

المستوى الرابع - كيمياء - (الذ 214)  
طرحه الدكتور المسبح لتقديره العظم

Mansoura University  
Faculty of Science  
Dept. of Chemistry  
Analytical Chemistry  
Course Title & Code 412C



١٤٤٥ Semester (Dec. 2014)  
Final Exam  
Sc. students  
Time allowed: 2 hours  
Full Mark: 80 Marks

Answer All the following Question

Notes: Express your answer by formula & equations & figures wherever possible.

I- Define 5 only of the following express your answer by equation, diagram: (15 Marks)

- 1- DI (AAS & AES.)
- 2- Heavy metals Specificaton (cpds, elements).
- 3-  $K_d$ ,  $\alpha$  &  $R\%$
- 4-  $D$ , capacity of resin, Doerner-Hoskens law.
- 5-  $F\%$ ,  $R_e\%$  flotation.
- 6-  $F$ ,  $t$ ,  $Q$ ,  $X^2$  tests.
- 7- Renolles- Soveck & Bragg's, Scheibe, Lomakin-Kaiser equations.

2- A) Complete 8 only from the following: (16 Marks)

- 1- Preconcentration methods should be done two overcome on difficulties .....and.....
- 2- The most important of these effects of heavy metal ions human body are 1-....., 2-....., and 3-.....
- 3- Flotation is define as..... the classification of the methods based on ...., .... and.....
- 4- Using the Flotation method for separation of 1...2...3...4...5...6...and .....
- 5- Advantages of solid phase extraction are ....., ..... and.....
- 6- Applications of ions exchanger in analytical chemistry 1..., 2..., 3..., 4..., 5...and 6-.....
- 7- Factors affecting up on Flotation 1...2...3...4...5...6...7- ... and 8....
- 8- Give 10 methods for determination of multi trace heavy or single element 1...to 10...
- 9- Ions exchanger techniques are 1-..... and 2-.....
- 10- Factors affecting up on ions exchanger separation are 1....., 2....., 3....., 4....., 5....., and 6...
- 11- Applications of Electrophoresis in 1-...., 2-...., 3-... and .4....

B)-Hg (II) ion in solution after pre-concentration. is 2 ppm . If the  $\log K_d = 2.3$  for Zn (II), calculate  $\alpha$  .

If the volume of solution 100 ml. (9 Marks)

Good Luck : prof. Dr. prof. Dr. I.Kenawy

G.P  
انظر الحلت →

**Answer the following questions**

**First Question:**

**a) Define the following terms:**

**(9marks)**

- i) Spectrograph      ii) Sensitivity and detection limit in atomic spectra      iii) The Chopper      iv) Auxochromes      v) Derivative spectroscopy      vi) Selection rule for i.r vibrations**

**b) Give an account on the construction of ICP torch indicating the different methods of Introduction of solution samples...**

**(6marks)**

**c) Discuss different types of interference in atomic absorption spectroscopy? (6marks)**

**Second Question:**

**a) Draw a schematic diagram of the following components, indicating the theory and application of each**

**(9marks)**

- i) Michelson Interferometer      ii) Hollow cathode lamp      iii) Photovoltaic cells**

**b) Give reasons for:**

**i) Use of graphite for manufacturing electrodes in atomic spectroscopy?**

**ii) Charge Transfer Absorption**

**iii) Interference filters are preferred compared to absorption filters. (6marks)**

**c) The 2,3-quinoxalinedithiol complexes of cobalt and nickel have molar absorptivities of  $\epsilon_{\text{Co}} = 36,400$  and  $\epsilon_{\text{Ni}} = 5520$  at 510 nm, and  $\epsilon_{\text{Co}} = 1240$  and  $\epsilon_{\text{Ni}} = 17,500$  at 656 nm. A 0.425 gram sample was dissolved and diluted to 50.0 mL. A 25.0 mL aliquot was treated to eliminate interferences. After addition of excess 2,3-quinoxaline-dithiol, the volume was adjusted to 50.0 mL. The solution had an absorbance of 0.446 at 510 nm and 0.326 at 656 nm. Calculate the parts per million of cobalt and nickel in the sample. (Atomic weights Co=58.9 Ni=58.7) (4marks)**

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**Good Luck :      Prof. Dr. M. E. Khalifa**



