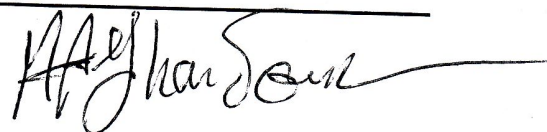## Final Examination of Waste Water Treatment (Chem410)
Students: 4th Level , Faculty of Science

Write on the following:

1-a- Determination of dissolved oxygen in water. (8 Marks)

b- Alkalinity of a water sample. (7 Marks)

2- Write briefly on a typical water treatment program. (15 Marks)

3- Discuss the principles of the treatment of waste water. (20 Marks)

Examinar: Prof.Dr.Mahmoud A.Ghandour

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

Assiut University

Faculty of Science
Chemistry Department

Time: 3 hrs.
Date : 15 May 2018

Answer the Following Questions:

Section (1) (Surface Chemistry)

1. Short answer: (4 Marks)

(i) Why solids in divided state are good adsorbent. (ii) What is desorption.

(iii) What is meant by selectivity. (iv) What is promoter.

2. Write short notes on the three only of the following (9 Marks)

(i) What are the desirable characteristics of a support.

(ii) Explain the factors that responsible for deactivation of a catalyst.

(iii) Chemisorption. (iv) Point defects.

3. Choose the correct answer (5 Marks)

(i) At which temperature chemical adsorption occurs

(a) At high temperature (b) At very low temperature

(c) At low temperature (d) Temperature does not affect

(ii) What will be the value of slope after drawing graph of $\log \dfrac{x}{m}$ with $\log P$ in Freundlich adsorption isotherm

(a) $\dfrac{1}{P}$ (b) $\dfrac{1}{n}$ (c) $\dfrac{1}{a}$ (d) log k

(ii) What is not true for catalytic reaction

(a) Catalyst increases equally both the rate of forward and reverse reactions.

(b) Catalyst does not effect to equilibrium constant.

(c) Catalyst decreases activation energy.

(d) Catalyst increases activation energy.

(iii) The n-type semiconductors is

a) $[D] = [A]$ b) $[A] > [D]$ c) $[D] > [A]$ d) none

(iv) In Feromagnets

(a) All the moments are aligned parallel in the same direction.

(b) The moments are aligned in parallel and antiparallel.

(c) The moments are aligned in compensatory way.

(d) None.

4- Answer three only of the following (15 Marks)

a) Effects of foreign ions which increases or decreases the electrical conductivity of ZnO.

b) The catalytic reaction over catalyst proceeds in three steps. Explain and how is the activation energy can be determined.

c) Apply the V_a- t method for calculation of S_t and the porosity of a solid catalyst.

d) Explain how is the catalyst prepared by precipitation method and mention the forming operations.

Section (2)(Electrochemistry)

Answer the following:

(A) For silver-silver ion electrode reaction: $Ag^+_{(aq)} + e^- = Ag_{(s)}$

$$\text{The rate} = k_{chem,f}\, C_{Ag+}\, e^{\dfrac{-\beta F \Delta \phi}{RT}} - k_{chem,b}\, e^{\dfrac{(1-\beta)F\Delta\phi}{RT}}$$

Define the parameters, $k_{chem,f}$, $k_{chem,b}$, C_{Ag+}, β, and $\Delta\phi$, and starting from this equation drive the Butler-Volmer equation. (*7marks*).

(B) Answer <u>only two</u> questions (5 marks for each) from the following:

1) Starting with the first law of thermodynamic and using fundamental thermodynamic relations, indicate that electrochemical cell potential is directly calculated the free energy of the process.

2) When Pt electrode is cathodically polarized in deaerated acid solution at 25°C the hydrogen overvoltage is 0.033 V at 0.01 A cm^{-2} and 0.063 V at 0.1 Acm^{-2}, calculate the Tafel constants (a and b) and the exchange current density for discharge of H$^+$ on Pt under given condition.

