Assiut University

Faculty of Science

Chemistry Department

June: 2017

Time: 2 hours

(50 Marks)

Second Semester Examination for Biological Students

Subject: Analytical Chemistry (C- 460)

Answer the following questions: (50 Marks)

Q₁) Answer <u>Only Two</u> from the following: (12.5 Marks)

a) Write on the following:

i) Acid –Base indicators.   ii) Electrochemical cell.

b) During the titration of 100 ml of NaCl (0.1N) using AgNO₃ (0.1N) calculate **pCl**.

i) before the titration,   ii) after the addition of 50 ml AgNO₃.

iii) at the end point and   iv) after the addition of 110 ml AgNO₃.

($k_{sp} = 1.2 \times 10^{-10}$)

c) Give the reason for the following:

i) Nitric acid is used in Volhard method.

ii) Mohr method is applicable in neutral solution.

iii) Supporting electrolyte is used in the polarographic analysis.

Q₂) Answer <u>Only Two</u> from of the following: (12.5 Marks)

a) Define the following terms:

i) Ilkovic equation.   ii) Nernst equation.

b) Write on the following:

i) Buffer solutions.

ii) Factors affected on the half wave potential ($E_{1/2}$).

c) Calculate the equivalent weight for:

i) $KMnO_4$ in acidic and basic medium.   ii) $K_2Cr_2O_7$.   (K=39, Mn = 55, O = 16, Cr = 52)

Q₃) Answer <u>Only Two</u> from the following: (12.5 Marks)

a) Complete:

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

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

b) **Write on the following:**

i) Determination of the equivalent point in potentiometric titration. (two only)

ii) Interferences and limitation of Mohr method.

c) Define the following:

i) Molar conductivity, specific conductivity and equivalent conductivity.

ii) Types of polarographic current.

Q₄) Answer <u>Only Two</u> from the following: (12.5 Marks)

a) Write on the following:

i) Standard hydrogen electrode.   ii) Limitation of argentemetric titration.

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

c) During the titration of 100 ml of CH_3COOH (1N) using NaOH (1N) calculate the **pH** :

i) at the beginning.   ii) during the titration.

iii) at the end point.   iv) after the end point.

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

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

Assiut University   Date: 28th May 2017
Faculty of Science
Chemistry Department   Time: 3 hour

C-444 Selected Topics in Analytical Chemistry(Final Exam)

Answer the Following Questions:

Section I: (17 Mark)   *Prof Dr Hassan Sedaira*

Answer *five only*:

a) What is the distribution coefficient? The distribution ratio?.

b) For the extraction of benzoic acid, derive the relation between D and K_D. Discuss the effect of the pH on such relation.

c) Describe the equilibrium processes involved in the solvent extraction of metal chelates.

d) Derive a mathematical equation that express the percent extracted. Define each term used.

e) For a solute with a distribution ratio of 25, show by calculation which is more effective, extraction of 10 ml of an aqueous solution with 10 ml organic solvent or extraction with two separate 5 ml portions of the same organic solvent.

f) Arsenic (III) is 70% extracted from 7M HCl into an equal volume of toluene. What percentage will remain unextracted after three individual extractions with toluene?

Section II: (17 Mark)   *Prof Dr Nagwa Abo El-Maali*

a) Explain how you can quantify the concentration of virus C In a patient sample using the real time PCR technique.

b) Answer *three only*.

i) Define the following Terms:
   Color additive- Color Additive Approval-   E –number.

ii) What are the regulations for color additives?

iii)   What are the types of Color Additives?

iv)   Discuss a method for speciation of Cr(VI) and Cr(III) in water samples.

Section III: (16 Mark)   *Dr Ahmed Kamal Youssef*

Answer *Four only* (16 marks

a) Describe a spectrophotometric method (involving the mechanism) for the determination of dopamine drug through the complexation of dopa- semiquinone with Ni (II) ions.

b) Illustrate the scheme proposed for metronidazole drug reacting with sodium nitrite in the presence of hydrochloric acid. Describe the reaction

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involving in the mechanism between diazotized drug and β-napthol as a coupling agent to form the azo product.

c) Suggest a spectrophotometric method for the detection of Fluoroquinolone antibacterial (Norfloxacin) drug by forming binary complex between the drug and Eosin Y dye.

d) Describe the scheme proposed for indirect determination of ascorbic acid by oxidation with $HgCl_2$ and reaction of oxidation product with 4,5- dimethyl-o-phenylendiamine.

e) Describe the scheme proposed for detection of dothiepin drug using quinalizarin in an acidic medium.

