Assuit University May 2015

Faculty of Science Time: 3 hours

Final examination in Organic Chemistry 2 (212C), Group 2

Section (1): (Aromatic Chemistry) **(25 Marks)**

1) a) Illustrate by equations the preparation of only three of the following compounds from benzene: (6 Marks)

i) 1, 3, 5-Trinitrobenzene ii) 3-Nitrobenzaldehyde

iii) 4-Acetyl-2-chlorobenzoic acid iv) 3-Bromo-5-ethylphenol

b) Describe the reaction mechanism for nitration of anisole (3 Marks)

c) Predict the major product(s) that will be obtained upon mono bromination of only four of the following compounds. (4 Marks)

i) Benzophenone ii) Benzanilide iii) Ethyl benzene

v) Benzene sulfonic acid vi) Benzonitrile

2) a) Arrange of the following compounds in order of decreasing reactivity towards ring chlorination. (3 Marks)

i) Benzoic acid ii) Phenol iii) Acetanilide

iv) N, N-diethyl aniline v) Toluene vi) Nitrobenzene

اقلب الصفحة

(الامتحان مكون من ثلاث صفحات)

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b) Predict the major product(s) of the following reactions: (5 Marks)

1) 1,3-Dinitrobenzene $\xrightarrow{(NH_4)_2S}$?

2) Phenol $\xrightarrow[RT]{\text{Conc. } H_2SO_4}$?

3) 3-Methoxybenzaldehyde $\xrightarrow{Cl_2 / FeCl_3}$?

4) 4-Bromoanisole $\xrightarrow{NaNH_2 , NH_3}$?

5) Toulene $\xrightarrow[AlCl_3 \text{ anhydrous}]{CH_3(CH_2)_3Cl}$?

c) Write on only two the following: (4 Marks)

i) Benzoin condensation ii) Rearrangement of phenyl hydroxylamine

iii) Perkin synthesis of cinnamic acid

Section (2): Heterocyclic Chemistry) (25 Marks)

Answer the following questions:

1) Show how the disconnection approach can rationalize the synthesis of only two of the following compounds: (5 Marks)

i) 2, 5-Dimethylfuran ii) 2, 3, 4-Trimethylpyrazole iii) 2, 6-dimethylpyridine

2) Write on only two of the following: (6 Marks)

a) Electrophilic substitution reactions of pyrrole, thiophene and furan

b) Anion Chemistry of oxazole, imidazole and thiazole

c) Electrophilic substitution reactions of isoxazole, pyrazole and isothiazole

3) Write briefly on the following: (4 Marks)

a) Vilsmeier reaction mechanism on 2-methylfuran

b) Mannich reaction for thiophene and indole

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4) Answer the following: (5 Marks)

a) Electrophilic and nucleophilic substitution reactions of quinoline and pyridine

b) Draw the structural formula of only five of the following:

i) Coumarin ii) Purine iii) Benzo[c]thiophene

iv) 1-Methylindazole v) 3-Methylisoquinoline vi) Acridine

5) How can you synthesize only five of the following compounds? (5 Marks)

i) 7-Methylquinoline ii) 2, 3, 5-Trimethylimidazole

iii) 2, 3, 4, 5- Tetramethylpyrrole iv) 5-Amino-3-methylisothiazole

v) 2-Phenylindole vi) 5-Methyltetrazole

Good Luck

Prof. Dr. Yasser A. Elossaily

(1)

Chemistry Department
Faculty of Science
Assiut University

May 2015
Time: 3 hours

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

Section A: (Aromatic chemistry) (25 Marks)

Answer the following questions:-

(1) A- Indicate the product(s) you would obtain from nitration of the following compounds (**Three only**):
(i) Phenyl benzoate (ii) m-Xylene (iii) Anisaldehyde (iv) P-Methyl acetanilide

B- Electrophilic substitution on aniline occurs at the ortho and para positions. Explain, using resonance structures of the intermediates.

C- Complete **Three only** of the following equations, giving the name of each product:

(i) Acetophenone $\xrightarrow[HCl]{Zn\,(Hg)}$ .....?..... $\xrightarrow[\Delta]{KMnO_4}$ .....?..... $\xrightarrow[ZnCl_2]{C_2H_5OH}$ .....?.....

(ii) sodium benzene sulphonate $\xrightarrow[\Delta]{NaCN}$ .....?..... $\xrightarrow[H_2O]{SnCl_2/HCl}$ .....?..... $\xrightarrow[MeCO_2Na]{Ac_2O}$ .....?.....

(iii) 1,2-Dinitrobenzene $\xrightarrow{NH_3}$ .....?..... $\xrightarrow{HNO_2}$ .....?..... $\xrightarrow{Cu_2Br_2}$ .....?.....

(iv) Bromobenzene $\xrightarrow[(ii)\,MeI]{(i)\,Mg/ether}$ .....?.... $\xrightarrow[AlCl_3\text{-}CuCl]{CO/HCl}$ .....?..... $\xrightarrow{Cl_2}$ .....?.....

(2) A- Indicate using the mechanism of **only two** from the following reactions:

(i) Friedel-Crafts alkylation. (ii) Aldol condensation. (iii) Benzidine rearrangement.

B- Carry out the following conversations: **(Three only)**

(i) Nitrobenzene to p-bromoaniline. (ii) Toluene to (T.N.B.)

(iii) Aniline to 1,3,5-tribromobenzene. (iv) Benzene to anisole.

C- Write a note on the Hinsberg reaction.

