marks)

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Section B (Heterocyclic Chemistry) (25 Marks)

1- Answer the following:

a) Draw the structure of the following compounds: (7 Marks)

Furan – quinoline – indole – pyrimidine - isoxazole, benzothiazol – 1,2,3-triazole.

b) Marks (only six) of the following as (√) or (X): (6 Marks)

i) Pyrimidines are not aromatic heterocycles.

ii) 1,3-Azoles are very reactive towards electrophilic attack.

iii) 1,2 - Azoles are more basic than 1,3- azoles.

iv) Isoxazole and isothiazole are basic heterocycles.

v) Quinoline nucleus is a benzene ring fused to Pyrrole ring

vi) Acetylene has acidic character

vii) Thiophene is stable to Lewis acids.

2- a) Show by equations and mechanisms the preparation of the following: (6 Marks)

i) The Paal – Knorr synthesis of thiophene.

ii) Robinson-Gabril synthesis of oxazole.

b) Complete (only six) of the following equations: (6 Marks)

i) Furan + $HCHO/HN(CH_3)_2$ in HCl ---------- ?

ii) 2,5- Dimethylthiophene + EtBr ($AlCl_3$) ---------- ?

iii) Isoxazole + Br_2 ---------- ?

iv) Pyridine + H_2O_2 (AcOH) ---------- ?

v) 2-Methylquinoline + CH_3Br/KNH_2 ---------- ?

vi) Imidazole + HNO_3/H_2SO_4 ---------- ?

vii) Thiophene + CH_3COCl ($SnCl_4$) ---------- ?

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

Prof. Ali Ahmed Abdel Hafez

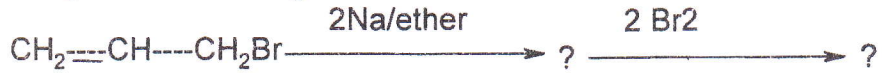
Assiut University
Faculty of science **January 2020**
Chemistry Departement **Time 2 hours**

Final examination in Organic chemisty 211C for non chemistry students(the chemistry of aliphatic compounds and some selected aromatic compounds)

Answer the following questions---------- 50 marks

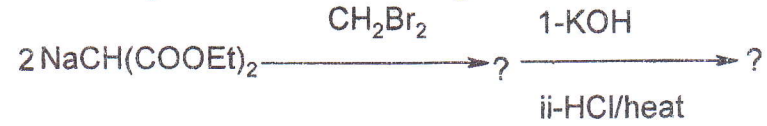
Question1 Answer five only of the following--------- 20 marks

a-Complete the following **reactions**



b- Hydration of Vinyl acetylene using dil H2SO4/HgSO4 and give the type of the reaction

c-Predict the products of the following reactions



d-By equations convert Calcium adipate to 1.,2 dibromocyclopentane

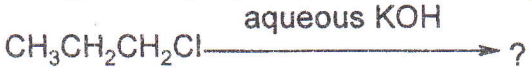
e-Acid hydrolysis of CH3CO(CHPh)COOEt) and name the product

f- Reaction of ethyl acetoacetate(EAA) with PhNHNH2 and give a mechanism

Question 2 Answer five only of the following---------- 15 marks

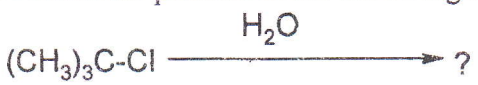
a-Neopentyl bromide is very unreactive in SN2 reactions .Explain

b-Assign the major product of the following reaction and suggest a mechanism



c-Give the structure and type of the reaction of 1-butene with HCl

d-Predict the product of the following reaction and propose a mechanism

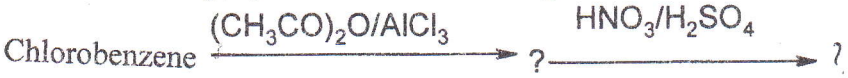


e-By equations prepare trinitrobenzene(TNB) from benzene

f-Nitrobenzene did not undergo fridel-crafts reactions .Give the reason

Question 3 Answer five only of the following---------- 15 marks...

a-Predict the major product of the following reactions

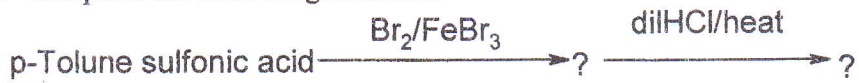


b-Reaction of toluene with CH3COCl/AlCl3 and name the reaction

c-Complete the following sequence of reactions

d-Prepare p-bromoaniline from benzene

e- Complete the following reactions



f-Synthesis of m-aminobenzaldehyde from benzene.

