

Chemistry Department

Dec. 2016

Faculty of Science

Time: 3h

Assiut University

Final exam for the 4th level students in "Industrial Chemistry"(course 453C)

Part I

1. Answer the following (17 Marks)
 - i) Suggest the probable products produced upon hydration of dicalcium and tricalcium silicates, tricalcium aluminate and tetracalcium aluminoferrite in cement industry.
 - ii) Give in details the manufacture of Na_2CO_3 using the Solvay process.
 - iii) Write on the most important properties of fiberglass (but not glass fiber).

2. Answer the following (18 Marks)
 - i) Give short notes on **THREE** of the following items from glass industry:
Annealing of glass – chemical reactions occurring during glass formation – borosilicate glass – soda-lime glass.
 - ii) "Manufacture of simple superphosphate fertilizer includes two stages followed by ageing and neutralization of the product".
Discuss each stage giving chemical equations when possible.
 - iii) Give the properties and uses for **TWO** of the following ceramics:
chemical stoneware – porcelain – Bone china .

أنظر خلفه حيث بقية الأسئلة

- 4) Reaction of glycine with ethanol in presence of hydrogen chloride gas gives:
 a) Glycyl glycinate. b) Ethyl glycinate hydrochloride. c) Hippuric acid. d) Glycolic acid
- 5) Carrying out the Strecker amino acid synthesis on acetaldehyde gives:
 a) Glycine b) Alanine c) Aspartic acid d) glutamic acid
- 6) The sequence of amino acids in a polypeptide chain is called:
 a) Primary structure b) Secondary structure c) Tertiary structure d) Quaternary structure
- 7) Which of the following fats has the highest iodine value?
 a) Tripalmitin. b) Stearo-diolein. c) Palmito-oleo-stearin. d) Triolein.
- 8) Rancidity increases as:
 a) The molecular weight increase. b) The molecular weight decrease.
 c) The number of double bonds increases. d) The number of double bonds decreases.
- 9) Which of the following fatty acids has the lowest melting point?
 a) Palmitic acid b) Oleic acid c) Linoleic acid d) Stearic acid
- 10) Saponification number increases as:
 a) The molecular weight increase. b) The molecular weight decrease.
 c) The number of double bonds increases. d) The number of double bonds decreases.

V. Put (✓) in the front of the correct Statements and (X) in the front of wrong ones: (10 Marks)

- 1- D-glucose and D-galactose are anomers.
- 2- Reduction of fructose gives sorbitol and mannitol.
- 3- The Fisher open structure does not account for all the reactions of glucose.
- 4- The cyclic structure of glucose is formed by reaction of -CHO with -OH on C4.
- 5- The type of the peptide glycyl-L-alanyl glycine is dipeptide.
- 6- The antiparallel strands of DNA are not identical, but are complementary.
- 7- In proteins, the amino acids joined by glycoside linkage.
- 8- Acid value is a measure of rancidity.
- 9- Oils with high acetyl number are toxic.
- 10- Adenosine-5'-phosphate is nucleoside of RNA.

Prof. Dr. Mohamed S. Abbady & Dr. Waleed A. El-sayed

Good luck

Assiut University
Faculty of Science
Chemistry Department

Date: 16th Jan 2017

Time: 2 hours

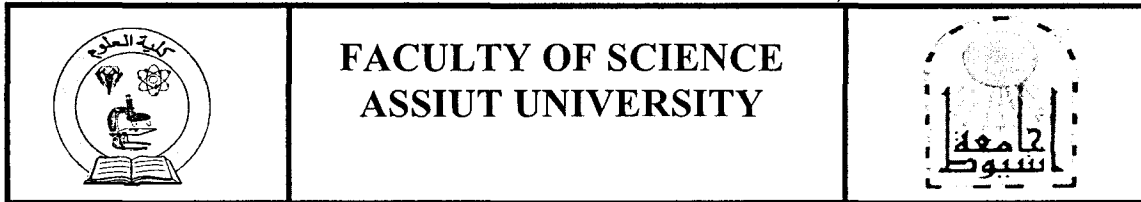
C-441 Analytical and Bioanalytical Chemistry Exam

Answer *Five only* from the Following Questions: (50 Mark)