Section B: (Heterocyclic chemistry) (25 Marks)

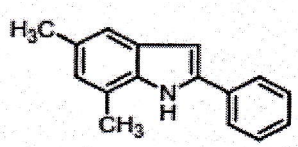
Answer the following questions:

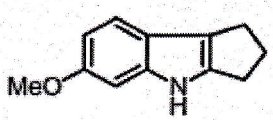
(1) a- Draw the structural formulae of **Three only** of the following heterocycles:

i- 2-Amino-5-benzoyl-4-phenylPyrimidine. ii- 2-Acetylamino-3-cyanoquinoxaline.

iii- 2-Bromo-5-isopropyl-1,3,5-thiadiazole. iv- 2-Cyanomethyl-4-aminoindole.

b- From what starting materials could you make these two indoles?

? + ? ⟶ 

? + ? ⟶ 

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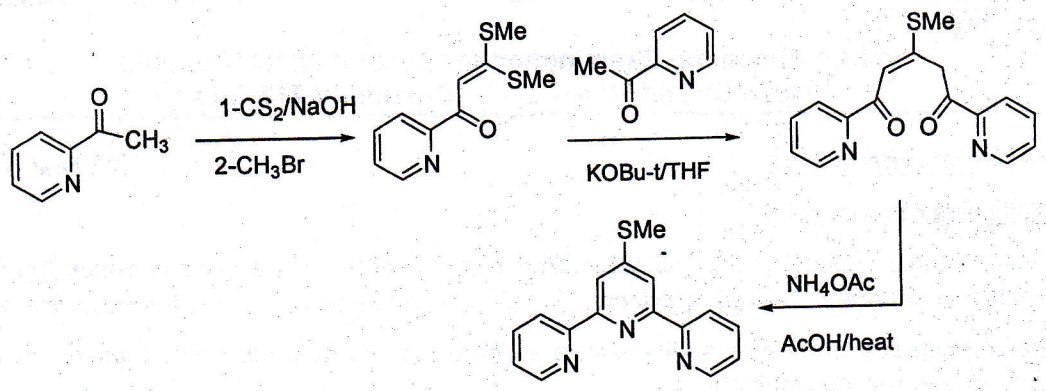
(2) a- Suggest detailed mechanism for the following reaction:



b- Show by equations how can you synthesize **two only** from the following heterocycles.

i) Ranitidine ii) Pyridoxine iii) 2-Carboethoxyindole

Good Luck

(1)

Chemistry Department
Faculty of Science
Assiut University

May, 2015
Time: 3 hours
50 Marks

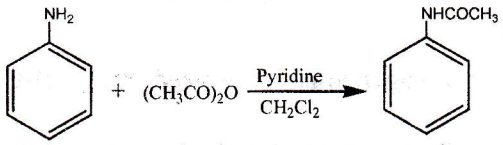
Final Exam of Green Chemistry (214 C) for the 2nd level students

Answer all of the following questions: **50 Marks**

1]- Answer *One* only of the following: **(10 Marks)**

a) **Discuss in details the oxidation mechanism of RCH=CHR in smog?**

b) **From the view point of the green chemistry principles, what are the disadvantages of the following conventional reactions? Outline a greener route for each reaction to obtain these products? And what are the advantages of the new methods?**

i) 

ii) $CH_2=CHCH_2Cl + H_2O \longrightarrow CH_2=CHCH_2OH + HCl$

2]-Provide a brief account for *Four* only of the following: **(4×2.5 = 10 Marks)**

a) **Organophosphate insecticides**

b) **Direct, indirect and synthetic greenhouse gases**

c) **Reactions responsible for ozone hole**

d) **The major regions of the atmosphere**

e) **Hydrogen abstraction reactions of ($OH^{\bullet}$) radical**

f) **Atmospheric lifetimes**

3]- Answer *Two* only of the following: **(2×5 = 10 Marks)**

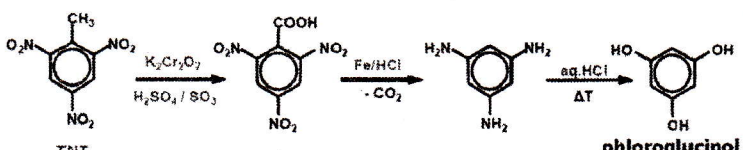
a) **What is the Dobson unit (DU)? Show by equations the role of $NO^{\bullet}$, $OH^{\bullet}$ and $Cl^{\bullet}$ radicals in the catalytic ozone destruction?**

b) **Describe in details the troposphere oxidation of Methane CH_4 to CO_2?**

c) **Outline the manufacturing of biodegradable polymer and Levulinic acid from renewable resources? Sketch Levulinic acid as a platform chemical?**

4]- Answer *One* only of the following: **(10 Marks)**

a) **Calculate the atom economy for the following reaction?**



potassium	iron	chromium	nitrogen
19	26	24	7
K	Fe	Cr	N
39.0983	55.845	51.9961	14.0067
oxygen	**sulphur**	**chlorine**	**carbon**
8	16	17	6
O	S	Cl	C
15.9994	32.065	35.453	12.0107

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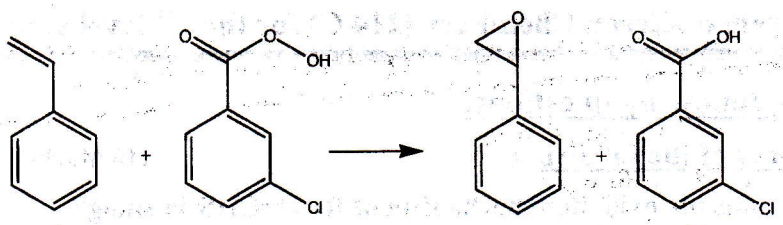
b) In the following reaction, find out the different efficiency parameters (percentage yield, atom economy, conversion factor, and reaction selectivity).

