جامعة المنصورة كلية العلوم -- قسم الرياضيات المـــادة:إحـــصاء حـــيـــوي كود المادة : ر301 الدرجة الكلية : 80 درجة		إمتحان نهاية الفصل الدراسى الثانى 2011 المستوى : الثـــالـــث برامج : كيمياء وكيمياء حيوى التاريخ: 25 / 6 /2011 الزمن: ســـاعتان

Answer the following questions

Q1: (25 marks)

(a) Find the standard deviation (S) for the following data :

2 , 8 , 7 , 3 , 4 , 6 , 5 , 0 , 10 (10 marks)

(b) Let X be a random variable having values 1 , 3 , 5 , 7 , 9 , 11 and Y another random variable having values 2 , 4 , 6 , 8 , 10 , 12 .

Is there a relation between X and Y ? Why ? . (15 marks)

Q2: (25 marks)

Consider a random experiment a fair die is tossed two times . Let X be a random variable denotes the sum of the two numbers appears. Then

(i) Find the sample space S . (4 marks)

(ii) Find $P(X < 7)$ (7 marks)

(iii) Find $E(2X - 5)$ (7 marks)

(iiii) Compute $V(3X + 2)$ (7 marks)

Q3: (30 marks)

(a) Write about the sampling distribution for the sample mean $\overline{X}$ (10 marks)

(b) A random sample of size 16 is taken from a normal population with mean 12 and standard deviation 4. Find $p(\overline{X} \geq 14)$. (10 marks)

(c) A random sample has elements 8.5 , 11.5 , 9.5 , 10.5 , 8 , 9 , 11 , 10 , 12 is taken from a normal population $N(\mu, \sigma^2)$ with unknown mean and standard deviation 4 . Find 95% confidence interval for μ. (10 marks)

Note that : $p(Z < 2) = 0.97$ $p(Z > 2) = 0.03$, $p(Z < 1.5) = 0.93$

$Z_{0.025} = 1.96$, $Z_{0.05} = 2{,}58$, $t_{(0.025,8)} = 2.3$, $t_{(0.05,8)} = 3.35$, $t_{(0.025,9)} = 2.26$

مع تمنيات للجميع بالنجاح د. محمد جاد

الستوى الثالث - كيمياء - ديناميكا إحصائية ك ٣٤٤

Mansoura University
Faculty of Science
Chemistry Department
Subject: Statistical Thermodynamics
Course code: Chem 344

Level: Third level
Major: Chemistry
Time allowed: 2 hours
Full Mark: 80 Marks
Date: 14 Jun. 2011

Answer the following questions

I-

1- Verify that $P_j = \frac{e^{-\beta E_j}}{Z}$ *(15 Marks)*

2- Calculate $S^{\circ}_{m,298}$ and $U^{\circ}_{m,298}$ of N_2 (g), treating the gas as ideal ($\theta_{rot} = 2.862$ K and $\theta_{vib} = 3352$ K). *(10 Marks)*

II-

1- Prove that $S = k \ln w$ and verify the third low of thermodynamics. *(10 Marks)*

2- Calculate z_{tr} , z_{rot} , z_{vib} , and z_{el} for 1 mol of O_2(g) at 25°C and 1 atm, treating the gas as ideal ($\theta_{rot} = 2.069$ K and $\theta_{vib} = 2239$ K). *(10 Marks)*

III-

1- Express (without derivation) U, P, S, A and G in terms of the canonical partition function Z. Verify only the relation between U and Z. *(15 Marks)*

2- The following statements are NOT correct, re-write them correctly: *(20 Marks)*

a) For a system of noninteracting molecules: $\psi = \psi_1 + \psi_2 + \ldots + \psi_N$, where the wave function ψ corresponds to a microstate and the wave functions $\psi_1, \psi_2, \ldots, \psi_N$ correspond to molecular states.

b) For a system of fixed volume, composition and temperature, all microstates have equal probability of occurring.

c) The canonical partition function Z is a characteristic property of the microstate of the system.