3) In a short note define the following: cathodic protection – direct and indirect loss of corrosion

Good Luck

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

B) Answer only <u>One</u> of the following: (2.5 marks)
  (i) Derive the equation for calculation of the formation constants of 1:1 complex using the continuous variation spectrophotometric method.
  (ii) Show how the 1st and 2nd order reaction rate constants can be calculated for the substitution reaction: $[PtCl(dien)]^+ + I^-$ -------- $[PtI(dien)]^+ + Cl^-$.

3- A) Write briefly on <u>Two</u> only of the following:
  (a) Definition of the nucleophilicity parameter and nucleophilic discrimination factor. (4 marks)
  (b) The effect of spectator ligand in the substitution of octahedral Cr(III) and Co(III) complexes. (4 marks)
  (c) Leaving group effect on the hydrolysis reaction of $[CoX(NH_3)_5]^{2+}$. (4 marks)

  B) **NO** is regarded as a three electrons donation ligand in the (4.5 marks) same sense as **CO** is considered two electron donation ligand. Give the compounds having NO ligands and isoelectronic with the following ones (using two methods): **Ni(CO)₄** and **Fe(CO)₅**

4- A) (6.5 marks)
    Vibrational spectra is one of the main lines of physical evidence showing the multiple nature of the M- CO bonds. Explain this fact and give examples to illustrate your answer.

B) Give the chemical equations expressing the following: (6 marks)
  i-Reaction of carbonylate anion with halogen compounds.
  ii- Carbonyl hydrides are slightly soluble in water whereas they behave as acids.

GOOD LUCK

أ.د. سحر الجيار   ـأ.د. سعيد ابراهيم

Final Examination of Instrumental Analysis Course (C-445)

Students: Fourth Level , Faculty of Science

Section(I)

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

a- Stripping voltammetry.

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 od 0.250 M **X** 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.

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

a- Discuss the principles of amperometric titration.

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 11.7μ 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.

فضلاً أنظر خلف باقي الأسئله

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فضلاً أنظر خلف باقي الأسئله

Section(II)

3- Answer <u>Two Only</u> of the following: (15 marks)

a- How the stoichiometry of a Metal – Liqand Complex can be determined using the method of continuous variations.

b- Sketch the spectrophotometric titration curves for reaction between an analyte (A) and a titrant (T) if a) only A absorbs , b) only T absorbs and c) A and T absorb.

c- What is meant by a) intersystem crossing , b) fluorescence quantum yield and   c) phosphorescence.

4- Answer <u>Two Only</u> of the following: (10 marks)

a- The transmittance of a solution is found to be 35.0% . What is the transmittance if the solution is diluted in half?

b- The accuracy of a spectrophotometer can be evaluated by preparing a solution of 60.06 ppm $K_2Cr_2O_7$ in 0.0050 M H_2SO_4 and measuring its absorbance at a wavelength of 350 nm using a cell with a pathlength of 1.00 cm. The absorbance should be 0.640. What is the molar absorptivity of $K_2Cr_2O_7$ at this wavelength? Consider the following atomic weights (K=39.098 , Cr=51.996 and O=15.999).

c- EDTA forms colored complex with a variety of metal ions that may serve as the basis for a quantitative spectrophotometric method of analysis. The molar absorptivities of the EDTA complexes of Cu^{2+} and Co^{2+} at two wavelengths are summarized in the following table:
(all values of ε are in $M^{-1} cm^{-1}$).

Matal	$\varepsilon_{462.9}$	$\varepsilon_{732.0}$
Co^{2+}	15.8	2.11
Cu^{2+}	2.32	95.2

using these informations , determine the concentrations of Cu^{2+} and Co^{2+} in a solution that has an absorbance of 0.453 at a wavelength of 732.0 nm and 0.106 at a wavelength of 462.9 nm. The pathlength , b , is 1.0cm.