Good Luck

Assiut University

Faculty of Science
Chemistry Department

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

Date: Wednesday , 17/05/2017	Time: 2 hours.

Answer the following Two Sections:

Section A: (Textiles and Dyes Chemistry). (25 points)

Answer the following:

1) Discuss the physical character of fibers related to durability.

2) **Answer One of the Following:**

 a) Relation between color and constitution of organic compounds.

 b) Chemical structure of Wool as compared with that of cotton.

3) **Write on One of the following :**

 a) Reaction mechanism of Azo dye formation in industry.

 b) Chemical reaction of cotton related to industry.

Section B : (Polymers &Material Science) (25 Points)

Answer Eight Only from the following questions:

1) What you mean by HIPS, draw its chemical structure ?

2) Nylon 6,6 come from two monomers names:...........and .... Draw the equation?

3) What is a peptide linkage? Illustrate your answer with 2-amino-ethanoic acid ?

4) What you mean by Urea-Methanal Polymer, Discuss its i) synthesis ii) properties and iii) uses.

5) Why is the structure of DNA called a double helix? Name its component structure?

6) Show by equations the mechanism of coordination polymerization using Zigler-Natta catalyst and Propylene gas.

7) Why would a hole appear when a dilute alkali is spilt on a fabric made of Kevlar? Discuss with reaction mechanism ?

8) What are the three main types of degradable plastics? Why are they degradable?

9) Explain the term "vulcanization of rubber". What are the differences between natural rubber and vulcanized rubber?

Good Luck

Examiners:

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

Assiut University   Date: June 2017
Faculty of Science   Time allowed: 2 Hours
Chemistry Department

Final exam of Chemistry of biomolecules (413C) for double major-chemistry Students
(Chemistry of carbohydrates, amino acids & proteins, Lipids and nucleic acids)

Answer the following questions:

I.   **(10 Marks)**

  A) Define the following terms:

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

  B) Conduct a comparison between:

    i) Waxes and fats & oils.   ii) DNA and RNA.   (6 Marks)

II.   **(10 Marks)**

  A) Write short notes on: (6 Marks)

    i) Hazards of rancid fats   ii) Disadvantage of soap   iii) Disadvantage of hydrogenated oils.

  B) Draw the chemical structure of 1-Stearo-2,3-diolein.   (4 Marks)

    1) What is the type of this triglyceride?

    2) Calculate the Iodine number for 1-Stearo-2,3-diolein

    3) Calculate the Saponification value for 1-Stearo-2,3-diolein

  [Mol.Wt of Stearo-diolein = 887.45; A.Wt. of iodine =127; Mol.Wt. KOH =56]

III. Show how can you do <u>only five</u> of the following: **(10 Marks)**

  a- Conversion of glucose to fructose.

  b- Conversion of fructose to glucose.

  c- Synthesis of tyrosine by Erlenmyer synthesis.

  d- Synthesis of aspartic acid by modified Gabriel's synthesis.

  e- Reaction of glycine with formaldehyde and with nitrous acid.

  f- Conversion of arabinose to glucose.

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

  1) Oxidation of glucose with nitric acid gives:

    a) Saccharic acid   b) Gluconic acid   c) Glucuronic acid   d) Glycolic acid

  2) Lactose 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 nitrous acid gives:

a) Hippuric acid.   b) Nitrogen gas.   c) Glycolic acid   d) b & c.

5) The sequence of amino acids in a polypeptide chain is called:

a) Primary structure   b) Secondary structure   c) Tertiary structure   d) Quaternary structure

6) Which of the following fats has the highest iodine value?

a) Tripalmitin.   b) Stearo-diolein.   c) Palmito-oleo-stearin.   d) Triolein.