GOOD LUCK
Prof.Dr.Sh.M.Radwan

Assiut University
Faculty of Science
Chemistry Department

Dec:2019
Time:2 hrs

Final Exam in Quantitative Analytical Chemistry (C-240)

Answer Four Questions Only:- **(12.5 Marks for each question)**

1)a- Define the following:- i- Electrode potential ii- Redox indicators

b- Equal volumes of 0.1 M Fe^{2+} and 0.2M Ce^{4+} are mixed. What is the potential in the solution , vs.N.H.E.? ($E°Fe^{3+},Fe^{2+}$=0.77V ; $E°Ce^{4+},Ce^{3+}$=1.61V)

c- Exactly 33.31 ml of $KMnO_4$ solution were required to titrate a 0.1278 g sample of primary standard $Na_2C_2O_4$. What is the molarity of $KMnO_4$ solution?

2)a- Discuss the limitations of Volhard method .

b- What pH is required to just precipitate iron(III) hydroxide ($K_{sp}=4.0\times10^{-38}$) from a 0.10M $FeCl_3$ solution?

c- A divalent metal ion reacts with a ligand to form a 1:1 complex , ML^{2+} , ($K_f=1.0\times10^{8}$). Calculate the pM in a solution obtained by mixing equal volumes of 0.2M M^{2+} and 0.2M ligand.

3)a- Define: i- Chelating agent ii- Chelatometric titration

b- Express the titer of a 0.10M EDTA solution in mg BaO/ml.

c- Distinguish between co-precipitation and post- precipitation.

d- Calculate the weight of Ba and the weight of Cl present in 25.0g $BaCl_2$.

4)a- Explain the difference between systematic and random errors.

b- A soda ash sample is analyzed by titration with standard HCl. The analysis is performed in triplicate with the following results 93.50 , 93.58 and 93.43% Na_2CO_3. Within what range are you 95% confident that the true value lies? (t=4.303)

c- A buffer solution is 0.2M in acetic acid and in sodium acetate. Calculate the change in pH upon adding 10ml of 0.10M sodium hydroxide to 100ml of this solution(pKa=4.76)

5)a- Write briefly on: Bronsted acid-base theory.

b- Calculate the pH of a solution obtained by reacting 50ml each of 0.1M NH_4OH and 0.1M HCl ($K_b=1.8\times10^{-5}$, $K_w=1.0\times10^{-14}$)

c- Tris (hydroxymethyl) amino methane (Tris) is a weak base used to prepare buffers in biochemistry. What weight of Tris must be taken with 100ml of 0.5M HCl to prepare 1L of a pH 7.4 buffer solution (For Tris M.wt =121.135 , pK_b=5.92)

(At.wts: C=12 , O=16 , Na=23 , Cl=35.5 , Ba=137.34)

Good Luck

Examiners: Prof.Dr.Hassan Sedaira ; Prof.Dr.Elham Y.Hashem

Assiut University **Dec 2019**
Faculty of Science **Time: 2 Hours.**
Chemistry Department

Inorganic Chemistry (1) (C - 220)
Final Examination for 2nd year students
First semester 2019 - 2020

Answer the following questions : **(50 Marks)**

I)Write a short account on: **(10 Marks)**

1- Clathrate compounds formed by some Nobel gases.
2- The composition and production of both water gas and producer gas.
3- Comparison between diamond and graphite regarding the structure and electrical conductivity.
4- Diagonal relationships in periodic table.

II) Answer only four of the following :

1) **Complete the following staments:** **(10 Marks)**
   a- CO is toxic for human beings because.....
   b- Factors influencing complex formation are 1.....2.....3.....
   c- Permanent hardness is due to ..... and can be removed by .....
   d- HF cannot be handled in glass vessels due to .....

2) **Give reason (s) for the following:** **(10 Marks)**
   a- Cesium salts conduct electricity more than Lithium salts.
   b- In pure water beryllium salts are acidic.
   c- Carbon is limited to form a maximum of four covalent bonds.
   d- Perchloric acid is more acidic than hybochlorous acid.