- 1- Define the following Terms: (10 Marks)
 - (i) Factors influencing the quality of analytical data
 - (ii) Internal quality control
 - (iii) Theoretical plates of a chromatographic column
 - (iv) Blank determinations
 - (v) Proficiency testing.
- 2- What are the general factors increasing resolution in a chromatographic separation? (10 Marks)
- 3- Explain how to Performing a GC separation. (10 Marks)
- 4- Give reason:
 - (i) In GC analysis, the injection port and detector are kept somewhat warmer than the column. (5 Marks)
 - (ii) Hydrogen and helium carrier gases are preferred with thermal conductivity detectors. (5 Marks)
- 5- Why: (10 Marks)
 - (i) Separation of amino acids is a challenge?
 - (ii) We must chemically modify amino acids when analyzing by GC.
6. What are the basis of electrophoretic separations? (10 Marks)

Good Luck

Examiner: Prof. Dr. Nagwa Abo El-Maali



**Final Exam on Radiometric & Geothermal Methods (452G)
(Two Pages – 50 marks total)**

January: 2017


Time: 2 hours

A. Mark the following statements as True or False: (one marks each)

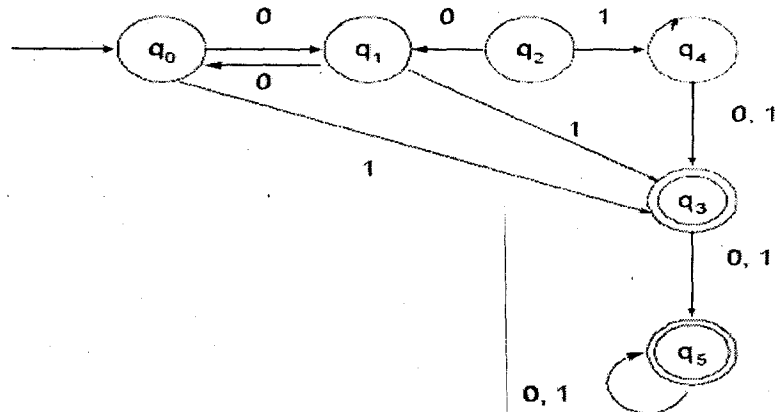
1. Presence of radon at the surface indicates buried uranium concentrations
2. The greater the depth, the greatest the thermal conductivity and the lowest the thermal gradient
3. The advantage of K-Ar age dating method is the abundance of K
4. Highly conductive salt intrusion displays a thermal low and a gravity high.
5. The carbon isotopes can be used to estimate Ancient climate feature
6. Thermal conductivity of rocks is controlled by Porosity and mineral content
7. Thermal gradient can be used to detect changes in lithology
8. The appreciable anomaly in radiometric survey is three times the background
9. Salt dome structure will result in high gradient, low thermal conductivity
10. The age of the earth can be determined from the uranium-lead age dating method
11. Salt domes are considered excellent targets in geothermal survey
12. The Radon Emanometer can be used to map faults
13. Temperature within the earth increases by 10°C per 3 meter
14. The mean heat flow values of continents are lower than oceans
15. The radiometric measurements are usually conducted in conjunction with magnetic and electromagnetic survey
16. The greatest temperature gradient occurs in shales and the lowest in salt and anhydrite
17. Thermal conductivity of rocks is controlled by porosity and mineral content
18. The disadvantage of $^{87}\text{R}-^{87}\text{Sr}$ age dating method that it represents a solid-solid system (no loss of daughter)
19. Thermal gradient is more efficient than absolute temperature to detect changes in lithology
20. Low level of radioactivity is present in almost all rocks and minerals which attributed to traces of U, Th, and isotope of ^{40}K

B. Define five only of the following: (two marks each)

- | | | |
|-------------------------|-------------|--------------------------|
| 1) Thermal conductivity | 2) Isotope | 3) Radioactivity |
| 4) Thermal gradient | 5) Curie | 6) Terrestrial heat flow |
| 7) Half-life time | 8) Roentgen | |

See next page 

Q4: a) 4pts Minimize the states in the dfa depicted in the following diagram.



b) 6pts give a regular expression r such that

- i) $L(r) = \{w \in \Sigma^* : w \text{ has at least one pair of consecutive zeros}\}$.
- ii) $L(r) = \{w : n_a(w) \text{ and } n_b(w) \text{ are both even}\}$.
- iii) $L(r) = \{w : (n_a(w) - n_b(w)) \bmod 3 = 1\}$.

Q5: a) 5pts Show that the language $L = \{w \in \Sigma^* : n_a(w) < n_b(w)\}$ is not regular on $\Sigma = \{a, b\}$.

b) 6pts Find context-free grammars for the following languages (with $n \geq 0, m \geq 0$).