d) $S_{tr} = \frac{U_{tr}}{T} + Nklnz_{tr}$

e) XeF_4 has 6 distinguishable orientations obtainable from one another by rotations.

f) In the relation $z_{el} = \sum g_{el} e^{-\beta \varepsilon_{el}}$, the summation is over all electronic quantum states and g_{el} is the total number of electronic quantum states.

g) z_{tr} and z_{rot} vary with the volume of the system.

h) In order to calculate z_{rot} of a pure diatomic ideal gas, a molecule was treated as a harmonic oscillator.

i) θ_{vib} is called characteristic vibrational temperature because it depends on temperature.

j) For a hypothetical system of 10 identical, distinguishable and noninteracting molecules ($z = 10$), Z is 1000.

Constants: $k = 1.38 \times 10^{-16}$ erg $K^{-1} = 1.38 \times 10^{-23}$ J K^{-1} & $h = 6.63 \times 10^{-27}$ erg s

Examiners: Prof. Dr. E. Arafa and Dr. Hany El Shinawi

مستوى ثالث - كيمياء السطوح - (كيم ٣٤٣)

Mansoura University
Faculty of Science
Chemistry Department
Course: Physical Chemistry
Date : 2/ 07/ 2011

Second term Examination
Subject: Surface chemistry, Chem.343
Third level
Full Mark : 60 Marks
Time Allowed : 2hours

Answer the Following Questions:

Question 1

ا- اكتب الاجابة الصحيحة فى ورقة الاجابة 2- وضح حل المسائل في ورقة الإجابة 3- الامتحان في صفحتين

Choose the response answer: (20marks)

1-Some statements are given about adsorption as
(a) It is a surface phenomenon (b) It involves energy changes
(c) It is an endothermic process (d) It depends upon temperature
Among the above, the correct statements are
a) only i and ii b) i, ii and iii c) ii, iii and iv d) i, ii, and iv

2- Point out the correct statement
a) Freundlich equation is valid over a limited range of pressure.
b) The constants K and n vary with temp.
c) Freundlich adsorption equation is purely empirical formula d) All of the above

3- Chemical adsorption is
a) exothermic b) irreversible c) favored by high temperature d) all of these

4- Which one of the following is a properly of physical adsorption?
a) non specific nature b) high specificity c) irreversibility d) none

5- The extent of physisorption
a) decrease with rise in temperature b) increases with rise in temperature
c) independent of temperature d) first increases and then decreases with rise in temperature

6- Which of the following forms mono molecular layer of adsorbate on the surface of adsorbent?
a) chemisorption b) chemical adsorption c) valence adsorption d) all are correct

7-The heat evolved during adsorption in known as
a) heat of sorption b) heat of desorption c) heat of absorption d) none of these

8-The coloring matter which gets adsorbed on activated charcoal is called
a) Adsorbate b) Absorbent c) Adsorbent d) Adsorber

9- The extent of adsorption of a gas on a solid depend on
a) Nature of gas b) Pressure of gas c) Temperature of the system d) All the correct

10- The curve indicating the variation of adsorption with pressure at constant temperature is known as
a) adsorption isotherm b) adsorption isobar c) adsorption isostere

11- Water rises up to a height h_1 in a capillary tube of radius r. the mass of the water lifted in the capillary tube is M. if the radius of the capillary tube is doubled, the mass of water that will rise in the capillary tube will be
(a) M (b) 2M (c) M/2 (d) 4M

12- Choose the wrong statement from the following.
(a) Small droplets of a liquid are spherical due to surface tension
(b) Oil rises through the wick due to capillarity
(c) In drinking the cold drinks through a straw, we use the phenomenon of capillarity
(d) Gum is used to stick two surfaces. In this process we use the property of Adhesion

13- If the surface of a liquid is plane, then the angle of contact of the liquid with the walls of container is
(a) Acute angle (b) Obtuse angle (c) 90° (d) 0°

14-The work done in blowing a soap bubble of radius R is W_1 and that to a radius 3R is W_2. The ratio of work done is
(a) 1:3 (b) 3:1 (c) 1:9 (d) 9:1

15- The height of water in a capillary tube of radius 2 cm is 4 cm. what should be the radius of capillary, if the water rises to 8 cm in tube?