7) 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.

8) Which of the following fatty acids has the **lowest** melting point?

a) Palmitic acid   b) Oleic acid   c) Linoleic acid   d) Stearic acid

9) Alkaline hydrolysis of oils leads to the formation of:

a) Metallic salt of fatty acids and glycerol   b) Fatty acids and metallic salt of glycerol

c) Metallic salt of fatty acids and metallic salt of glycerol   d) Soap only

10) The complementary base sequence for matching strand in the following DNA section:
-A-G-T-C-C-A-A-T-G-C-   is:
a) -T-C-A-G-G-T-T-A-C-G-   b) -C-A-G-G-T-T-A-C-G-T-
c) -C-G-T-C-A-G-G-T-T-A-   d) -A-C-G - G-G-T-T-A-C-G-

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 epimers and give the same osazone.

2- Reduction of fructose gives sorbitol and mannitol.

3- The gradually change of rotation of α- and β-D-glucose to equilibrium value is called mutarotation.

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 nucleic acids, the nucleotide monomers linked together via a phosphodiester linkage.

8-Acid value is a measure of rancidity.

9- Oils with high acetyl number are toxic.

10-Adenosine-5'-phosphate is nucleoside of DNA.

Prof. Dr. Mohamed S. Abbady
Good luck

Final Examination In Selected Topics in Organic Chemistry (414 C)

Answer the following THREE sections: (50 Marks)

Section (A):   (17 Marks)

Answer the following questions:

1- Write on the following terms: (6 Marks)

    a- Neurotransmitters with examples.   b- NSAIDs.

    c- Hormones and their types.   d- Caffeine action mechanism.

2- Give short notes on the negative and positive feedback in hormones mechanism.

    (4 Marks)

3- Show by equations how can you synthesize the following drugs: (5 Marks)

    (i) Ibuprofen (from benzene).

    (ii) Chloramphenicol (from benzaldehyde).

4. Give the structure of the following drugs: (2 Marks)

    a- Tryptophan.   b- Serotonin.   c- Clotrimazole.   d- Caffeine.

Section (B): (17 Marks)

Answer the following questions:

1- Give short notes in the following terms: (6 Marks)

    (i) The differences between initiation and termination steps in the protein synthesis.

    (ii) Mutation and its types.

2- Draw the structures of the following species: (4 Marks)

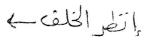   (a) Adenosine.   (b) Adenosine 5'-monophosphate (AMP).

    (c) Deoxyguanosine.   (e) Deoxycytidine 5'-monophosphate (dCMP).

3- Define the HIV Virus and AIDS treatment.   (4 Marks)

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4- The following section of DNA is used to build mRNA for a protein: **(3 Marks)**

$$—GAA—CCC—TTT—$$

A. What is the corresponding mRNA sequence?

B. What are the anticodons on the tRNAs?

C. What is the amino acid order in the peptide?

Section (C): (16 Marks)

Answer the following questions:

1- Draw the mechanisms for **Two** of the following: **(6 Marks)**

A) Acid-catalyzed and base-catalyzed keto-enol tautomerization of propanone.

B) Claisen condensation.

C) Aldol reaction.

2- Show the kinetic and thermodynamic enolate for 2-phenylcyclohexane and discuss the different conditions that favor each one. **(5 Marks)**

3- Put (√) for the correct statement and (×) for the wrong one: **(5 Marks)**

(i) LDA is a bulky base that allows selective formation of the kinetic enolate and prefers deprotonation from the more substituted carbon.

(ii) The major product of the reaction of 3,7-nonadione with sodium ethoxide is 3-ethyl-2-methylcyclohex-2-en-1-one.

(iii) Crossed aldol condensations are only possible when all partners have α-protons.

(iv) Carrying out the reaction under very low temperature in presence of aprotic solvent favors deprotonation from the more substituted carbon.

(v) Phenoxides undergo O-alkylation in a solvent such as water and trifluoroethanol.