- i) $L = \{a^n b^m : n \leq m + 3\}$.
- ii) $L = \{a^n b^m : n \neq 2m\}$.
- iii) $L = \{w \in \{a, b\}^* : n_a(w) \neq n_b(w)\}$.

c) 6pts Remove all unit-productions, all useless productions, and all λ -productions from the grammar

$$\begin{aligned}
 S &\rightarrow aA \mid aBB, \\
 A &\rightarrow aaA \mid \lambda, \\
 B &\rightarrow bB \mid bbC, \\
 C &\rightarrow B.
 \end{aligned}$$

What language does this grammar generate?

Dr. Marghny



Final Exam of Petroleum & Petrochemicals (451C) for Double Branches Students

Answer the following questions:

1- I- Answer **two only** of the following: (10 Marks)

- Naphthenes and olefins compounds as petroleum compositions.
- Importance of hydrotreating of kerosene.
- Starting with ethane, how can you prepare of ethylene glycol?

II- Draw and discuss thermofore catalytic cracking process.

2- I- Discuss **two only** of the following points: (10 Marks)

- Carbide theory of petroleum in nature and its disadvantages.
- Write by equations hydrotreatment processes of Indole.
- Starting by benzene, how can you prepare of styrene?

II- Write by equations, if you have n-heptane as feedstock and catalyst, what are the three basic functions in the catalytic cracking processes for n-heptane?

3- I- Explain **two only** of the following: (10 Marks)

- Smoke and pour points and their significant.
- Composition of the residue as older methods of evaluation of crude oils.
- Effect of sulfur compounds in mazout.

II- Draw and discuss of electric desalting process.

4- I- Give an account **two only** on the following: (10 Marks)

- Aqueous alkali as solvent extraction method for desulfurization process.
- Starting with methane, how can you prepare formaldehyde and its uses?
- Octane number and its additives.

II- Draw and discuss Philips alkylation process.

5- I- Write a short notes **two only** of the following: (10 Marks)

- Write by equations, how can you isomerization of n-butane into isobutene?
- API gravity and its examples.
- Decoking in coking process mechanically and hydraulic methods.

II- Draw and discuss vacuum distillation for residual products.

Part 1

Assiut University
Faculty of Science
Chemistry Department

Jan:2017
Time: one hour

Final Examination of Instrumental Analysis Course(C-445)



Students: Fourth Level Students , Faculty of Science



Answer the following questions:

1) Write on **Only Two** of the following: (12.5 marks)

- a)(i) Application of masking reagents in chemical analysis.
 - (ii) Give an example for the extractive separation of metal ions as chelates.
 - (iii) Explain the use of cyclic voltammetry for estimating the values of E° and n (number of electrons) for a reversible system.
- b)(i) The diffusion coefficient (D) for Tl^{+1} is $2.00 \times 10^{-5} \text{ M cm}^2/\text{sec}$, whereas D for Cd^{2+} is $0.72 \times 10^{-5} \text{ cm}^2/\text{sec}$. If a $1.00 \times 10^{-3} \text{ M}$ solution of Cd^{2+} gives a diffusion current of $8.15 \mu\text{A}$, Predict the diffusion current for $1.00 \times 10^{-3} \text{ M } Tl^{+1}$ under the same conditions.
- (ii) An unknown solution containing Tl^{+1} and Cd^{2+} gives a diffusion current of $3.4 \mu\text{A}$ for Tl^{+1} and $4.1 \mu\text{A}$ for Cd^{2+} with the same drop characteristics as in (i), What are the Tl^{+1} and Cd^{2+} concentrations in the solution?
 - (iii) Calculate the drop characteristics.
- c) Stripping voltammetry.

2) Write on **Only Two** of the following: (12.5 marks)

- a) Write short notes on differential pulse voltammetry and square wave voltammetry.
- b) The distribution coefficient for a substance A between CCl_4 and water is 85. Calculate the concentration of A remaining in the aqueous phase after 50 ml of $2.00 \times 10^{-2} \text{ mmol}$ of A is treated by extraction with the following quantities of CCl_4 :
 - (i) One 30ml portion.
 - (ii) Two 15ml portions.
 - (iii) Three 10ml portions.
- c) Amperometric titration.

Examiner: Prof.Dr.Mahmoud.A.Ghandour

Examination of Organic Chemistry (411C) for 4 th Level Students
(Petroleum chemistry, Petrochemicals and Chromatography)

Answer the following three sections (50 mark)

Section (A): Petroleum chemistry (17 Marks)

1- Answer all of the following questions: (9 Marks)

- Outline the characteristics of N&O-compounds present in crude petroleum oils?
- Describe the thermal conversion processes (Visbreaking & Delayed Coking)?
- What are the definitions of API-gravity and Watson factor (UOP)?
How can their values useful in the determination of oil quality?