Examiners : Prof.Dr.Mahmoud A.Ghandour
Dr.Ahmed Bayoumi

A. Bayoumi

Answer the following Two Sections:

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

Answer the following:

1) a) Discuss the chemical reactions of cotton related to industry?
    b) Write on the relation between color and constitution of organic molecules used as colors?

2) a) Illustrate by equations, the reaction mechanism of diazonium salt production in industry and discuss the effect of substituent in the primary aromatic amine on diazotizaion and stability of resulting diazonium salt.
    b) Explain the physical properties of fibers related to stability, care and comfort ?

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

Answer the following :

1) " Carbon Fibers........ the wonder polymer......... stronger than the steel". Show by equations the steps of its production ?

2) $Al(CH_3)_3 + TiCl_4 + CH_2=CH_2 \longrightarrow$
    Show the mechanism of its coordination polymerization

3) Compare between the step- and chain- growth polymerization, and also compare, giving reason, between the time needed in polymerization of theses monomers: (Vinyl Chloride, Styrene , MMA).

4) Discuss how the presence of alkyl group in propylene monomer fail to polymerize ?

5) In the formation of polyurethanes, it combine both the addition and the condensation polymerization , Discuss? Then, show with examples the types of Initiators.

6) Why would a hole appear when a dilute alkali is spilt on a fabric made of Kevlar?

7) Complete the following table:

Polymer	Structural formula of monomer	Structural formula of polymer	Uses
Nylon-6,6	(i)	(ii)	(iii)
Kevlar	(iv)	(v)	(vi)
Dacron	(vii)	(viii)	(ix)
Urea-methanal	(x)	(xi)	(xii)

Good Luck

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

Section(II)

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  c- What is meant by a) intersystem crossing , b) fluorescence quantum yield and   c) phosphorescence.

4- Answer Two Only of the following: (10 marks)

  a- The transmittance of a solution is found to be 35.0% . What is the transmittance if the solution is diluted in half?

  b- The accuracy of a spectrophotometer can be evaluated by preparing a solution of 60.06 ppm $K_2Cr_2O_7$ in 0.0050 M H_2SO_4 and measuring its absorbance at a wavelength of 350 nm using a cell with a pathlength of 1.00 cm. The absorbance should be 0.640. What is the molar absorptivity of $K_2Cr_2O_7$ at this wavelength? Consider the following atomic weights (K=39.098 , Cr=51.996 and O=15.999).

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Examiners : Prof.Dr.Mahmoud A.Ghandour
          Dr.Ahmed Bayoumi

A. Bayoumi

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

iii- Crossed aldol condensations are only possible when all the reactants have α-protons.

iv- LDA is a bulky base, which preferred deprotonation from the more substituted carbon and allows selective formation of a kinetic enolate product.

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

Section (C): Nucleic acids and protein synthesis (16 Marks)

1. Write the structure of the following:

    (i) dGMP.   (ii) UMP.   (iii) AZT.

2. Determine the amino acids from the following codons in a section of mRNA?

        —CCU —AGC—GGA—CUU—

3. Give short notes on:

    (i) The steps of protein synthesis.   (ii) Caffeine mechanism

    4. Define the following terms:

    (i) RNA types with the function of each.   (ii) Viruses.

    (iii) Types of mutations.

Good Luck

Dr. Hassan Abdou   Dr. Waleed Ahmed   Dr. Ahmed abdou

Selected topics in Organic Chemistry (414C) final Examination for 4th Students

Section (A): Polymer Chemistry   (17 Marks)

1- Describe in detail _four_ only of the following: (10 Marks)

   a) **Coatings and adhesives**
   b) **Classification of polymers according to their structures**
   c) **Thermoplastic and thermosetting polymers**
   d) **Conducting polymers**
   e) **Vulcanization of rubber**

2- Answer _two_ only of the following questions: (7 Marks)

   a) **Describe the Ziegler-Natta isotactic-addition polymerization?**
   b) **Discuss in detail, the radical and ionic chain polymerization mechanisms?**
   c) **Outline the manufacture of Dacron and Mylar?**

Section (B): Nanomaterials and Organic Synthesis (17 Marks)

Answer the following question: (17 marks)

1) Write briefly on three of the following: (6 marks)

i) Nanotechnology   ii) Nano-Biotechnology

iii) Bio-Nanotechnology   iv) different strategies of Nanofabrications

2) Draw the mechanisms for the following: (6 marks)

A) acid-catalyzed and base-catalyzed keto-enol tautomerization of acetone.