Good Luke

Dr. Waleed Ahmed El Sayed   **Dr. Ahmed Abdou Omar**

Assiut University   May/June 2017
Faculty of Science
Department of Chemistry   Time: 3 hours
_____Final Exam: Inorganic Chem.4 (**C-422**) for 4th level chemistry students_____

Answer the following questions:

1 –A) Complete the following with the correct choice (between brackets) **(10 marks)**

  i)   Inert complexes are thermodynamically...........(stable – unstable)

  ii)   Soft Lewis base ligands have .... proton affinity. (very high – very small)

  iii) The nucleophilic discrimination factor characterizes the sensitivity of the rate constant to ....of the ligand.(size – nucleophilicity- polarizability)

  iv)   Strong field $3d^3$ and $3d^6$ complexes are generally ....(inert- labile).

  v)   In interchange substitution mechanism, the entering and leaving groups exchange ....formation of an activated complex. (with - without)

  vi)   The ....mechanism plays a central role in octahedral substitution reactions. (associative – dissociative – interchange)

  vii) The equilibrium constant favors the encounter if the reactants are .... and oppositely charged. (small - large)

  viii) The K_1 pathway in ....mechanism of square planar substitution reactions is two-step mechanism. (intimate – stoichiometric)

  ix)   Octahedral substitutions can acquire a distinct associative character in case of ....central metal ions. (small – large)

  x)   Substitution reaction of hexaaquoNi(II) complex is considered as a model for I_d reaction with........response to the nucleophilicity of the entering group. (high – low – very low)

B) Derive the equation for calculating the K_f of 1:1 complexes from spectrophotometric measurements.   **(2.5 marks)**

2-A) Put (√) or (X) in front of each of the following: **(10 marks)**

  i)   For determination of stability constants in solution, n+1 independent concentrations are needed ( ).

  ii)   Complexes of trivalent f-block metal ions are labile ( ).

  iii) Most stable complexes are those of soft Lewis acids and hard Lewis bases ( )

  iv)   The formation constants of complexes correlate well with Lewis basicity if steric factors considered. ( )

  v)   Steric crowding at the center of the reaction inhibits the associative reaction( )

  vi)   Intimate mechanism of substitution in square planar complexes is dissociative. ( )

  vii) Good donors stabilizes the reduced coordination number in octahedral substitution reactions.( )

  viii) The increase of coordination number in a dissociative reaction relieves the crowding in the activated complex.( )

  ix)   In Eigen- Wilkins mechanism, the first step is the rate determining step.( )

  x)   For Co(III) and Cr(III) octahedral complexes both cis and trans ligands affect rates of substitution.( ).

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B) Answer only **One** of the following: (2.5 marks)
  (i) Write briefly on the nucleophilicity parameter.
  (ii) Write briefly on the Eigen-Wilkins mechanism for substitution in octahedral complexes.

3- A) Write briefly on **Two** only of the following:
  (a) Leaving group effect in octahedral substitution reactions. **(4 marks)**
  (b) Trends in successive formation constants. **(4 marks)**
  (c) Class A and class B metals according to the Chatt- Ahrland generalization for stability correlations. **(4 marks)**

  B) Explain with necessary orbital diagrams how CO which has negligible donor properties toward simple acceptors can form strong bonds to transition metal atoms.
  (4.5 marks)

4- A- Give a definition of an organometallic compound. **(0.5 mark)**

  B- Write a chemical equation illustrating each of the following :
  (i)General method for preparing organometallic compound using *Grignard reagent.* (2 marks)
  (ii) Preparation of metal carbonyl using additional reducing agent. (2 marks)
  (iii) Preparation of *Li [Mn(CO)$_5$].* (2 marks)

  (iv) Carbonyl hydrides are slightly soluble in water where they behave as acids.
  (2 marks)

  (v) Obtain *[Ru(NH$_3$)$_5$N$_2$]$^{2+}$* by two methods. (4 marks)

GOOD LUCK

أ.د. سحر الجيار
أ.د. سعيد ابراهيم

Final Examination of Instrumental Analysis Course (C-445)
Students: Fourth Level Students , Faculty of Science

SECTION (I)

1- Write on <u>Only Two</u> of the following: **(12.5 marks)**

a- Stripping voltammetry.

b) (i) Calculate the diffusion current that would be expected from the reduction of 2.00×10^{-3} M Pb^{2+}. The diffusion coefficient for Pb^{2+} is 1.01×10^{-5} cm^2 / sec, and the flow rate of mercury is 6.59 mg/drop and the drop time is 3.47 sec/drop.