(a) 1 cm (b) 0.1 cm (c) 2 cm (d) 4 cm

16- Surface tension may be defined as

(a) The work done per unit area in increasing the surface area of a liquid under isothermal condition

(b) The work done per unit area in increasing the surface area of a liquid under adiabatic condition

(c) The work done per unit area in increasing the surface is of a liquid under both isothermal and adiabatic conditions.

(d) Free surface energy per unit volume

17 - The surface tension for pure water in a capillary tube experiment is

(a) $\frac{3g}{2hr}$ (b) $\frac{3}{hrpg}$ (c) $\frac{rpg}{2h}$ (d) $\frac{hrpg}{2}$

18- If common salt is dissolved in water, then the S.T. of salt water is

(a) Increased (b) Decreased (c) Not changed (d) First decreases and then increases

19- A drop of oil is placed on the surface of water. Which of the following statement is correct?

(a) It will remain on it as a sphere (b) It will float as distorted drop on the water surface.

(c) It will spread as a thin layer (d) It will partly be as spherical droplets and partly as thin film

20- A capillary tube is placed vertically in a liquid. If the cohesive force is less than the adhesive force, then

(a) The meniscus will be convex upwards (b) The liquid will wet the solid

(c) The angle of contact will be obtuse (d) The liquid will drip in the capillary tube

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Question 2

Answer the following: (20 Marks)

1-write the assumptions of Langmuir adsorption theory and drive the equation pertaining to it. (6 marks)

2- a- Why two mercury drops coalesce when brought together ? (1 mark)

b- When a glass window is smeared with glycerin, the rain drops do not stick to glass. Why? (1mark)

c- Explain why the surface tension of a liquid is independent of the area of the surface? (1mark)

d- Why is it possible to produce a fairly vertical film of soap solution but not of pure water? (1mark)

e-What are the two forces which determine the shape of a liquid drop? (1mark)

3- A soap bubble 50 mm in diameter contains a pressure (in excess of atmospheric) of 2 bar. Find the surface tension in the soap film. (3 marks)

4- What must the radius of a water droplet be if the vapor pressure is 2.7 times greater than that of the bulk liquid at 25.0 ^{0}C. If the surface tension = 71.97 x10^{-3} N.m^{-1} and density =0.997 g.cm^{-3} . Calculate the parachor of water. (6marks)

Question 3

Answer the following: (20 Marks)

1- Show how the contact angle affects on the immersion wetting? (4 marks)

2- Why the surfactants add to the system of oil and water ? (4 marks)

3- Derive the relation between surface tension and temperature? (4 marks)

4- You add 0.5 m mol of sodium dodecyl sulfate to pure water at 25^0 C. This leads to a decrease in surface tension from 71. 99 mJ m^{-2} to 69.09 mJ m^{-2}. What is the surface excess of sodium dodecyl sulfate. (4 marks)

5- The surface tension of water was determined using the drop weight method in which 100 drops of the liquid from a capillary tube are collected and weighted .Given that mass of drops is 2.53 g and the radius of the tube is 8.78 x10^{-2}cm, determine the surface tension of water. The correction factor for the system is 0.599. (4 marks)

Good luck Prof.Dr. S.A.El-Hakam

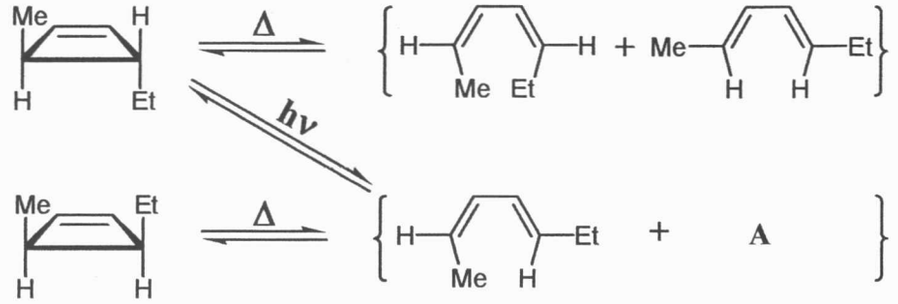
كيمياء (ل ٣٣٩) كيمياء التفاعلات العضوية

Mansoura University
Faculty of Science
Chemistry Department
Subject: ***Chemistry***
Course : Chem.(339),
Organic Reactions and Orbital Symmetry