2- Explain briefly four only of the following: (8 Marks)

- Copper chloride sweetening process
- Catalytic hydrodesulfurization Process
- Electrical desalting of crude oils
- Catalytic Reforming Process
- Isomerization mechanism of *n*-Alkanes

Section (B): Petrochemistry (17 Marks)

1- Answer all of the following questions: (9 Marks)

- Explain by equations the synthesis of TAME and MTBE?
- Outline the important petrochemicals based on propane?
- Describe the manufacture mechanism of acetic acid over Rhodium catalyst?

2- Discuss briefly four only of the following items: (8 Marks)

- Teijin oxychlorination method
- Hydration of ethylene
- Wacker process
- Oxidation processes of *n*-Butane
- Degussa process

Section (C): Chromatography

Write on only four of the following : (16 Marks)

- Ternary system, Coloumb,s law and Van Deemter equation.
- Instrumentation, advantages, disadvantages of thin layer chromatography (TLC) and methods of location of the separated organic components on it.
- Organic resins, gel and flash chromatography of open column chromatography.
- Instrumentation, derivatisation and applications of gas chromatography
- Instrumentation of high performance liquid chromatography (HPLC) and capillary zone electrophoresis (CZE).

GOOD LUCK



Faculty of Science
Chemistry Department

Final Examination for B.Sc. (Chemistry major)
Applied Organic Chemistry (412 C): (Textiles & Dyes & Polymers & Material science)

Date: Saturday, 04/01/2017

Time: 2 hours.

Answer the following Two Sections:

Section A: (Textiles and Dyes Chemistry).

(25 points)

Answer the following:

- 1) Write on physical properties related to Stability , Care and Confort ? .
- 2) Tabulate the physical and chemical structures of Cotton and Wool Fibers?
- 3) Discuss the reaction mechanism of Azo Dyes production?.

Section B : (Polymers &Material Science)

(25 Points)

Answer the following questions:

- 1) Compare between the step- and chain- growth polymerization, and also compare, giving reason, between the time needed in polymerization of these monomers: (Vinyl Chloride, Styrene , MMA).
- 2) Is it possible to make polyethylene from cyclohexane? If not, say why? then show examples of ring opening polymerization?
- 3) Show by equations the mechanism of coordination polymerization using Ziegler-Natta catalyst and Ethylene gas.
- 4) In the living polymerization, show by equations how can we put an ending for the living chain (Carbanion).
- 5) In the formation of polyurethanes, it combine both the addition and the condensation polymerization , Discuss? Then, show with examples the types of Initiators.

Good Luck

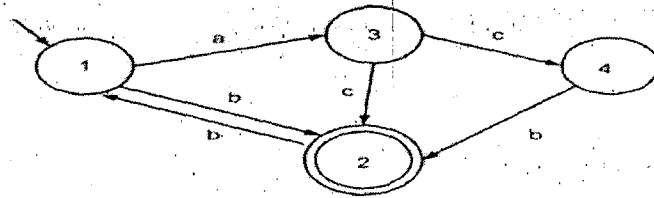
Examiners:

Prof. Dr. Saud A Metwally & Prof. Dr. Kamal I Aly

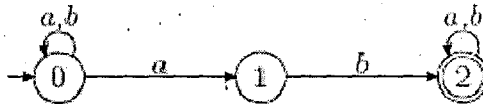


Answer the following questions:

- Q1: a) 4pts Write the subset construction algorithm to convert NFA to a DFA?
 b) 6pts Convert the following NFA to a DFA using the subset construction?
 i)



ii)