 (ii) An unknown solution containing lead gives a diffusion current of 11.7 μ A with the same drop characteristics as in (i) , what is the Pb^{2+} concentration in the solution.

c-(i) Application of masking reagents in chemical analysis.

 (ii) Give an example for the extractive separation of metal ions as chelates.

2- Write on <u>Only Two</u> of the following: **(12.5 marks)**

a- Discuss the principles of amperometric titration.

b- Write short notes on differential pulse voltammetry and square wave voltammetry.

c- The distribution coefficient for **X** between CCl_4 and water is 19. Calculate the concentration of **X** remaining in the aqueous phase after 50 ml of 0.250 M **X** is treated by extraction with the following quantities of CCl_4:
 (i) One 100 ml portion.
 (ii) Two 50 ml portions.
 (iii) Four 25 ml portions.

Examiner: Prof .Dr. Mahmoud A. Ghandour

Prof.Mahmoud A. Ghandour

Part 2

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Answer The Following Questions:

A. Choose the correct answer: (15 points)

1. What is a *red shift*?
   a) The shifting of an absorption towards the blue end of the spectrum.
   b) The shifting of an absorption to higher energy.
   c) The shifting of an absorption to lower energy.
   d) The shifting of an absorption to shorter wavelength.

2. According to the Beer-Lambert Law, absorbance is:
   a) Inversely proportional to the concentration.
   b) Directly proportional to the concentration.
   c) Directly proportional to the transmittance.
   d) Directly proportional to the log of the concentration.

3. Deuterium and tungsten lamps are used as a light source in one of the following techniques.
   a) Nuclear magnetic resonance spectrophotometers.
   b) X-rays diffractometers.
   c) Gas chromatograph.
   d) UV/Visible spectrophotometers.

4. Which one of the following arrangements for the sequence of the main components of a UV/visible spectrophotometer is Correct?
   a) Light source → Monochromator → Sample cell → Detector → Readout
   b) Light source → Detector → Sample cell → Monochromator → Readout
   c) Light source → Sample cell → Detector → Monochromator → Readout
   d) Light source → Readout → Sample cell → Detector → Monochromator

5. The part of an atomic absorption spectrometer to produce a mist or aerosol of the test solution is called :
   a) a light source   b) a monochromator   c) a detector   d) a nebulizer

6. Why do you think EDTA reduces the interference from phosphate in the determination of calcium atoms by AAS?
   a) Because EDTA complexes with phosphate.
   b) Because EDTA complexes with calcium.
   c) Because EDTA affects the solubility of calcium.
   d) None of these.

7. For AAS, ionization of analyte atoms in flame can be suppressed by:
$$M_{(g)} \leftrightarrow M^+_{(g)} + \bar{e}$$
   a) EDTA or other complexing agents.
   b) Addition of KCl to the matrix.
   c) Addition of oxyanions such as sulfate or phosphate.
   d) Internal standards methods.

Part 2

8. Light is passed through a solution with a light path of 2.0 cm and the absorbance is recorded as 0.40. If light is passed through the same solution at the same wavelength and the light path is reduced to 1.0 cm, the absorbance should be:

    a) 0.80   b) 0.40   c) 0.20   d) 0.10

9. UV-visible spectral absorbance curve may be used to:

    a) Find the wavelength of maximum absorbance.
    b) Select a wavelength best suited for measuring a compound.
    c) Identify an unknown compound by comparing its absorption spectra to that of a known compound.
    d) All of the above

10. UV-visible spectroscopy is widely used for quantitative analysis characterization, because:

    a) Wide range of applications with good sensitivity and detection limits of 10^{-4} to 10^{-7} M.
    b) Reasonable accuracy, precision and moderate to high selectivity.
    c) Speed and convenience, easy to perform, cheap and readily automated.
    d) All of the above

11. Method requiring the measurement of absorbance in the UV region of the electromagnetic spectrum require that the sample cuvette be made of:

    a) Glass   b) Plastic   c) Quartz   c) None of these.