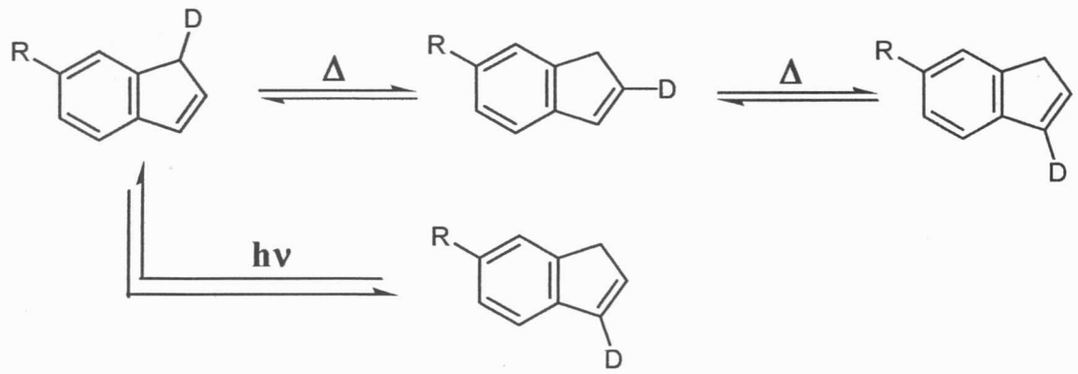
Second Term,
Third Level Chem. Students
Final Examination
Date: 21 /06/2011
Time Allowed: *2 hours*
Full Mark: 60 Marks

ANSWER ALL QUESTIONS AS DESIRED

1-a) Predict the structure of **A** and discuss **the stereochemical course** of the following inter-conversions on the basis of **the energy correlation diagram approach**. **[12 marks]**

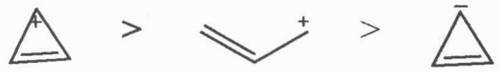


b) Discuss reasonable concerted mechanisms for the following conversions and complete when necessary: **[8 marks]**

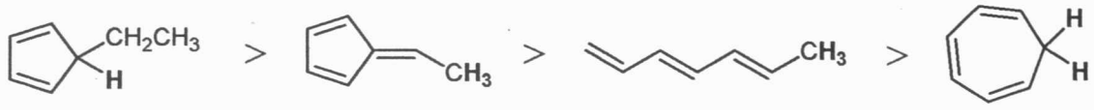


2- Account for the following observations

a) The stability of the following ions decreases in the following order: **[6 marks]**



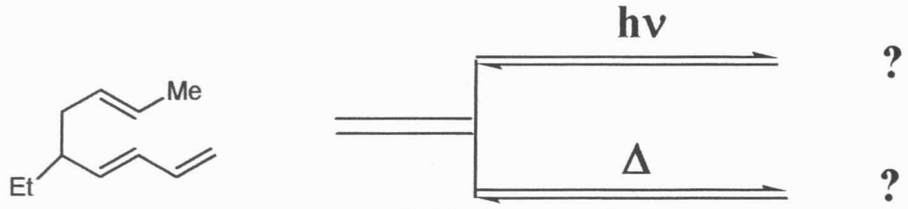
b) The **C-H-acidity** (the ability to lose one of the protons **drawn in bold**) of the following compounds decreases in the following order: **[7 marks]**



c) Trials on the preparation and isolation of **cyclobutadien** derivatives were never successful, but the preparation of the **acyclic analogue 1,3-butadien** and **cyclobutenyldication derivatives** are very common. **[7 marks]**