Note, the chemical analysis showed the presence of 1g of styrene at the end of the reaction.



5.2g **8.7g** **4g** **5.26g**

5]- Answer *Two* only of the following: **(2×5 = 10 Marks)**

a) Outline the greener synthesis of Ibuprofen?

b) Distinguish between homogeneous and heterogeneous catalyzed Friedel-Crafts acylation of methoxybenzene?

c) Classify the different types of pesticides according to their chemical structures as well as their applications, give an example for each type?

d) Define two only of the Following terms:

i. Pesticides

ii. Lethal Dose 50

iii. Atmospheric Chemistry

Good Luck

Dr. Hassan Abdou Kotb

Dr. Waleed Ahmed

Assiut University
Faculty of science
Chemistry Department

(1)

June 2015
Time: 3 hours

Examination of Physical Chemistry (I) for Second Level Students (230Ch)

Answer the following questions:

1) Answer <u>Three Only</u> of the following: **(17 Marks)**

(a) Derive the kinetic equation to determine the rate constant and the half-life period for the following reaction:

$$3A \xrightarrow{K_3} \text{Products}$$

(b) Discuss the theory absolute reaction rates.

(c) Discuss the effect of temperature on the reaction velocity.

(d) From the data of the preceding problem, calculate the time required for the reaction to proceed 95% to completion when the initial concentrations of base and ester are both 0.004 $molL^{-1}$ and the specific rate constant is 11.642 gm mol^{-1}/ liter min^{-1}. What would the half-life period be in this case?

2) Answer <u>Two Only</u> from the following: **(16.5 Marks)**

(a) Derive the relation between the standard free energy change with each of the following:

(i) Standard cell potential (ii) Equilibrium constant

(b) Show how to calculate the entropy change for the following thermodynamic processes:

(i) reversible and irreversible gas expansions.

(ii) reversible and irreversible processes accompanied by temperature change

(c) Calculate the work done obtained by three moles of a perfect gas upon expanding isothermally and reversibly from a pressure of 10 atm. to one atm. at 27 °C. What also q, ΔE, ΔH, ΔS and ΔG for the process?

3) Answer <u>Two Only</u> from the following: **(16.5 Marks)**

(a) Discuss the effect (relation) of temperature on each of the following:

(i) equilibrium constant.

(ii) enthalpy of formation of a given chemical compound.

(iii) the volume of a gas in an adiabatic expansion of a gas.

(b) Derive an expression for the efficiency of heat engine and its two working temperatures T_1 and T_2.

(c) Calculate the entropy change suffered by five moles of a gas on being heated from a volume of 100 liters at 50 °C to a volume of 150 liters at 25 °C. Find also ΔE, ΔH, q, W, and ΔG for the processes. [C_P= 9.88 $Cal.mol^{-1}K^{-1}$]

Good Luck

Examiners: Prof. Y. Temerk, Prof. R. Gaber

(1)

Assuit University **May: 2015**
Faculty of Science **Time: 3 hours**
Chemistry Department

Final Exam. of Organic Chemistry (Aromatic & Heterocyclic Chemistry, 212C)
for 2nd level students (Group 1)

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

Question 1:-

a) Write the equation which represents **Three only** of the following:- (3 points)

(i) Wurtz-Fittig reaction. (ii) Fluorescein reaction.
(iii) Cannizaro reaction. (iv) Reimer-Tiemann reaction.

b) Complete **Four only** of the following equations:- (6 points)

(i) Bromobenzene $\xrightarrow{Mg/ether}$? $\xrightarrow{CO_2}$? $\xrightarrow{H_2O/H^+}$?

(ii) Nitrobenzene $\xrightarrow{Zn/HCl}$? $\xrightarrow{HNO_2}$? $\xrightarrow{Cu_2Cl_2}$?

(iii) Benzene $\xrightarrow{CH_3Cl/AlCl_3}$? $\xrightarrow[AlCl_3/CuCl]{HCl/CO}$? $\xrightarrow{H_2N\text{-}CH_3}$?

(iv) Phthalimide $\xrightarrow{NaOH}$? $\xrightarrow{NaOCl}$? $\xrightarrow{HCl}$?

(v) Benzene + $COCl_2$ $\xrightarrow{AlCl_3}$? $\xrightarrow{H_2O}$? $\xrightarrow{CH_3OH/H^+}$?

c) Use the resonance theory to explain why the amino group in aniline is an activating group and ortho-para director, while the nitro group in nitro benzene is a deactivating group and meta director. (3 points)

Question 2:-

a) Predict the major product (s) would be obtained when **Five only** from the following compounds is nitrated:- (5 points)

(i) 4-Aminobenzoic acid. (ii) m-Nitroanisole.
(iii) 4-Nitrodiphenylamine. (iv) 2,4-Dichlorobenzaldehyde.
(v) o-Amino acetophenone. (vi) Phenyl benzoate.

b) What products would be formed when Toluene reacts with the following:- (4 points)

(i) $MnO_2/H_2SO_4/Ac_2O$. (ii) $CH_3COCl/AlCl_3$
(iii) $3H_2/Ni$. (iv) Cl_2/heat.

c) Illustrate by equations how can you prepared **Four only** of the following:- (4 points)

(i) Indigotin from anthranilic acid.
(ii) o-Bromoaniline from benzene.
(iii) Picramide from chlorobenzene.
(iv) 1,3,5-Tribromobenzene from toluene.
(v) Phenol from benzene.