Mansoura University  
Faculty of Science  
Chemistry Department  
Subject: Chemistry  
Course(s) : Org. them. (432)



First Exam  
Date : Jan, 2015  
Time Allowed: 2 hours  
Full Mark : 80 Marks  
4<sup>th</sup> level Students

Answer The Following Questions

1. Write equations to illustrate each of the following :

- a) Starting with anthranlic acid show how can you prepare indigoid and thioindigoid dyes. [ 15 Marks ]
- b) Metal azo dye complexes. [13 Marks]

2. Write an easay to illustrate each of the following :

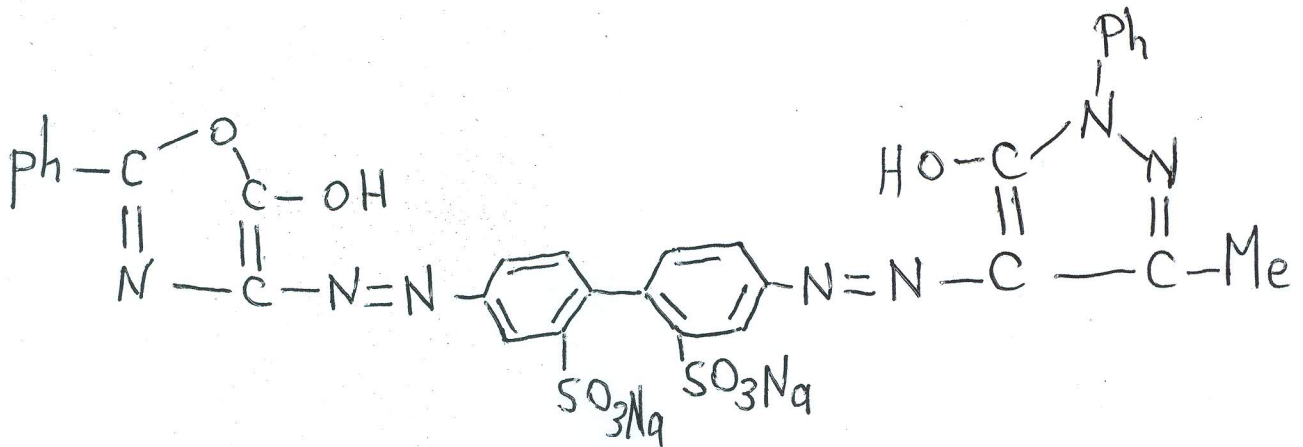
[ 13 Marks ] X2

- a) Reactive dyes.
- b) Gystal violet

3. Give an account to illustrate

[ 13 Marks ]

- a) Anthraquinone dyes
- b) Show how can you prepare the following diazo dye containing two different heterocyclic rings [ 13 Marks ]



مع الطيب الاضيائيات  
د. محمد يوسف

|                                                                                                                                           |                                                                                   |                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <p>Mansoura University<br/>Faculty Of Science<br/>Chemistry Department<br/>Code: Chem. 442<br/>Subject: Advanced<br/>Electrochemistry</p> |  | <p>First term<br/>Fourth level<br/>Program: Chemistry<br/>Date: Jan. 2014<br/>Time Allowed: 2 Hours<br/>Full Mark: 80 Marks</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|

Answer All Questions

الأسئلة على الوجهين

**First Question: (20 Mark)**

**[A] Complete: (6 Mark)**

- (1) An example of galvanic cell is .....
- (2) The presence of indifferent cation cause .....
- (3) The addition of bright nickel to an electrodeposition eliminate .....
- (4) The presence of precipitating ions such as  $OH^-$  or  $SO_4^{2-}$  decrease the .....

**[B] Discuss briefly the simultaneous deposition of two metals. (8 Mark)**

**[C] Write short notes on the following: (6 Mark)**

- (i) Corrosion                      (ii) Transpassivity                      (iii) Stress

**Second Question: (20 Mark)**

**[A] Tick (✓) for the correct answer: (12 Mark)**

(1) When coupling a metal M its  $E_{M/M^{+n}} = +0.345$  and metal N its  $E_{N/N^{+}} = -0.75$  the corrosion rate of the metal N is:

- (i) Increase                      (ii) Decrease                      (iii) Not change

(2) Gum is added to some electroplating bath to:

- (i) Increase conductivity.
- (ii) Stabilize the solution.
- (iii) Eliminate  $H_2$  bubbles.
- (iv) To give smooth deposit.