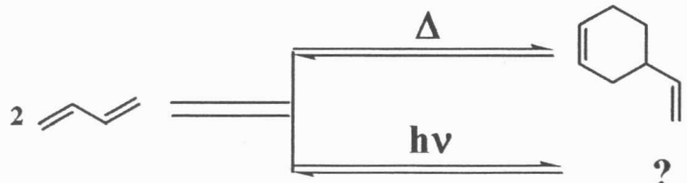
3- a) The following two conversions are **concerted** under **photochemical** condition but **not concerted** under **thermal condition. Explain**! **[6 marks]**

b) Complete the following conversions and account for your answer on the basis of **the aromatic transition state concept:** **[7 marks]**



[3,3]-sigmatropic rearrangement

c) Discuss reasonable **concerted mechanisms** for each of the following conversions and complete when necessary. **[7 marks]**



[4π + 4π]–Cycloaddition

Endo or Exo addition ?
Explain on the basis of
the frontier orbital approach!

Best Wishes *Prof. Dr. Ali Sarhan*

May 2011 Exam
Chem 335 (Natural Products' Chemistry)
Third level: Chemistry, Biochemistry,
Chem/Zoology, Chem/Botany

Mansoura University
Faculty of Science
Dept. of Chemistry
Time allowed: 2 hours
Full Mark: 60 Marks

Instructions: **Please do not answer more than required; In case of MCQ, do not explain, only write the letter in your answer notebook.**

1) **Answer the following questions by Choosing the Right statement** ***(30 marks; 2 for each item)***

1- Alkaloids are:
a) natural products b) nitrogenous basic compounds c) physiologically activity compounds
d) all of them

2- Classification of steroids as a class of natural products is based on:
a) carbon skeleton b) biogenesis c) physiological activity d) none of them

3- Shikimic acid pathway produces:
a) terpenoids b) alkylbenzenes c) fatty acids d) steroids

4- Mevalonic acid pathway produces:
a) terpenoids b) Steroids c) carotenoids d) all of them

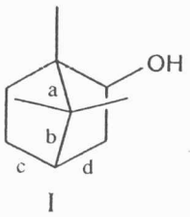
5- Biosynthetically, p-hydroxybenzoic acid is formed from:
a) polyketide pathway b) acetate pathway c) mevalonic acid pathway d) shikimic acid pathway

6- The ring closures in borneol **I** are:
a) a, b b) b, c c) a, d d) b, d

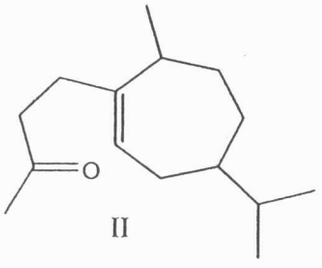
7- Compound **II** is classified as:
a) monoterpenoid b) sesquiterpenoid c) diterpenoid d) triterpenoid

8- A compound with molecular formula $C_{10}H_{18}O$, gave by aromatization p-cymene **III**. It may be:
a) An irregular monoterpene b) a regular monoterpene
c) a C_{10} compound d) a sesquiterpene

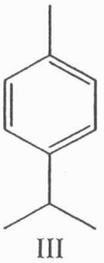
9- The precursor of compound **IV** is:
a) geraniol b) farnesol c) geranylgeraniol d) squalene

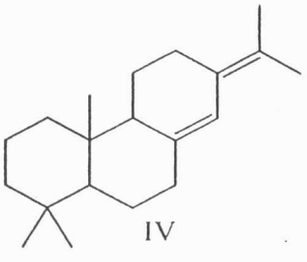


I



II


III


IV

10- When cholesterol is heated with selenium it gives:
a) squalene b) Diel's hydrocarbon c) spirostane d) sterol

11- The degrees of unsaturation in a compound with molecular formula $C_{10}H_{14}$ are:
a) 1 b) 2 c) 3 d) 4

12- If a triene gave by ozonolysis one mole of acetone, two moles of formaldehyde and 1,5-pentandial-3-one, this indicates that it has:
a) only one probable structure b) two probable structures
c) three probable structures d) four probable structures