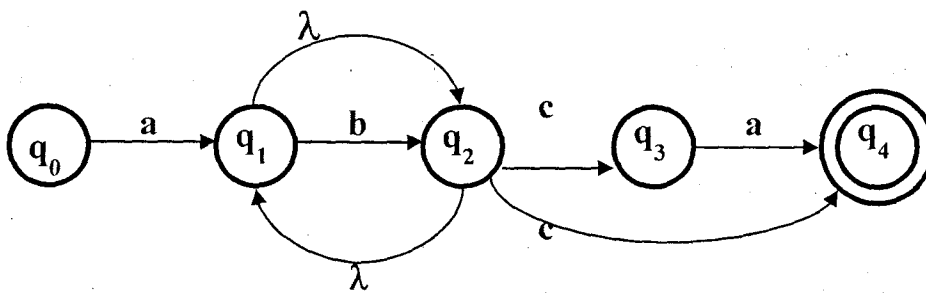


Q2: 8pts Find dfa's for the following languages on $\Sigma = \{a, b\}$

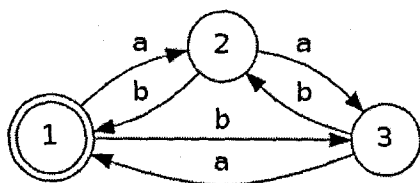
- $L = \{w : |w| \bmod 5 \neq 0\}$
- $L = \{w \mid n_a(w) \bmod 3 > 1\}$
- $L = L(ab^*a^*) \cup L((ab)^*ba)$.
- $L = L(ab^*a^*) \cap L((ab)^*ba)$.

Q3: 6pts Find regular expressions for the languages accepted by the following automata.

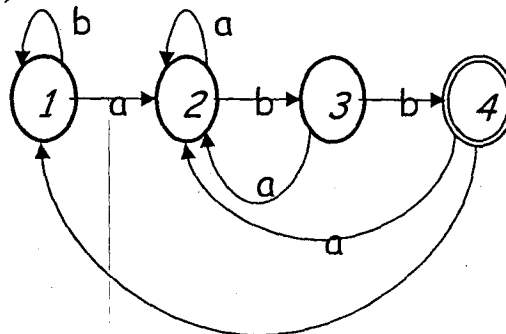
(a)



(b)



(c)



C. Write briefly (short notes) on Ten only of the following: (two marks each)

1. The procedure for thermal conductivity measurements in soft sediments
2. The essential factors in planning any radiometric survey
3. The different heat transfer mechanisms from the earth interior to the surface
4. Causes of local variations in temperature beneath the ground
5. Different types of instruments that can be used in radiometric survey
6. Geothermal measuring techniques with example
7. The importance of studying radioactivity of rocks and minerals
8. Regional and local information obtained from geothermal method
9. The radiocarbon and tritium method for age dating
10. Most common applications of radiometric methods
11. Regions of anomalous heat flow
12. Most common age dating methods
13. Classification of rocks and minerals based on their radioactivity
14. Different source of heat energy within the earth
15. Assumptions made in radiometric dating

End of questions

Good luck.....

Prof. Dr.: Gamal Zidan AbdelAal



Selected Topics in Inorganic Chemistry C-423 (Final Examination)

Question # 1 (Inorganic Biochemistry Section):

(17 Marks)

1. Choose the correct answer:

(11 Marks)

1. The oxy-hemoglobin's O_2 is in the form of (dioxygen – superoxide – peroxide), whereas oxy-hemerythrin contains (dioxygen – superoxide – peroxide) residues.
2. The two ferrous ions present in hemerythrin are of different (coordination number – magnetic moment - spin).
3. Inactive enzymes in their catalytic roles are called (holoenzymes - apoenzymes - senzymes).
4. A protein tertiary structure arises from (interchain interactions of the various R groups present in the protein - intra- and inter-molecular hydrogen bonds between the protein building blocks - intrachain interactions of the various R groups present in the protein).
5. Deoxyhemoglobin contains (pentacoordinate – tetra-coordinate – hexacoordinate) iron(II) centers.
6. The protein coat of ferritin contains (glutamate and histidinate - aspartate and histidinate - aspartate and glutamate) residues.
7. The hemoglobin's O_2 affinity decreases (at low pH and high CO_2 concentrations - at high pH and high CO_2 concentrations - at low pH and low CO_2 concentrations).
8. (Auranofin - Cis-platin – Trans-platin) is a medical of anticancer activity.
9. The dismutation of superoxide ions by superoxide dismutase results in the formation of (dioxygen and hydrogen peroxide - hydrogen peroxide – dioxygen).
10. H_2O_2 is a potentially harmful substance that is removed from biological systems by an enzyme containing (magnesium – zinc – iron).

2. Explain Two Only of the following:

(6 Marks)

1. Chromate ion is quite toxic and a recognized carcinogen.
2. Hemes are able to carry out their oxygen transport and storage functions in the presence of significant concentrations of carbon monoxide.
3. The ^{99m}Tc generator.

Question # 2 (Structural Inorganic Chemistry):

(16 Marks)

1. Choose the correct answer:

(5 Marks)

1. (Anisotropy - Isotropy - Allotropy) is the property of being directionally dependent.
2. In a simple cubic lattice, (the APF = 0.74 - $a = 2r$ - number of atoms =2).