B) Claisen condensation.

3) Put (√) for the correct statement and (X) for the wrong one (5 marks)

i- Carried out the enolate reaction in the presence of aprotic solvent under very low temperature favor deprotonation from the more substituted carbon.

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. Write short notes on: (10 Marks)

  i) Hazards of rancid fats   **ii)** Disadvantage of soap

  iii) Disadvantage of hydrogenated oils.   **iv)** Determination of the reducing part of lactose.

II. Show how can you do only four of the following: (10 Marks)

  a- Conversion of glucose to fructose.

  b- Conversion of fructose to glucose.

  c- Conversion of arabinose to glucose.

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

  e- Preparation of tryptophan by Erlenmyer synthesis.

III. A) Conduct a comparison between: (6 Marks)

  i) Waxes and fats & oils.   **ii)** DNA and RNA.

  B) A simple trigyceride has molecular weight 873.34 and iodine value equal to 261.75:

    1- Calculate the number of double bonds in the molecule of this oil.

    2- Calculate the saponification value of this oil.   (4 Marks)

    [At.Wt. of iodine =127; potassium=39; oxygen=16; hydrogen=1]

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 a 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 acids 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) Linolenic 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 Statement and (X) in the front of the wrong one: (10 Marks)

1- D-glucose and D-galactose are epimers and give the same osazone.

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

3- Dialysis is a property, which used to separate proteins from small molecular weight compounds.

4- Reduction of fructose gives sorbitol and mannitol.

5- The cyclic structure of glucose is formed by interaction of -CHO with -OH on C4.

6- The type of the peptide glycyl-L-alanyl glycine is dipeptide.

7- The antiparallel strands of DNA are not identical, but are complementary.

8- Deoxyadenosine-5'-phosphate is nucleotide of RNA.

9-Acid value is a measure of rancidity.

10- Oils with high acetyl number are toxic.

Good luck

Prof. Dr. Mohamed S. Abbady

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c) -C-G-T-C-A-G-G-T-T-A-   d) -A-C-G - G-G-T-T-A-C-G-

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Good luck

Prof. Dr. Mohamed S. Abbady

Final Examination of Selected Topics in Analytical Chemistry (444-C)

Section(I)   (18 Marks)

Answer the following:

1- Define or characterize:-   (3 Marks)
 i- Solvent extraction
 ii- The distribution coefficient   iii- The distribution ratio

2- For the extraction of benzoic acid from aqueous solution into ether , derive the relation between D and K_D. Discuss the effect of pH on such relation.   (3 Marks)

3- Answer <u>Only Three</u> of the following questions:-   (12 Marks)

 a- Describe two principle solvent extraction systems for metal ions. Give examples of each.

 b- Describe the equilibrium processes involved in the solvent extraction of metal chelates.

 c- Ninety percent of a metal chelate is extracted when equal volumes of aqueous and organic phases are used. What will be the percent extracted if the volume of the organic phase is doubled?

 d- A metal- APCD (ammonium pyrrolidinecarbodithioate) chelate has a distribution ratio of 5.96 for extraction from aqueous solution at pH 3.0 into methyl isobutyl ketone (MIBK). Calculate the number of extractions necessary using 25.0 ml portions of MIBK to extract 99.9% of the metal from 50.0 ml urine at pH 3.0

<div align="center">أنظر خلفه باقي الأسئله</div>

Section (II) : (16 marks)

Answer <u>Only Four</u> of the following questions:

1- Describe a spectrophotometric method for the determination of norepinephrine drug by oxidation with sodium iodate.