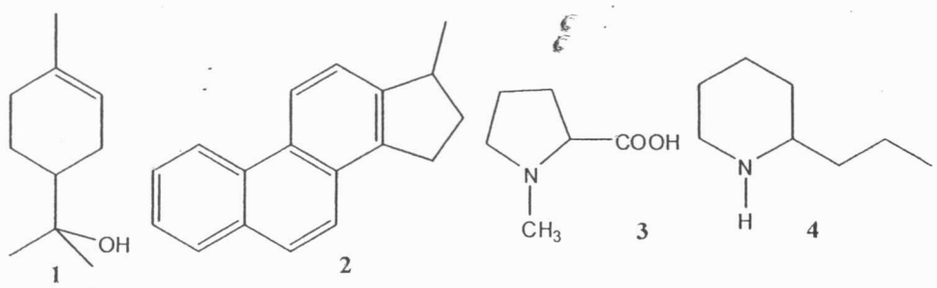
13- If an amine reacts with nitrous acid producing a yellow N-nitroso derivative, this indicates that it may be:
a) 1° amine b) 2° amine c) 3° amine d) none of them

14- A female sex hormone is:
a) a sterol b) an androgen c) an estrogen d) a gestogen

15- Ephedrine [ph-CH(OH)-CH($NHCH_3$)-CH_3] could be synthesized from:
a) pyridine b) pyrrole c) 1-phenyl-1,2-propandione d) none of them

2) <u>Answer only four of the following questions by illustrating by chemical equations the conversion of:</u> ***(16 marks; 4 for each item)***

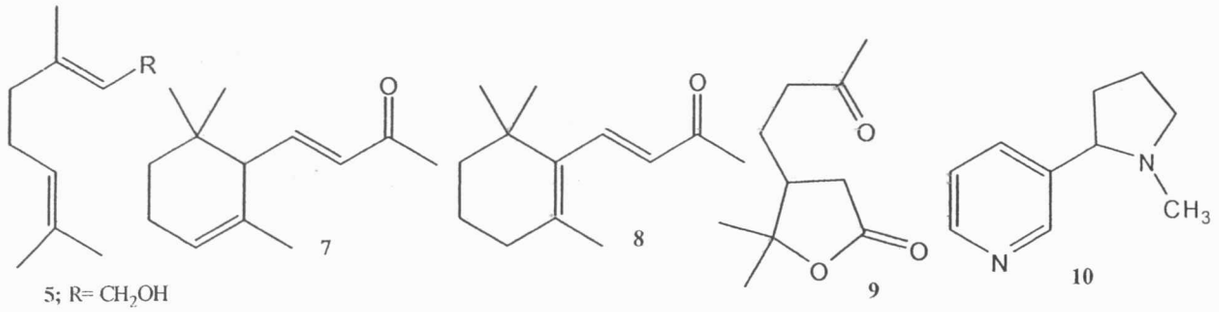
a) P-toluic acid into α-terpineol **1**.
b) 2(1-naphthyl)ethyl magnesium bromide into Diel's hydrocarbon **2**.
c) 3β-hydroxyandrost-5-en-17-one (DHEA) into 17-hydroxyandrost-4-en-3-one (testosterone).
d) 1,3-dibromopropane and sod. Diethyl malonate into hygrinic acid **3**.
e) Pyridine into coniine **4**.



1 2 3 4

3) <u>Answer only four of the following questions:</u> ***(14 marks; 3 for each item and 2 for commitment to instructions and the correct language)***

a) Illustrate the mechanism of converting geraniol **5** into α-terpineol **1**.
b) Indicate by chemical equations how citral **6** could be converted into a mixture of α-ionone **7** and β-ionone **8**.
c) Illustrate by chemical equations the conversion of α-terpineol **1** into compound **9**.
d) Illustrate by chemical equations the treatment of ephedrine [ph-CH(OH)-CH($NHCH_3$)-CH_3] by HCl, indicating the mechanism.
e) Illustrate by chemical equations the synthesis of nicotine **10** from 3-cyanopyridine.