(3) The presence of active ions such as  $Cl^-$ ,  $Br^-$ ,  $I^-$  during passivation of electroactive passive metal:

- (i) Break down the passive potential.
- (ii) Increase the passive potential.
- (iii) Not change the passive potential.



(4) Increase the exchange current density the electrodeposit change to:

- (i) Coarse crystalline.
- (ii) Smooth deposit.
- (iii) Dense crystalline.

[B] Describe briefly the simultaneous deposition of two cations. (8 Mark)

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**Third Question: (20 Mark)**

**[A] Give reason: (12 Mark)**

- (1) In aqueous aluminium solutions only Hydrogen can be obtained at the cathode, and oxygen evolution doesn't ordinarily occur to a copper anode.
- (2) The presence of precipitating ions during passivation of electroactive passive metal decreases the limiting passivating current density.
- (3) When coupling an active metal with an inert metal the corrosion rate of the active metal increase.
- (4) The presence of indifferent cations increase the deposition potential.

**[B] Write briefly on the following:**

- (i) The advantage of E/PH diagram. (6 Mark)
  - (ii) The role of complex ions on the electrodeposited metal. (2 Mark)
- 

**Fourth Question: (20 Mark)**

- (A) (i) Illustrate the role of anions in the electrodeposition of metals. (6 Mark)
  - (ii) Illustrate by diagram Helmholtz and Gouy and Chapman double layer. (6 Mark)
  - (iii) Illustrate the effect of deposition potential on the structure of the deposited metal. (4 Mark)
  - (iv) What is the meant by current efficiency 95%. (4 Mark)
- 

*With best wishes*

*Prof. Dr. H. Abd El-Rasoul*

Mansoura University  
 Faculty of Science  
 Chemistry Department  
 Course: Physical Chemistry  
 Date 13/ 01/ 2015



First term Examination  
 Subject: Chemistry (441)  
 Fourth level, Chemistry students  
 Full Mark : 60 Marks  
 Time Allowed : 2hours

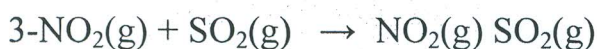
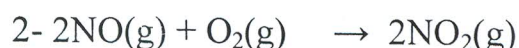
**Answer the Following Questions: (60 marks)**

1- a- A sample of glucose was decomposed at 100° and 150° C in a solution containing 0.03 mol/l HCl the observed velocity constants were found to be 0.08 and 0.20 hr<sup>-1</sup> respectively calculate catalytic coefficients k<sub>H</sub>, the observed and true activation energies – comment on your results .

b- The rate of reaction between acetylene C<sub>2</sub>H<sub>2</sub> with H<sub>2</sub> on platinum surface is found under certain circumstances to be directly proportional to the pressure of C<sub>2</sub>H<sub>2</sub> (ads), H<sub>2</sub>(ads) and inversely proportional to the C<sub>2</sub>H<sub>4</sub> pressure. Derive a rate equation which is consistent with this fact. If the heat of adsorption of C<sub>2</sub>H<sub>4</sub> is 150 kJ and that of C<sub>2</sub>H<sub>2</sub> and H<sub>2</sub> are 80 and 110 kJ respectively, discuss the effect of the heat of adsorption of H<sub>2</sub>, C<sub>2</sub>H<sub>2</sub> and C<sub>2</sub>H<sub>4</sub> on the true activation energy.

c- What is supported catalysis and the reasons for the predominant use of supported catalysts in industry?

2- a- For the following reaction mechanism:



i- Which species is a catalyst?      ii- Which species is an intermediate?

iii- How does this catalyst affect the rate of the reaction, E<sub>a</sub> = 150.9 kJ for the catalyzed reaction and E<sub>a</sub> = 250.0 kJ for the uncatalyzed reaction. What is the rate factor of the catalyzed reaction to that for the uncatalysed at reaction 250°C?

vi- Draw an energy level diagram for this reaction, with and without catalysis if ΔH = -150kJ.