12. Which of the following statements about atomic absorption spectroscopy is not true:

    a) It requires that the element to be measured does not ionized in the flame.
    b) It uses a tungsten lamp as a light source
    c) It uses a Hallow-Cathode Lamp with a cathode made of the same element being measured.
    d) All of the above.

13. Chemical interferences, formation of compound of low volatility, in AAS can be eliminated by using of,

    (a) Higher temperature.
    (b) Releasing agents.
    (c) Protective agents.
    (d) All of the above.

14. Which one of the following arrangements for the sequence of the processes occurring during atomization in AAS is correct?

    a) Solvent evaporation →Volatilization or decomposition → Atomization
    b) Volatilization or decomposition → Solvent evaporation → Atomization
    c) Atomization → Solvent evaporation →Volatilization or decomposition
    d) Self-absorption → Solvent evaporation →Volatilization or decomposition

15. The physical interferences in AAS occur due to:

    a) Variation in gas flow rate.
    b) Variation in sample viscosity.
    c) Variation in sample density.
    d) All of the above.

Part 2

(B) Are the following statements correct ($\checkmark$) or false ($\times$)? (5 points each)

1. Instrumental deviations of Beer's Law occur due to chemical phenomenon involving the analyte molecules due to association, dissociation and interaction with the solvent to produce a product with different absorption characteristics.	( )
2. Beer's law is good for monochromatic light only since ε is wavelength dependent.	( )
3. The technique applied in UV-Visible spectroscopy is the flame atomization.	( )
4. Stray radiation resulting from scattering or various reflections in the instrument will reach the detector without passing through the sample.	( )
5. In the Single-Beam Spectrometer the light from the source, after passing through the monochromator, is split into two separate beams, one for the sample and the other for the reference.	( )
6. Charge transfer (CT) occurs when electron-donor and electron-acceptor properties are in the same complex, electron transfer occurs as an 'excitation step'	( )
7. $\sigma \rightarrow \sigma^*$ and $\sigma \rightarrow \pi^*$ transitions are the most common transitions observed in organic molecular UV-Vis, observed in compounds with lone pairs and multiple bonds with λmax = 200-600 nm.	( )
8. The spectral interference in AAS occurs when an absorption or emission peak of an element in the sample matrix overlaps that of the analyte.	( )
9. The compound (b) has the largest λ_{max} and high value of ε than compound (a) (a) CH_2=CH–CH=CH–CH=CH$_2$ (b) CH_2=CH–CH=CH$_2$	( )
10. Monochromator is the part of an atomic absorption spectrometer that atomizes the sample.	( )

(C) Problems and Questions

1. What is the relationship between atomic absorption Spectroscopy and Flame Emission Spectroscopy **(1 point)**

	Atomic absorption	Flame Emission
1		
2		
3		

Part 2

2. The molar absorptivities of compounds X and Y were measured with pure samples of each:

λ (nm)	ε $(M^{-1} cm^{-1})$ X	Y
272	16400	3870
327	3990	6420

A mixture of compounds X and Y in a 1.000-cm cell had an absorbance of 0.957 at 272 nm and 0.559 at 327 nm. Find the concentrations of X and Y in the mixture. **(2 points)**

3. (a) A 3.96×10^{-4} M solution of compound A exhibited an absorbance of 0.624 at 238 nm in a 1.0-cm cuvette; a blank solution containing only solvent had an absorbance of 0.029 at the same wavelength. Find the molar absorptivity of compound A. **(1 point)**

(b) The absorbance of an unknown solution of compound A in the same solvent and cuvette was 0.375 at 238 nm. Find the concentration of A in the unknown. **(1point)**

Final Exam of Petroleum & Petrochemicals (451C) for the 3rd Petroleum Geology Level Students

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

Section (A): Petroleum chemistry   (25 Marks)