3) **Complete the following equations:** **(10 Marks)**
   a- $Li_3N + 3H_2O \rightarrow$ .....+.....
   b- $NaHCO_3 \rightarrow$ .....+.....+H_2O
   c- $F_2 + 3H_2O \rightarrow$ .....+.....
   d- $Al + NaOH + H_2O \rightarrow$.....

4) **Using Chemical equations clarify the following chemical processes.** **(10 Marks)**
   a- Freons causes damage to the ozone layer .
   b- Boric acid acts as strong monobasic acid in presence of glycerol.
   c- Write the names , symbols, electronic configuration and oxidation states of group IV Elements.

5) **Give a method for obtaining the following :** **(10 Marks)**
   Urea - XF_6 - Portland Cement – Boron sequioxide.

"Good Luck "

Examiners
Prof. Dr Ahmed Hassan Othman
Pof. Dr Dina M. Fouad

Chemistry Department — December 2019

Faculty of Science — Time: 2 h

Assiut university

Final examination of the second level students in "Inorganic chemistry" course, 207C (Industrial program)

Answer the following

1. Give reasons for **SEVEN ONLY** of the following (14 Marks)
   - i) Solutions of Be salts are acidic (give an equation)
   - ii) Electrical conductance of molten I_2 .
   - iii) Chemistry of B is different from that of other group III elements
   - iv) $K_2Cr_2O_7$ is used as a primary standard in volumetric analysis.
   - v) Lanthanide and actinide contractions.
   - vi) $La(OH)_3$ is more basic than $Lu(OH)_3$.
   - vii) ZnS does not precipitate when H_2S is passed in acidic solution of Zn(II) while CdS does.
   - viii) SF_6 is very resistant to chemical attack.
2. Give two methods for the preparation of metal carbonyls and then draw the molecular orbital diagrams to show the bonding in these compounds.(6 Marks)
3. Give the nomenclature of the following compounds: (6 Marks)
   $[Co(NH_3)_4Cl_2]^+$, $[Ag(CN)_2]^-$, $[Cr(NH_3)_3Cl_3]$
4. Give only one method for preparing the following compounds and then draw their chemical structures: i) the industrial preparation of hydrogen peroxide . ii) quantitative preparation of B_2H_6. Iii) chromyl chloride iv) pure Mn metal (8 Marks)
5. Complete the following equations: (16 Marks)

$2MO_2 + 2H_2O \rightarrow$

$2H_2S + SO_2 \rightarrow$

$SO_2 + PCl_5 \rightarrow$

$XeF_6 + 3H_2O \rightarrow$

$TiCl_4 + 2H_2O \rightarrow$

$Cu^{2+} + 2I^- \rightarrow$

$2Mn^{3+} + 2H_2O \rightarrow$

$Cr_2O_7^{2-} + 6I^- + 14\,H^+ \rightarrow$

Good Luck

Examinar: Prof. Dr. Aref A. M. Aly

Assiut university
Faculty of science
Chemistry department

Date: 22/12/ 2019
Time allowed: 3 hours

Final exam in 210 C course for second level's students

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<u>Part 1(Reaction Mechanism):</u> .... (25 marks)

<u>Answer the following questions:</u>

<u>1.A. Choose the correct answer for the following questions:</u> .... (5 marks)

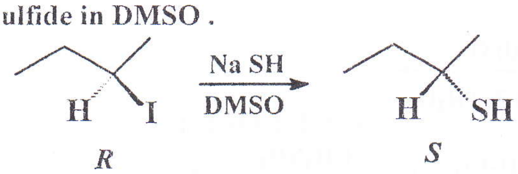
1) Which of the following statements regarding the E2 mechanism is wrong?
   a- Reactions by the E2 mechanism are generally second order
   b- Reactions by the E2 mechanism usually occur in one step
   c- Reactions by the E2 mechanism usually occur in two steps.
   d- Reactions by the E2 mechanism are always bimolecular.
2) Which of the following is not nucleophile:
   a- $CH_3CH_2CH_3$, b- $CH_2{=}CHCH_3$, c- CH_3CH_2SH , d- CH_3OH
3) Which of the following compound is classified as allylic halide:
   a. $PhCH{=}CBrCH_3$, b. $PhCH{=}CH\text{-}CH_2Br$, c. $PhCBr{=}CHCH_3$
4) Methyl bromid reacts with CH_3CH_2ONa / CH_3CH_2OH via :
   a- S_N1 mechanisme , b- E1 mechanisme , c- S_N2 mechanisme , d- E2 mechanisme
5) Based on Saytzeffs rule, select the most stable alkene :
   a- 1-Methyl cyclohexene , c- 3-Methyl cyclohexene ,
   b- 4-Methyl cyclohexene , d-They are all of equall stability