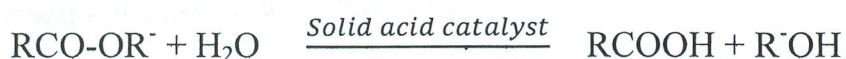
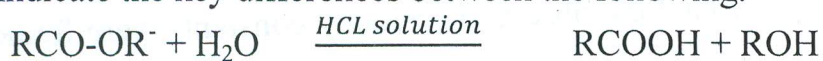
b- The conversion of a certain small peptide by chymotrypsin at 25 °C has a



Michaelis constant of  $5.89 \times 10^{-3} \text{ M}$ . The reaction rate is  $0.201 \times 10^{-3} \text{ M sec}^{-1}$  when the initial peptide concentration and initial enzyme concentration are  $0.450 \times 10^{-3}$  and  $1.2 \times 10^{-8} \text{ M}$  respectively. What is the turnover number,  $V_{\text{max}}$  and specificity constant?

c – Discuss the catalyst poisoning.

3- a- Indicate the key differences between the following.



b- The rate of bimolecular homogeneous catalytic reactions depends on the catalyst concentration regardless of the mechanism of formation of the active complex, prove this statement.

c- Write on :

i) Catalyst modifiers.

ii) Catalyst Selectivity and activity.

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Good Luck

Pof. Sohier A. El-Hakam

Prof. Awad I. Ahmed

Mansoura University  
Faculty of Science  
Chemistry Department  
Spectrometry & Electroanalytical  
Course code: Chem(417)



4<sup>th</sup> level (Chemistry)  
Date: 13/1/2015  
Time allowed: 2 hours  
Full Mark: 60 Marks

Answer the following Questions:

Question 1: (15 marks)

- a) In the determination of  $\text{Fe}^{3+}$  by atomic absorption (AAS) 0.32 mg of the iron sample was dissolved in 50 ml acid. In the determination standard solution of 5 ppm  $\text{Fe}^{3+}$  gave absorbance of 0.25 and the  $\text{Fe}^{3+}$  in the sample gave absorbance 0.3. Find the purity, % of the iron in the sample. (4 marks)
- b) Discuss the flame process in (FAAS). (4 marks)
- c) Explain the difference between: (3 marks)
- a) Atomic absorption
  - b) Atomic emission
  - c) Atomic fluorescence
- d) Discuss the types of interferences in FAAS. (4 marks)

Question 2: (15 marks)

- a) An iron(III) complex solution of concentration  $5.7 \times 10^{-5} \text{M}$  was measured spectrophotometrically and it was found that the transmittance of such solution equal to 0.21. Calculate the Molar Concentration of unknown sample of the same iron(III) complex, if its transmittance was 0.70. (7 marks)
- b) In instruments of spectrophotometry discuss the following :
- i) Device which isolate a limited regions of spectra . (4 marks)
  - ii) Radiation detectors. (4 marks)

Question 3: (15 marks)

- 1.a) Define the following: (3 marks)
- i) Electro-generated intermediate
  - ii) Polarographic maxima
  - iii) Half wave potential
- 1.b) Indicate briefly the following : (9 marks)
- i) The advantages and limitations of dropping mercury electrode?
  - ii) Selection of constant potential and conditions for minimizing time of electrolysis in controlled potential coulometry
  - iii) The effect of complex formation on polarographic waves





3b) The H<sub>2</sub>S content of a water sample was assayed with electro-generated iodine by introducing 3g of KI into 50ml portion of water. The titration required a constant current of 31.9 mA for 6.36 min. The reaction is:



Express the concentration of H<sub>2</sub>S in terms of milligrams per liter of sample (3 marks)  
(H = 1.0 ; S = 32.0).

Question 4

(15 marks)

1-a- Write an account about the indicator electrode of the 3<sup>rd</sup> type with reference to the half-cell electrode reaction, the electrode potential and how it can be used for the determination of Ca<sup>2+</sup> ion concentration in a hard water sample. (6 Marks)

1-b- Calculate the liquid junction potential E<sub>J</sub>, volt across a membrane at 25°C, in which electrolyte (1) is KCl, 2 M and electrolyte (2) is 0.25 M. The transport numbers are t<sub>K+</sub> and t<sub>Cl-</sub>, neglect the activity coefficient f<sub>+</sub>. (3 Marks)

1-c- Calculate the solubility product constant, K<sub>AgI</sub>, the solubility, X in molar and in ppm for the sparingly soluble AgI present in the cathode compartment of the following cell:



Knowing that: E<sub>cell</sub> = 0.1135 volt, E<sup>0</sup><sub>Ag<sup>+</sup>/Ag<sup>0</sup></sub> = 0.8 volt and E<sup>0</sup><sub>2H<sup>+</sup>/H<sub>2</sub></sub> = 0.0 volt, At.Wts:

Ag = 108 and I = 127.