Part 2

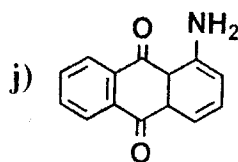
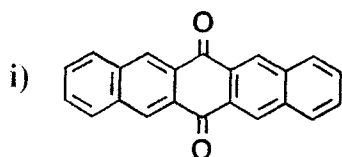
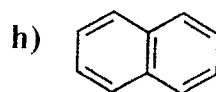
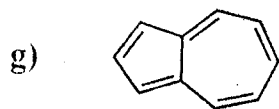
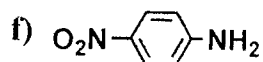
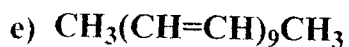
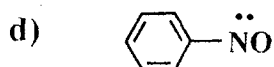
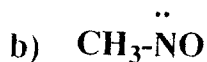
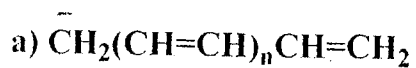
Dyes

Time: 1 hr

Answer the following questions:

1- Select a suitable substituted primary aromatic amine for the production of a stable diazonium salt: Discuss the reaction mechanism and precautions of this reaction. (5 marks)

2- The following structures may represent different chromogens : classify. (5 marks)



3- Discuss the main characteristics of Direct Azo Dyes. (5 marks)

الممتنون

د. د. مود عبد طعم

د. د. علاء الدين محمد علي

Answer the following Questions:

1- A) Complete the following sentences with the correct choice (between brackets) (10 marks).

- (i) The formation constants for metal complexes correlates well with basicity if steric factors are considered. (Arrhenius - Bronsted - Lewis)
- (ii) Hard Lewis acids are metal ions of size and high charge. (large - small)
- (iii) Ligands in which the coordinating atom has a high electronegativity are Lewis bases. (hard - soft)
- (iv) Steric crowding at the reaction centers usually assumed to dissociative reactions. (inhibit - facilitate)
- (v) Inert complexes are thermodynamically (stable - favored - unstable).
- (vi) Greater the overlap of σ or π ligand orbitals with metal orbitals is the trans effect. (weaker - stronger)
- (vii) Non-chelate reactions result in of the independent molecules. (an increase - a decrease - no net change)
- (viii) Among the d^8 systems with similar entering and leaving groups, most are comparatively (inert - labile)
- (ix) In interchange mechanism of square planar complexes the intermediate persists time than in the associative mechanism. (shorter - longer)
- (x) As the reaction enthalpy is largely unaffected, the complex equilibrium constants (K_n) lie in favour of as (n) increases. (reactants- products)

B) Answer One only of the following

(2.5marks)

- (i) Define proton sponge ligands – spectator ligand
- (ii) Derive the equation for calculation of the formation constant of 1:1 complex from spectroscopic measurements.

2- A) Put (\checkmark) or (X) in front of each of the following (10 marks)

- (i) The order of Irving- Williams series is insensitive to the choice of the ligand .
- (ii) Strong field $3d^3$ and $3d^6$ complexes are generally labile.
- (iii) The steric effect is greater if the ligand is trans to the entering group.
- (iv) A ligand for which K_f is small is that binds to the metal ion more tightly than H_2O .
- (v) The faster the reaction with an entering group the greater is its nucleophilicity.
- (vi) All complexes of S-block elements are very labile.
- (vii) Border-line cations are made softer by coordination to soft ligands.
- (viii) There is the same number of overall formation constants as stepwise formation constants.
- (ix) In the Interchange mechanism, the leaving and the entering groups exchange in a single step without formation of an activated complex.
- (x) Highly polarizing ligands have a very small proton affinity.

Final exam of Chemistry of biomolecules (413C) for non-chemistry Students
(Chemistry of Carbohydrates, Amino acids & Proteins, Lipids and Nucleic acids)

Answer the following questions:

I. (10 Marks)

A) Write short notes on:

- 1) Hazards of rancid fats 2) Disadvantage of soap 3) The double helix structure of DNA

B). Give an account(s) for:

- 1- Although glucose is aldohexose, fructose is ketohexose, they give the same osazone.
2- Lactose is reducing sugar but sucrose is not although the two are disaccharide.
3- The Fisher open structure does not account for all the reactions of glucose.

II. (10 Marks)

A) Define the following terms:

- 1) Epimers. 2) Isoelectric point of amino acid 3) Acid value. 4) Anomers.