Question 3:-

a) Mark **Five only** (√) for the right statements and (X) for wrong ones. (5 points)

(i) The steps in Knorr synthesis consists of the reaction of ketones with amine to give an enamine followed by intermolecular cyclization.

(ii) Imidazoles are less basic than oxazoles and thiazoles.

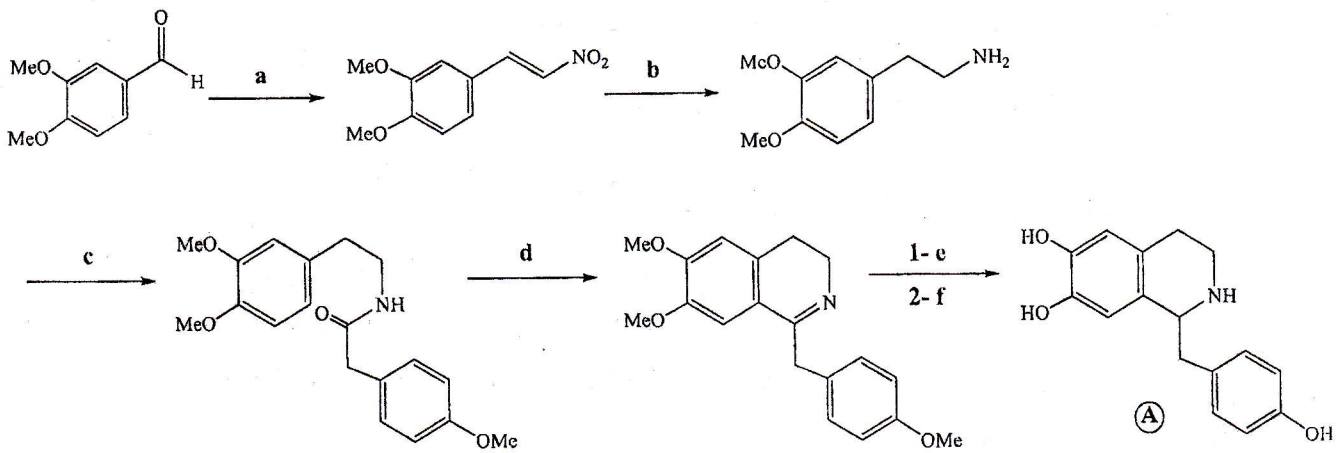
(iii) Thio-carbonyl compounds are more nucleophilic than carbonyl compounds because the higher electronegativity of sulphur as compared to oxygen.

(iv) Acetyl nitrate can't be used for the nitration of furan and pyrrole.

(v) Synthesis of 2-aminoquinoline from the reaction of quinoline with sodamide named Chichibabin reaction.

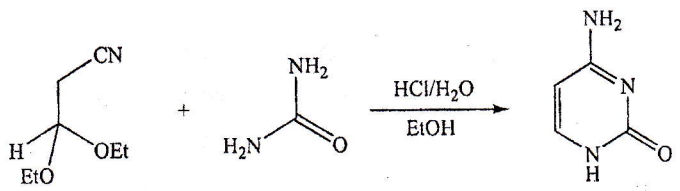
(vi) Alkylation or acylation of thiophene via Friedel-Crafts reaction occurs at C_3 position.

b) A synthesis of the naturally-occurring isoquinoline alkaloid Ⓐ is shown below. What reagents might be used to accomplish each transformation. (3 points)

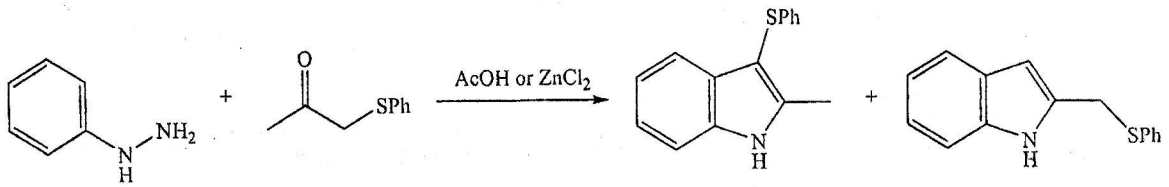


c) Write in details a reaction mechanism of **Two only** of the following reactions:-(4 points)

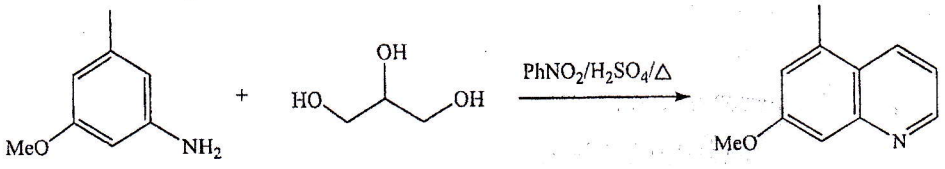
(i)



(ii)



(iii)



Question 4:-

a) Choose the correct answer for **Five only** from the following:- (5 points)

(i) The formylation of reactive aromatic compounds by using a combination of N,N-dimethylformamide/$POCl_3$, followed by a hydrolytic workup named
(Paal Knorr, Vilsmeier, Mannich reaction).

(ii) Which of the following solvents is a heterocyclic compounds
(DMSO, DMF, THF).

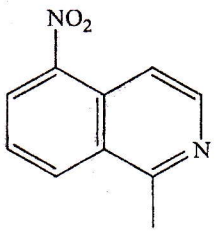
(iii) Formal replacement of (CH) unit in pyridines by a nitrogen atom leads to a a series of three possible isomers of
(Thiazines, Diazoles, Diazines, Triazoles).