(6 Marks)

GOOD LUCK  
Prof.Dr.Medhat Hafez

Mansoura University  
Faculty of Science  
Chemistry Department  
Subject: Chem. (421)  
f-Block Elements and Organo-  
Metallic Chemistry



First term  
B.Sc. Students  
Date: 10/01/2015  
Time Allowed: 2 hrs  
Total Marks: 80

Answer the following Questions:-

A- Put (✓) or (x) and correct the following statements:- (20 Marks)

- 1- Nd is less active than Gd.
- 2- Tendency of Sb to form complexes is higher than As ligands.
- 3-  $\text{Lu}^{3+}$  ion forms covalent and acidic complexes.
- 4- The greater negative charge on the carbonyl complexes the higher should be the C-O bond order.
- 5-  $\mu$ -bond is formed, between  $\text{M} \rightarrow \text{L}$ , and used to explain olefinic complexes.
- 6-  $\text{Yb}^{2+}$  ion is the most stable divalent between lanthanides.
- 7- Triene and arene complexes 7 electron donors.
- 8-  $\text{Ce}^{3+}$  compounds are colorless while  $\text{Ce}^{4+}$  compounds are orange in color.
- 9- Carbonylate ion is obtained by gaining an electron.
- 10-  $\text{M}^+$  and  $\text{M}^{2+}$  are less stable ions than  $\text{M}^{3+}$  ions in lanthanides.
- 11- Lanthanides prefer to form complexes with high coordination numbers.
- 12- Nd reacts with N forming  $\text{Nd}_2\text{N}_3$ .
- 13- Magnetic properties of lanthanides are highly affected by the nature of the ligand.
- 14-  $\text{Nd}^{3+}$  has the electronic configuration  $[\text{Xe}]4f^4$ .
- 15- The 4f electrons in the lanthanides are taking part in bonding.
- 16- Ln salts form complexes with  $\pi$ -bonding ligands .
- 17-  $\text{Lu}(\text{OH})_3$  is more basic than  $\text{Al}(\text{OH})_3$ .
- 18- Ln metals react water by heating.
- 19- Coordination numbers 7, 8 and higher are characterized for lanthanides.
- 20- Mononuclear  $[\text{Fe}(\text{CO})_4]^{2-}$  has a square-planar geometry.

B- Write in details for the following:

(40 Marks)

- 1- Two methods for separation of lanthanides using charge and basic properties. (6 Marks)
- 2- The resembles and differences between  $\text{Eu}^{2+}$  and  $\text{Ca}^{2+}$ . (3 Marks)
- 3- Explain in the bonding in two types of acetylenic complexes. (6 Marks)
- 4- The differences of color between lanthanides and d-elements. (3 Marks).
- 5- Molecular orbital description of NO molecule. (3 Marks)
- 6- Explain by VBT theory the complex  $[\text{CH}_2=(\text{CH})_2=\text{CH}_2]\text{PdCl}_2$ . (3 Marks).
- 7- Methods of preparation of  $[\text{Fe}(\text{CO})_5]$ . (2 Marks).

P.T.O



- 8- Formation of coordinate bond by [NO] in metal complexes (3 Marks).  
9- Mechanism of bonding in Zeise's salt. (8 Marks)  
10- Preparation and structure of  $[\text{Mn}(\text{CO})_4(\text{PPh}_3)]$  by VBT Theory. (3 Marks)

C- Comments on the following: (14 Marks)

- 1- Lanthanides give sharp bands in the visible and UV regions.
- 2- Pt prefers to form square-planar complexes.
- 3- Lu is easily separated from lanthanide elements.
- 4- Lanthanides are more active than d-block elements but less active than s-block-elements.

D- Calculate the  $\mu_{\text{eff}}$  for  $\text{Gd}^{3+}$  and  $\text{Ho}^{3+}$  ions and comment on the results obtained. (Z= 64 and 67 for Gd and Ho, respectively). (6 Marks)

Good Luck

Prof. Dr. Mohsen M. Mostafa