B) Conduct a comparison between: i) Waxes and fats & oils. ii) DNA and RNA.

III. Show how can you do only five of the following: (10 Marks)

- a- Conversion of glucose to fructose.
b- Conversion of ketoses to aldoses.
c- Conversion of arabinose (pentose) to glucose (hexose).
d- Synthesis of aspartic acid by modified Gabriel's synthesis.
e- Synthesis of tyrosine by Erlenmyer synthesis.
f- Reaction of glycine with formaldehyde and with nitrous acid.

IV. Choose the correct answer of the following: (10 Marks)

1) Oxidation of glucose with bromine water gives:

- a) Gluconic acid b) Saccharic acid c) Glucuronic acid d) Mannonic acid

2) Maltose is reducing sugar and consists of:

- a) Glucose + fructose, linked 1-2'. b) Two glucose units linked 1-4'.
c) Galactose + glucose linked 1-4'. d) Two glucose units linked 1-5'.

3) The presence of solid α -amino acid as Zwitter ion explains:

- a) Its high melting points. b) Low solubility in organic solvents.
c) a & b. d) None of them.

- 4) Reaction of glycine with ethanol in presence of hydrogen chloride gas gives:
 a) Glycyl glycinate. b) Ethyl glycinate hydrochloride. c) Hippuric acid. d) Glycolic acid
- 5) Carrying out the Strecker amino acid synthesis on acetaldehyde gives:
 a) Glycine b) Alanine c) Aspartic acid d) glutamic acid
- 6) The sequence of amino acids in a polypeptide chain is called:
 a) Primary structure b) Secondary structure c) Tertiary structure d) Quaternary structure
- 7) Which of the following fats has the highest iodine value?
 a) Tripalmitin. b) Stearo-diolein. c) Palmito-oleo-stearin. d) Triolein.
- 8) Rancidity increases as:
 a) The molecular weight increase. b) The molecular weight decrease.
 c) The number of double bonds increases. d) The number of double bonds decreases.
- 9) Which of the following fatty acids has the lowest melting point?
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- 10) Saponification number increases as:
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V. Put (✓) in the front of the correct Statements and (X) in the front of wrong ones: (10 Marks)

- 1- D-glucose and D-galactose are anomers.
- 2- Reduction of fructose gives sorbitol and mannitol.
- 3- The Fisher open structure does not account for all the reactions of glucose.
- 4- The cyclic structure of glucose is formed by reaction of -CHO with -OH on C4.
- 5- The type of the peptide glycyl-L-alanyl glycine is dipeptide.
- 6- The antiparallel strands of DNA are not identical, but are complementary.
- 7- In proteins, the amino acids joined by glycoside linkage.
- 8- Acid value is a measure of rancidity.
- 9- Oils with high acetyl number are toxic.
- 10- Adenosine-5'-phosphate is nucleoside of RNA.

Prof. Dr. Mohamed S. Abbady & Dr. Waleed A. El-sayed

Good luck



Assiut University
Faculty of Science
Chemistry Department



January: 2017
Time: 2 hours

First Semester Examination for Biological Students
Subject: Analytical Chemistry (C- 460)

Answer the following questions: (50 Marks)

Q1) Answer Only Two from the following: (12.5 Marks)

a) Write on the following:

i - Electrochemical cell. ii - Fajan method iii - Half wave potential and factors affected on it.

b) Give the reason for the following:

i - The equivalent weight for KMnO_4 in acidic medium is $1/5$ its molecular weight while in basic medium the equivalent weight is $1/3$ its molecular weight

ii - Mohr method is applicable in neutral solution.

c) Define the following :

i - Ilkovic equation . Calculate the diffusion current (i_d) for the reduction of $5 \times 10^{-4} \text{M Zn}^{2+}$ which has diffusion coefficient (D) = $0.72 \times 10^{-5} \text{cm}^2 \text{sec.}$ $m = 15 \text{mg/sec.}$ and $t = 4 \text{sec/drop.}$

ii - Molar conductivity and equivalent conductivity.

Q2) Answer Only Two from of the following: (12.5 Marks)

a) If you are provided with $0.1 \text{M NH}_4\text{OH}$ (100ml) and titrated with 0.1M HCl .

Drive the pH value: ($K_b = 1.35 \times 10^{-5}$)

i - at the beginning of the titration, ii - during the titration and iii - at the end point.

b) Write on the following:

i - Standard hydrogen electrode.

ii - Limitation of volumetric precipitation titration reaction

c) Define the following :

i - Acid – base indicators.

ii - Oxidizing agent and reducing agent.