1- (I)- Give a brief account on *THREE* only of the following: (9 M)
   a) Propane deasphalting process
   b) Doctor's sweetening process
   c) Hydrocracking of heavy oils over zeolite catalyst
   d) Catalytic hydrodesulfurization process

(II)- Discuss isomerization mechanism of *n*-alkanes into their isoparaffins? (4 M)

2- Answer *THREE* only of the following points: (12 M)
   a) What are the definitions of API gravity and cloud point? Does a lighter crude oil have a lower or higher API value?
   b) Describe the thermal conversion processes (Visbreaking & Delayed coking)?
   c) Outline the characteristics of N-compounds present in crude petroleum oils?
   d) Discuss the solvent extraction and dewaxing processes of lubricating oils?

Section (B): Petrochemicals   (25 Marks)

1- (I)- Answer *THREE* only of the following questions: (9 M)
   a) Outline the important petrochemicals based on *n*-butane?
   b) Explain by equations the synthesis of MTBE and TAME?
   c) Discuss the production steps of nitric acid by oxidizing ammonia?
   d) State the main steps of oxirane process in ethylene glycol production?

(II)- Discuss the manufacture mechanism of acetic acid over rhodium catalyst? (4 M)

2- Write short notes on *THREE* only of the following: (12 M)
   a) Andrussaw process (Hydrogen cyanide production)
   b) Single cell protein (SCP)
   c) Hydration of ethylene
   d) Haber process (Ammonia production)
   e) Methanol production mechanism over heterogeneous catalyst

Good Luck

Dr. Hassan Abdou Kotb

Surface Chemistry & Electrochemistry for 4th students (Chem.432)
(Chemistry Major)

Assiut University

Time: 3 hrs.
Date : 22-5- 2017

**Faculty of Science
Chemistry Department**

Answer the Following Questions:

Section (1) (Surface Chemistry) (33 Marks)

1. a. Complete the following terms: (3 Marks)

(i) The position in energy of the absorption peaks associated with defect centers provides a direct measure of the ………… of an electron attached to the center.

(ii) Paramagnetic results from the presence of a permanent……….

(iii) Chemical imperfection results from addition of ………

(iv) Adsorption is exothermic process which follows the equation……..

(v) The amount of gas physically adsorbed always ……… as a temperature increased.

(vi) The turnover number is the……….that react per site per unit time.

1.b. Define the following terms (5 Marks)

(i) Promoters   (ii) Catalyst selectivity   (iii) Isostructural   (iv) Periodic lattice

(v) Specifity of adsorption.

2. Write short notes on two only of the following (10 Marks)

(i) Effects of foreign ions on the enhancement of creation of electrons and holes within n- and p-type semiconductors, respectively.

(ii) The factors affecting in the reduction of the catalyst activity.

(iii) The types of nitrogen adsorption isotherms at -196°C.

3. Define the homogeneous catalysis and discuss the Wacker process for synthesis of acetaldehyde from ethylene. (5 Marks)

4. Explain the importance of catalyst supports taking in your consideration the characteristic properties of a support and why alumina is used industrially support. (5 Marks)

5. The following results were obtained from the nitrogen adsorption isotherm of MoO_3 supported on SiO_2

P/P°	0.05	0.10	0.15	0.20	0.25	0.30
V_a	55.90	65.90	71.60	76.90	81.90	86.80

From these data, calculate the specific surface area, S_{BET}. (5 Marks)

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Answer the following questions:

A) How many hours are required to produce 1.0×10^3 kg of sodium by the electrolysis of molten NaCl with current 3.0×10^4 A? How many liters of Cl_2 gas at STP will be obtained as a by-product? [F = 96500 C/mol, Na = 23].

(5 mark)

B) Answer *only two* from the following:

1- Define the corrosion and explain the electrochemical and chemical reactions for rusting of iron

(5 mark)

2- Define the polarizable and the nonpolarizable electrodes; explain them by using platinum and mercury electrodes in HCl solution.

(5 mark)

3- Define the electric double layer and explain its theories.

(5 mark)

Good Luck

Prof. Dr. Abd El-Aziz A. Said, Prof. Dr. Abo El-Hagag Abd El-Aziz