(iv) The molecular formula of the major product obtained upon treatment of 2-Methylpyrrole with Ac_2O/HNO_3
($C_5H_6N_2O_2$, $C_6H_7NO_2$, $C_{11}O_{10}N_2$).

(v) Indole synthesis from the condensation of arylhydrizine with ketone followed by cyclization under acidic condition named
(Leimgruber-, Skraup-, Fischer-synthesis).

(vi) The disconnection approach of synthesis essentially involves working backwords from a target compound in a logical manner so-called
(Reaction mechanism, Synthesis, Retrosynthesis).

b) Write the systematic name for **Three only** of the following:- (3 points)



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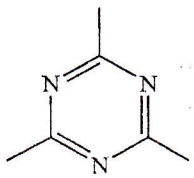
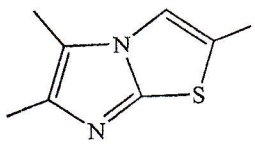
b



c



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c) Complete **Five only** from the following equations:- (5 points)

(i) $CH_3CN + H_2NOH \longrightarrow A \xrightarrow{PhCOCl} B$

(ii) Indole + RMgX $\xrightarrow{ether}$ A $\xrightarrow{Br}$ B

(iii) 2-Chloroquinoline $\xrightarrow{KNH_2/\Delta}$ A $\xrightarrow{PhCOOEt}$ B

(iv) Pyridine $\xrightarrow{H_2O_2/AcOH}$ A $\xrightarrow{H_2SO_4/HNO_3}$ B $\xrightarrow{PCl_3}$ C

(v) 2-Methyloxazole $\xrightarrow{n\text{-}BuLi}$ A $\xrightarrow[HCl/H_2O]{Ph_2CO}$ B

(vi) 2-Butyne + NaN_3 $\xrightarrow{H_2SO_4}$ A

Good luck

المتحنين: ا.د. زينب عبد الحميد حزين – د. احمد فكرى المهدى

Assiut University
Faculty of Science
Chemistry Department

Date : 2/6/2015
Time: 3 hours

The Final Physical Chemistry-2 Examination (C-232) for 2nd Level Students

Answer the following questions:

I- Colloids:

1- Explain what is meant by Only Three from the following terms (Give an example for each term): i) Associated Colloids. (1.5 Marks) ii) Solid foam. (1.5 Marks) iii) Salting out of lyophilic colloids.(1.5 Marks) iv) Emulsifying agents.(1.5 Marks)

2- Describe a method for the preparation of Only Three from the following:
i) Paint pigment sols. (1.5 Marks) ii) Colloidal mercury. (1.5 Marks)
iii) Water in oleic acid emulsion. (1.5 Marks) iv) Calcium acetate gel. (1.5 Marks).

3-a) Give the structure of the colloidal ion of As_2S_3 sol. (2/3 Mark)

b) Write on Only Two from the following:
i) The behavior of gold sol under an applied electric potential difference. (1.5 Marks)
ii) Define: Electro-osmosis - Isoelectric point of protein. (1.5 Marks)
iii) How oil in water emulsion can be converted to water in oil emulsion. (1.5 Marks)

4-a) Give reason: The amount of electrolyte required to precipitate a given sol depends on the nature of the electrolyte added. Give an example. (2 Marks)

b) Complete Only Two from the following:- (2 Marks)
i) ..... is a common thixotropic gel , and the dispersed phase in emulsions are generally ..... charged.
ii) ..... sol can be obtained by change of solvent, whereas ..... can be obtained by hydrolysis.
iii) Edible jelly can be obtained by ....., whereas ..... can be obtained by Bredig's arc method.

II- Phase Rule

1- Predict the number of phases, components then the degree of freedom for each of the following: (3 2/3 Marks)
i) Aqueous solution of sodium chloride.
ii) Transition point (at 95.6 °C) in sulphur system.
iii) Cryohydric point (at - 55 °C) in ferric chloride – water system.

2- Complete each of the following: (3 Marks)
i) Cooling of liquids below their freezing point is called ....., while heating of solids above their transition point is known as .....

إنظر خلفه باقي الأسئلة،،،

(٤)

ii) The addition of salt to ice results in considerable lowering of temperature owing to .....

iii) The dome shaped areas represents the regions of ....., while any point out side these areas represent the existence of .....

3- Explain briefly Only Two from the following: (10 Marks)

i) Sodium sulphate-water system.

ii) Lead- silver system and its uses to extract silver from argentiferrous lead ore.

iii) The ternary system NH_4NO_3-$AgNO_3$-H_2O at 30°C, where the binary compound NH_4NO_3-$AgNO_3$ is formed.

III- Electrochemistry: (16 2/3 Marks)

Answer Three Only from the following questions:

1) From the following cell:

$$Pt.\ H_2\ (P=1)\ /\ H^+\ (1M)\ \ //\ \ (x)\ H^+\ /\ H_2\ (P=1).\ Pt$$

1- Write the type of the cell.

2- Calculate E^0_{cell}.

3- Calculate pH value x of the cathode if E_{cell} =0.12 v.

Calculate ΔH, ΔS, and ΔG if $(\rho E/\rho T) = 10^{-5}$ of the previous cell and T = 298 K.