Q3) Answer Only Two from the following: (12.5 Marks)

a) Write on the following:

i - The applications and the determination of equivalent point in potentiometric titration.

ii - Limitation of volumetric precipitation titration reaction.

b) Show how you can use polarographic technique in qualitative and quantitative analysis.

c) Write on the following:

i - Buffer solutions.

ii - Nernst equation.

Q4) Answer Only Two from the following: (12.5 Marks)

a) During the titration of 100 ml of HCl (1N) using NaOH (1N) , Calculate the pH

i - before the titration.

ii - during the titration.

iii - at the end point and

iv - after the end point.

b) Complete:

i - The equation which give the relation between ($E_{1/2}$) and diffusion current (i_d) is -----.

ii - In the titration of strong acid with strong base the indicators are ----- and -----, while the indicator ----- is used in the titration of weak acid with strong base and ----- is used in the titration of strong acid with weak base.

iii - The indicator in Mohr method is ----- , while in Volhard method the indicators are ----- and in Fajan method the indicators are -----.

c) Write on the following:

i - Limitation of argentometric titration.

ii - Standard hydrogen electrode.

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

Examiner: Prof. Dr. Azza M.M.Ali

3. While packing polygons in two dimensions, (heptagons – trigons – hexagons) don't occur.
4. The tetrahedral interstices in CCP lattice are situated (between a corner and three face-centring atoms - at the centres of the faces - mid-points of the edges).
5. The cesium chloride structure is considered (a BCC lattice consisting of a chloride ion at the center and eight cesium ions at the cube corners – two interpenetrating FCC lattices of cesium and chloride ions – a simple cubic structure of alternate cesium and chloride ion layers).

2. Define the Following Terms:

(5 Marks)

1. Cubic Site
2. Tetrahedral site

3. Answer only one of the Following:

(6 Marks)

1. What is the linear density of metal atoms along the [101] direction in BCC & FCC lattices? consider a lattice constant of 0.3 nm.
2. State the packing differences between the FCC and HCP structures and calculate the APF factor for both structures.

Question # 3 (Metallurgy):

(17 Marks)

Answer the following:-

1- Write about Three of the following:

(9 Marks)

- a- Hydrometallurgy as a method of ore dressing.
- b- BISRA spray steel marking process.
- c- From chromite show how to prepare ferrochrome alloy and pure chromium.
- d- Reactions in the blast furnace used for the extraction of iron.

2- Give reason to Only Four of the following:

(8 Marks)

- a- In the blast furnace CO is major reducing agent while carbon is the minor.
- b- Al is used as a reducing agent for many metal oxides.
- c- Pure oxygen is not used in the Bessmer converter.
- d- Cryolite is used in the electrometallurgy of aluminum.
- e- Carbon is not used as reducing agent in the extraction of titanium from titanium oxide

The Examiners :

1- Prof. Dr. Zaher Abd-Elmohsen.

2- Dr. Ahmed Bayoumi.

(B) Answer One only of the following: (2.5 marks)

- (i) Define the nucleophilic discrimination factor.
- (ii) Intimate mechanism of ligand substitution reactions.

3- (A) Write briefly on the following: (8 marks)

- (i) Derive the equation of calculating \bar{n} values (average number of ligand molecules attached to the metal ion) from pH- measurements.
- (ii) The difference between interchange mechanism and intimate mechanism.

(B) What are the formulas of the metal carbonyls which are isoelectronic with $\text{Cr}(\text{NO})_4$, $\text{Mn}(\text{CO})(\text{NO})_3$, $\text{Fe}(\text{CO})_2(\text{NO})_2$

4- (A) Write balanced equation for the following: (8 marks)

- (i) Using alkylating agent to generate metal to carbon bonds.
- (ii) Carbonyl hydrides are slightly soluble in water where they behave as acids.
- (iii) Preparation of carbonylate anions.
- (iv) How $[\text{Ru}(\text{NH}_3)_5\text{N}_2]^{2+}$ cation can be obtained.

(B) Answer the following question: (4.5 marks)

- (i) Prove that M-N bonds appear to be stronger than M-CO bonds in a chemical sense.
- (ii) Draw the diagrams showing the molecular orbital view of alkene metal bonding.
- (iii) Show with drawing that cyclooctatetraene with four essentially unconjugated double bonds can bind in several ways depending on the metal system.

Good luck

Examiners: Prof. Said Ibrahim, Prof. Sahar El-Gyar