2- Illustrate the scheme proposed for secnidazole drug reacting with sodium nitrite in the presence of hydrochloric acid. Describe the reaction involving the mechanism between diazotized drug and β-naphthol as a coupling agent to form the azo product.

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

4- Describe an acid catalyzed ring opening and subsequent amino acid cleavage for the spectorphotometric determination of 2-amino-5-nitrobenzophenone from nitrazepam.

5- Explain the energy scheme of various types of electron excitations for Ultraviolet/Visible spectra of organic molecules.

Section(III) (16 Marks)

Answer <u>Only Four</u> of the following questions:

1- Discuss the advantages of fluorescence spectroscopy.

2- What is the meaning of "Quenching"? Write on its types.

3- In the coulometric determination of MnO_4^- by generating iron(ii) from iron(III), the permanganate was all reduced to Mn(II) by a constant current of 2.5 mA acting for 10.37 min. Calculate the molarity of the permanganate solution if the initial volume was 25 ml.

4- Explain the factors affecting the conductance of the solution.

5- Write on the conductometric titration of strong acid with strong base.

Good Luck

Examinars: Prof.Dr.Hassan Sedaira

Dr.Ahmed Kamal   Dr.Doaa Abd.Elrahman

Assiut University
Faculty of Science
Chemistry Department

May: 2018
Time: 2 hours
(50 Marks)

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

Answer the following questions: (50 Marks)

Q₁) Answer Only Two of the following: ……..................... **(12.5 Marks)**
   a) Write on the following:
      i. Buffer solution.   *ii.* Standard hydrogen electrode.
   b) Determine the potential of a platinum indicator electrode if dipped in a solution containing 0.1M Sn^{+4} and 0.01M Sn^{+2} $E° = - 0.15V$.
   c) If you are provided with 50 ml (0.1N) NH_4OH and titrated with 0.1N HCl. Calculate pH at the following points:
      i. At the beginning .   *ii.* After the addition of 40 ml (0.1N) HCl.
      iii. After the addition of 60 ml HCl.

Q₂) Answer Only Two of the following: .... **(12.5 Marks)**
   a) Define the following terms:
      i. Electrochemical series of metals.   *ii.* The oxidizing agent and the reducing agent.
   b) Write on the following:
      i. The applications of potentiometric titration.
      ii. Limitation of argentometric titration.
   c) Give the reason for the following:
      i. Mohr method is applicable in neutral solution.
      ii. Supporting electrolyte is used in the polarographic analysis.
      iii. The equivalent weight of $KMnO_4$ is **1/5** its molecular weight in acidic medium while in basic medium is **1/3** its molecular weight.

Q₃) Answer Only Two of the following: .... **(12.5 Marks)**
   a) Complete the following :
      i. The indicator in Mohr method is -----, while in Volhard method the indicators are--------- and in Fajan method the indicators are --------------------.
      ii. The equation which gives the relation between $E_{1/2}$ and diffusion current i_d is ---------.
   b) Write on the following:
      i. Limitation of volumetric precipitation titration reaction.
      ii. The titration of halides in acidic medium .
   c) Show how polarographic technique is used in qualitative and quantitative analysis.

Q₄) Answer Only Two of the following: .... **(12.5 Marks)**
   a) Define the following terms:
      i. Acid – base indicators.   *ii.* Half wave potential ($E_{1/2}$) and factors affected on it.
      iii. Molar conductivity and equivalent conductivity.
   b) Define Ilkovic equation, and then calculate the diffusion current (i_d) for the reduction of 5×10^{-4} M **Zn²⁺** which has diffusion coefficient **D** $= 0.72 \times 10^{-5}$ cm^{-2} sec., **m** =15mg/sec. and **t** = 4 sec. /drop.
   c) Show why and how you can prevent the reaction of AgCl which formed in Volhard method.

------------------------------------**Good Luck**------------------------------
Examiner: Prof. Dr. Azza M.M.Ali