2) For the following galvanic cells, show which one of the electrode acts as anode and which one acts as cathode. Calculate the E.M.F of each cell:

$$Cd\ /\ CdSO_4\ (1\ M)\ //\ NiSO_4\ /\ Ni\ (0.1\ M)\quad ,\quad Pb\ /\ Pb(NO_3)_2\ (10^{-5}\ M)\ //\ NiSO_4\ /\ Ni\ (1\ M)$$

$(E^0_{Cd/Cd^{+2}} = -0.4\ V,\ E^0_{Ni/Ni^{+2}} = -0.25\ V,\ E^0_{Pb/Pb^{+2}} = -0.13\ V)$

3) Give short account on Two Only from the following:

a- Standard cell. b- Calomel electrode. c- Quinone electrode.

4) (i) Detect the products on the electrodes and the remaining solution in the electrolysis of Na_2SO_4 and NaCl.

(ii) Write short account on corrosion process and its protection.

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

Prof. Dr. Maher M. Girgis .
Prof. Dr. Maher M. A. Hamed .
Dr. Mustafa H. Wahdan.

Assiut University
Faculty of Science
Chemistry Department

(1)

June, 2015

Time allowed : 2 hour

Final Examination of Introductory Quantitative Analysis (C-240)
Students : Second Level " Credit Hours System "

Answer the following questions : (50 Marks)

First Question: (13 Marks)

a) Define each of the following terms: (9 Marks)
Chelating agent- Buffer solution- Co-precipitation.

b) Orthophosphate is determined by weighing as ammonium phosphomolybdate, $(NH_4)_3PO_4.12MoO_3$ .If 1.1682 g precipitate was obtained from 0.2711 g sample.Calculate the percent of P and P_2O_5 in the sample. (Atomic weights :H=1, N=14, O=16, P=30.97 and Mo=95.94)
(4 Marks)

Second Question: (12 Marks)

a) Calculate the pH at 0, 5, 45, 50 and 55 ml added of 0.1 M NaOH in the titration with 50 ml of 0.1 M HCl. (6 Marks)

b) For the titration of 50 ml of 0.05 M solution of NaCl with 0.1 M $AgNO_3$ solution. Calculate the pAg in the following cases: Addition of 0, 24.5, 25 and 25.5 ml of 0.1 M $AgNO_3$. (K_{sp} of AgCl = 1.82×10^{-10}).
(6 Marks)

Third Question: (13 Marks)

a) Give reason for each of the following: (7 Marks)
i) The iodine solution is considered weak oxidizing agent.
ii) The Volhard method is performed in an acidic medium.
iii) The use of sodium chromate as an indicator during the titration of chloride ions with silver nitrate by Mohr method.

b) Compare between three only of the following: (6 Marks)
i) Self indicator and external indicator in redox titrations.
ii) Accuracy and precision.
iii) Iodimetric and Iodometric titrations.
iv) Direct and back- titration methods of EDTA .

Fourth Question: (12 Marks)

a) Write short notes to express two only of the following:
Henderson-Hasselbalch equation – Beer's law–Detection limit. (4 Marks)

b) Describe briefly how does adsorption indicator work during precipitation titrations.
(4 Marks)

c) Complete and balance the following reactions: (4 Marks)
i) $H_2O_2 + MnO_4^- \longrightarrow O_2 + Mn^{2+}$ (acidic solution)
ii) $MnO_4^- + Mn^{2+} \longrightarrow MnO_2$ (slightly alkaline solution).

"Good Luck"

Examiner: Dr.Ahmed Mohamed Kamal

(11)

Assist University
Faculty of Science.
Chemistry Department

Date : Saturday 30/5/2015
Time : 3 Hours
Course No.: 210C

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Final Exam for Second Level Chemistry Student 210C (Sce. Term , 2014/2015)

Answer the Following Questions: (50 Marks)

(I) A- Complete the following equations giving the name of each product : (10 Marks)

1) Formaldehyde + NaOH / Δ → A + B

2) 1-methylcyclohexene $\xrightarrow[2)\ Zn/CH_3COOH]{1)\ O_3}$ A $\xrightarrow{KMnO_4}$ B

3) $CH_3CH_2CH_2CH_2I + CH_3CH_2O^-Na^+ \xrightarrow[CH_3CH_2OH]{50^\circ C}$ A (major) + B (minor)

4) $PhCH_2I + Mg \xrightarrow{Ether}$ A $\xrightarrow[2)H_2O]{1)Formaldehyde}$ B $\xrightarrow{KMnO_4}$ C

5) 1-methylcyclopentpene + H_2O/H^+ → A

B- What is the Saytzeff's rule ? give example. (1.5 Marks)

C- Rank the species below in order of increasing nucleophilicity : (1.5 Marks)

CH_3COO^- , CH_3S^- , HO^- , H_2O

D- Predict the most likely mechanism and the product for the reaction of:

Cis-1-bromo-2-methylcyclohexane with $NaOCH_3$ in methanol (2 Marks)

(II) Mark **TEN ONLY** (√) or (X) for the following sentences and then correct the wrong one : (10 Marks)

1) In singlet carbene the unshared electron are not paired and occupied sp hybrid orbitals for bonding ( )

2) Allylic and benzylic intermediates stabilized by delocalization of charge ( )

3) t.butyl alcohol react with HCl to give t.butyl cholorid via S_N2 mechanisme ( )

4) Acetylene reacts with water in the presence of H_2SO_4 giving acetone ( )

5) Carbanion stabilized by alkyl substituents by inductive effect and hyperconjugation ( )

6) Polar aprotic solvents form weaker interactions with substrate and permit fast S_N1 reactions ( )

7) In E2 reaction; C-H and C-X bonds break simultaneously and giving the alkene in a single step without intermediates ( )