B. Mark <u>Five ONLY</u> (√) or (X) for the following sentences and then correct the wrong one:..........(5 marks)

1) Crowding at the carbon that bears the leaving group slows the rate of bimolecular nucleophilic substitution.
2) Hydrolysis of Vinyl bromide give vinyl alcohol.
3) $CBr_2{=}C(CH_3)_2$ can exist as cis and trans isomers.
4) E1cb reaction takes place through carbocation intermediate .
5) S_N1 reactions go faster with DMF as solvents.
6) Isolation and chemical trapping are used to determine intermediates.

2.A. Draw the equation , reaction mechanism with showing the selectivity, the energy diagram and type of the reaction for; (10 marks)

1- 2-Iodo pentane with sodium sulfide in DMSO .

4. 

2- HBr with 2-methylpropene.
3- t.Butyl bromid with C_2H_5OH/H_2O.
4- Propyl cholorid with $t.BuO^-K^+/t.BuOH/60°C$.

B. <u>Answer FIVE ONLY of the following:</u> .... (5 marks)

1) Draw all resonance structures of $CH_3CH{=}CHCHO$ .Explaine your answer using curved arrows.
2) Rank the following substances in order of their expected S_N1 reactivity (explain your answer):

CH_3CH_2Br $\quad H_2C{=}CHCH(Br)CH_3 \quad H_2C{=}CHBr \quad CH_3CH(Br)CH_3$

3) What is meaning with intermediates?
4) What is the hyperconjugation ?
5) Why S_N1 mechanism is non-stereospecific while S_N2 mechanism stereospecific.
6) Explain when the reaction proceeding E1cb and not proceeding according E1.

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Part 2 (Carbonyl Compounds): ..... (25 marks)

Answer the following questions

Question No. 3:

A) Which of the following is true for ethyl acetate? (5 Marks)

1) This compound is classified as carboxylic acid
2) Reduction with $LiAlH_4$ afforded ethanol
3) There is NO reaction with amines
4) An excess of CH_3MgBr/ ether reacts to give t-butanol.
5) It can react with another molecule of ethyl acetate in presence of EtONa through Aldol condensation.

B) Explain by equations TWO ONLY of the following reactions and then discuss the mechanism, name the products and name of the reaction (4 Marks)

1- $HCOOC_2H_5 + CH_3COOC_2H_5 \xrightarrow[(ii)\ H_3O^+]{(i)\ EtONa} ?$

2- $Ph_3P{=}CH\text{-}CH_2\text{-}CH_3 + CH_3COCH_3 \longrightarrow ? + ?$

3- $PhCOCH_3 + 3I_2 \xrightarrow[(ii)\ H_3O^+]{(i)\ NaOH} ? + ?$

C) Starting with ethyl acetoacetate or diethyl malonate, show by equations how to synthesize TWO ONLY of the following (4 Marks)

1) Cyclohexane carboxylic acid 2) 2-pentanone 3) Acetyl cyclopentane

Question No. 4:

A) Complete FIVE ONLY of the following equations: (5 Marks)

1- 2- Butenal + 1,3- Butadiene $\longrightarrow$?