8) Addition of osmium tetraoxide to cis-but-2-ene is stereospecific syn addition ( )

9) Acetals can be used to 'protect' aldehydes and ketones from reacting with strong bases and nucleophiles ( )

10) Nucleophilicity and basicity increase with the increase in atomic number of the key atom in the same-period of the periodic table ( )

11) The molecularity of an elementary reaction is the number of molecules or ions involved in the formation of one activated complex *(involved in the rate determining step)* ( )

12) Aldol reaction favors with aldehydes than ketones ( )

(III) Explain by equations the following reactions and then discuss the mechanism of each reaction , give the name or type of each reaction and the type(s) of Selectivity : (15 Marks)

1) benzaldehyde (PhCHO) with ethyl malonate [$CH_2(COOEt)_2$] in the presence of NaOEt/EtOH

2) acid-catalyzed hydrolysis of methyl vinyl ether

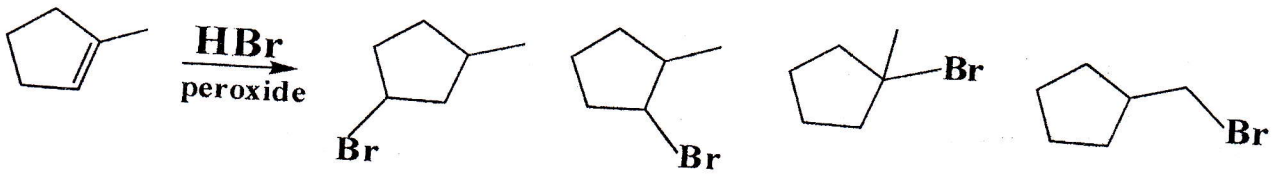
3) 2-bromo-3-phenylbutane with NaOEt / EtOH

4) 1-chloro-1-phenylpropane with CH_3COONa in the presence of CH_3COOH / H_2O

5) cyclohexanone with ethyl formate in the presence of NaOEt / EtOH

(IV) Choose the correct answer from the following sentences (10 Marks)

1) What is the major product for the following reaction?



(a) (b) (c) (d)

2) Which functional group does not contain an oxygen atom?

(a) alcohol , (b) amine , (c) ester , (d) ether

3) Which of the following anions would be the best leaving group for a substitution or elimination ?

(a) $TosO^-$, (b) H_3C^- , (c) HO^- , (d) Br^-

4) The functional group RCOOR' is characteristic of an

(a) ether , (b) ester , (c) amide , (d) aldehyde

5) Which one of the following alcohols may be oxidized by CrO_3/H^+ to a ketone having the same number carbon atoms ?

(a) ethanol , (c) propan-1,3-diol

(b) 2-methylbutan-2-ol , (d) 1-phenylpropan-1-ol

6) Methyl iodide reacts with $(CH_3)_3CONa$ / t.ButOH via

(a) S_N2 mechanisme , (c) S_N1 mechanisme

(b) E1 mechanisme , (d) E2 mechanisme

7) The formula of 3-oxopentanoic acid is :

(a) $CH_3CH_2CH_2COCOOH$

(b) $CH_3CH_2COCH_2COOH$

(c) $(CH_3)_2CH_2COCH_2COOH$

(٤)

8) When 3-iodo-3-ethylpentane is treated with $NaOCH_3$ in methanol , the major organic product is an ---------- that is generated through an -------- mechanism

(a) ether,S_N1 , (b) ether,S_N2 , (c) alkene,E1 , (d) alkene,E2

9) Isotops used to find out :

(a) type of intermediats

(b) which bond is broken

(c) type of the reagent (Nu^-,E^+)

10) Which of the following compounds can exist in two geometrically isomeric forms

(a) CH_3-C≡C-CH_3 , (c) $CH_3CH_2CH_2CH=CH_2$

(b) $CH_3CHOHCH_2CH_3$, (d) $CH_3CH_2CH=CHCH_3$

انتهت الاسئلة وبالنجاح والتوفيق

د اميمة سعد الطوخى

(١)

Assiut University
Faculty of Science
Chemistry Department

2015

Time : 2hr.

Ref. : Final Examination (Acad. Year 2014/2015)
Subject : Course C-250(physical and Inorganic Chemistry)

Section I (25 Marks)

1-Answer the following (12.5 Marks)

a- Give the reasons of(five only)
1) Melting point of NaCl is higher than that of $AlCl_3$.
2) NaCl is soluble in water but $BaSO_4$ is not.
3) Beryllium salts are acidic in pure water.
4) CaO is a basic oxide. 5)H_2O has an unexpected boiling point
6) $CaCO_3$ dissolve slightly when excess CO_2 is passed into an aqueous slurry.

b-How you can prepare (two only): H_2,Na,Mg

c-What products are formed when each of group(I) metals burnt in dioxygen? How do these products react with water

2- Answer the following : (12.5 Marks)

a-Mark with (x)for the wrong statement or (√) for the correct statement of the following and explain why(three only)
i)ozone is a powerfully oxidizing agent. ii)Nitrogen is able to form pentahalides.
iii)Acidity strength of HF is higher than HI. iv)HF is kept in glass apparatus

b-compare between the following (three only)
i)conductivity and reactivity of diamond and graphite. ii)Acidity of HOCl and $HClO_4$.
iii)Oxidation state of oxygen and groupVI elements. iv)Reactivity of fluorine and iodine.