2- $CH_2(CN)_2 \xrightarrow{H^+/\ H_2O} ? \xrightarrow{C_2H_5OH\ /\ H^+} ?$

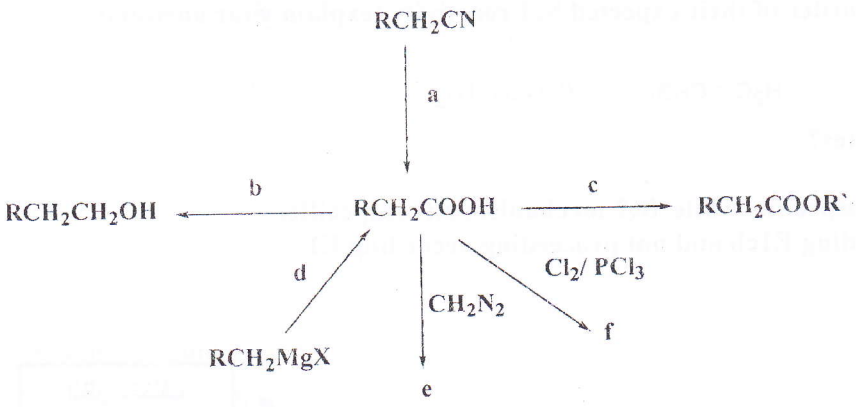
3- $PhCH_2COOH \xrightarrow{SOCl_2} ? \xrightarrow{NH_3} ? \xrightarrow{Br_2/\ NaOH} ?$

4- $(CH_3)_2\text{-}C{=}C(CH_3)_2 \xrightarrow[(ii)\ Zn/\ H_2O]{(i)\ O_3} ?$

5-  $\xrightarrow{PDC\ /\ CH_2Cl_2} ? \xrightarrow{CH_3NH_2} ?$

6- $CH_3CHO + PhCHO \xrightarrow{NaOH} ? + ?$

B) Show reagents, conditions and products to bring about each equations: (3 Marks)



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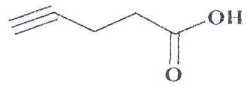
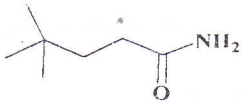
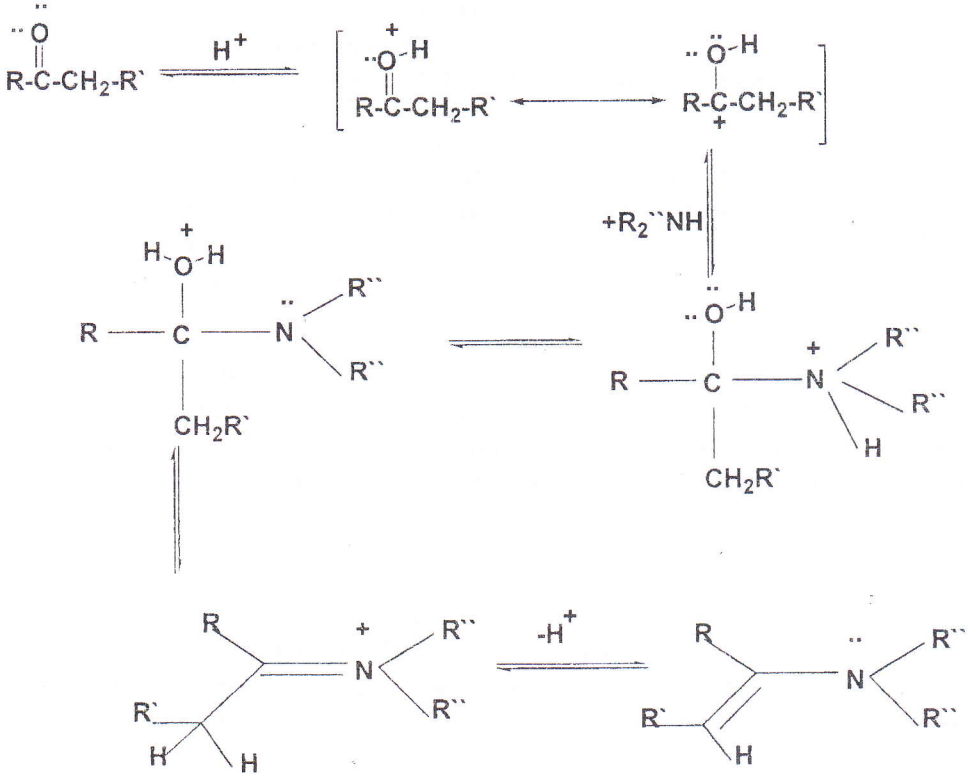
C) Write the IUPAC name of TWO ONLY of the following (2 Marks)

1) 

2) 

3) 

D) The following reaction scheme is describing Enamine Formation, show the flow of electrons by using arrows in this scheme. (2 Marks)



GOOD LUCK

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