c-i)Complete the following equations(two only)
1-$Xe+F_2 \longrightarrow$ 2-$PCl_5+4H_2O \longrightarrow$ 3-$CCl_4+2HF \longrightarrow$

ii)Write the structure of the following(two only):
Nitric acid, Dithionous acid, Hydrogen azid

iii)How can you prepare the following(two only)
i)Hydrofluoric acid ii)Carbon monoxide iii)Urea

أنظر خلف الورقة باقى الاسئلة

(c)

Section II (Marks:25)

Answer the following questions I) Choose the correct answer (Marks:10)

1) The work done under isothermal condition is equal to:

a) $nR\ln\frac{V_2}{v_1}$ b) $nRT\ln\frac{P_2}{P_1}$ c) $nRT\ln\frac{V_2}{v_1}$ d) $nR\ln\frac{Q_2}{Q_1}$

1) Under adiabatic expansion: $\Delta Q = ...$ a) nRT b) $PV.$ c) 0 d) ΔE

2) Under adiabatic condition: $(\frac{V_1}{V_2})^{\gamma} = ...$ a) $\frac{E_1}{E_2}$ b) $\frac{H_1}{H_2}$ c) $\frac{P_2}{P_1}$ d) $\frac{T_1}{T_2}$

3) $C_P - C_v = ...$ a) nRT b) nR c) R d) ΔH

4) For reversible isothermal condition, $dS = ...$

a) ΔH b) ΔQ c) $nR\ln\frac{V_2}{V_1}$ d) $nR\ln\frac{T_2}{T_1}$

6) ΔS Depending on T, $\Delta S = ..$ a) $nRT\ln\frac{P_2}{P_1}$, b) $nRT\ln\frac{V_2}{v_1}$, c) $nR\ln\frac{T_2}{T_1}$

7) P change at constant V, $\Delta W = ...$ a) PdV ,b) 0.00, c) nRT

8) For irreversible expansion, $\Delta W = ..$ a) PdV, b) nRT, c) $C_P(T_2 - T_1)$

9) The efficiency of a heat engine in the carnot cycle is equal to ($\eta = ...$)

10) For isothermal chemical processing: $dG = ...$

a) $dH - SdT$ b) $dH - TdS$, c) $dH - dQ$, d) $dH - dE$

II) The enthalpy change ($\Delta H^{\#}$) of vaporization of SO_2 is 5959 cal/mole, at its boiling point 263 k. The heat capacity (C_P) of liquid is 21.5 cal/mole-deg.and that of vapor is 11.5 cal/mole-deg. Calculate ΔH of vaporization at 213 K. (Marks:5)

III) Calculate ΔS at: (Marks:5)

a)) Variable volume b) Variable temperature

Consider a hypothetical reaction: $aA + bB \xleftarrow{K_1/K_2} cC + dD$ (Marks:5)

Show how can you calculate $\Delta G^{\#}$ and $\Delta G^{\#0}$ at equilibrium

Good Luck

Examiners: Prof. Dr. Amina SA Zedan, Prof. Dr. Seddique M Ahmed

(1)

Assiut University
Faculty of science
Department of chemistry

June . 2015

Time : 2 hours

Inorganic chemistry (1) (220 Chem.) For 2nd year students

Answer the following questions: (50marks)

1- Answer the following: (20marks)

a- Mark with (x) for the wrong statement or (√) for the correct statements of the following and *explain why*: (answer five only) (10marks)

i. Xenon reacts with fluorine depending on the F_2/Xe ratio
ii. Boiling point of NaCl is higher than $AlCl_3$.
iii. Cesium salts conducts electricity more than lithium salts.
iv. Hellium is diatomic.
v. Beryllium salts are basic in pure water.
vi. HF is kept in glass containers.

b- Compare between the following and *explain why* (answer five only) (10 marks)

i- Boiling point of H_2O and H_2S.
ii- Differences in acidity between HOCl and $HClO_4$.
iii- The acidic strength of HF and HBr.
iv- Oxidation states of oxygen and group VI elements.
v- Li, Ga , F (hardness , electro negativity)
vi- Permanent and temporary hardness.

2- Answer the following: (10marks)

a- Complete the following equations : (answer five only) (5marks)

i- $Ca_3N_2 + H_2O$ ii- $N_2H_4 + 2NH_2Cl$ iii- $XeF_2 + HCl$
iv- $Mg_3B_2 + H_3PO_4$ v- $PCl_5 + 4H_2O$ vi- $N_2O_4 + H_2O$

b- Show by equations how can you prepare the following (answer five only) (5marks)

i- Urea ii- SO_2 iii-NH_3 iv- CO v- H_2O_2 vi- HF

3- Answer the following: (10marks)

a- Give reasons for the following statements: (answer three only) (6marks)

i- Boric acid behaves as strong monobasic acid in presence of glycerol.
ii- CO is toxic for human beings
iii- Tl(+I) is more stable than Tl(+III).
iv- Freons causes damage to the ozone layer .

b- Write the structure of the following (answer seven only) (4marks)

i- Hydroxylamine ii- Nitrogen sesquioxide iii- Halic acids iv- Ozone
v- Dithionic acid vi- Hydrogen azide vii- Nitrous acid viii- XeF_4 molecule

4- Answer the following: (10marks)

a- Complete the following statements: (6marks)

i- Great reactivity of fluorine is due to 1…..2…….
ii- Factors influencing complex formation are 1…..2…..3…..
iii- The balanced equation for the reaction between MnO_4^- and N_2H_4 in alkaline solution to produce MnO_2 and N_2 is ……..

b- Show by equations how can H_2O_2 act as a strong oxidizing and reducing agent. (4marks)

Good luck

Examiner: Dr. Dina Mamdouh