7 8 9 10

5; R= CH_2OH
6; R= CHO

Mansoura University Faculty of Science Chemistry Department Subject: Chemistry Course: Coordination Chemistry, Chem. 322		Second Term 3rd Level, Chem. Students Date: May 2011 Time Allowed : 2 hours Full Mark: 80 Mark

Answer the following questions:

1) Comment on FIVE only of the following: **(30 mark)**

i) $[Ni(dmg)_2]$ has no unpair electron (Ni = 28)
ii) The orbit-orbit coupling of d^2 system has numerous terms.
iii) $[Pt(NH_3)_2]^{1+}$ does not prepared by thermal decomposition only.
iv) $[Co(EDTA)]^{2-}$ is octahedral (Co = 27)
v) The electronic spectrum of $[Ti(Py)_4]^{3+}$ has only one band (Ti = 22)
vi) The stability of $[Cu(dipy)_3]^{2+}$ is more than $[Co(py)_6]^{2+}$

2) a) Suggest Russell-Saunders couplings for the d^8 system and draw its Orgel diagram **(10 mark)**

b- Based on CFT, predict the structure and the magnetic properties of: $[Fe(CN)_6]^{3-}$ and $[Mn(Ox)_3]^{-2}$. Discuss the first complex by VBT. **(10 mark)**

3) a- Name, indicate the primary valancy, type of isomerism, the number of isomers and the geometry of:
$[Cr(Hgly)_2(CN)Cl]I$,
$[Fe(NH_3)_2(H_2O)_2Cl]Br_2$,
$[Ni(NCS)_4]^{2-}$ **(12 mark)**

b- Prepare and give two methods to investigate the following complexes:
a- $[Co(en)_3]Cl_3$, b- $Na_3[CuF_6]$ **(8 mark)**

c) The reaction between $PtCl_4$ and NH_3 gas gave different compounds with molar conductances of 430, 250, and 0.0 ohm^{-1} cm^2 mol^{-1}, write their plausible geometry, Which one has no isomerism **(10 mark)**

Best Wishes Prof Dr Ahmed Fawzy El-Asmy

Mansoura University **Faculty of Science** **Chemistry Department** **Subject: Analytical Chemistry** **Course(s): Electroanalysis & Chromatography**		**Second Term ,** **3rd year Chemistry Students** **Date June. 2011** **Time Allowed: 2 hours** **Full Mark: 60 Marks**

Answer The Following Sections

CHROMATOGRAPHY
(30 Marks)

1. **Give a brief account ... the following:**
   - (i) **Affinity Chromatography (Principles, applications and elution methods).**
   - (ii) **Principles and properties of gel chromatography.**
   - (iii) **Planar chromatography and detectors used.**
   - (iv) **Compare between GC and HPLC and specify the main detectors used .**
   - (v) **3 analytes A, B, and C were separated on a column of 3 cm length (I.D. =5 um) at 0.5; 0.6 and 0.65 minutes with 3 ; 2; and 5 beak widths, respectively. Calculate n, H and R ,Comment on the results.**

2.(a) Describe the main methods of preparation and applications of ion exchangers. What is meant by separation factor and capacity.

1.a)- A 100 g sample of 2 hazardous pollutants whose concentrations are 10; 12 ppb with MWs: 200; 240,respectively. If they were extracted into 10 ml cyclohexane solvent, calculate their concentration in the new solvent. Depict which are the best detectors to be used in their analysis once if they are insecticides and 2nd if they are elemental radioisotopes.

Electroanalytical : (30marks)

Q1) For the following electrochemical cell

Pt | $FeCl_2$ (0.015 M) , $FeCl_3$(0.045 M) ‖ ($AgNO_3$ 0.1 M | Ag

a)Identify the anode and cathode.

b)write the oxidation or reduction reaction occuring at each electrode

c) Calculate E cell . (E^o_{Fe} =0.771 v , E^o_{Ag} = 0.8 v) . (5 marks)

Q2) What is the theoryof glass ion selective electrode ,and what are the types of errors in pH measurements by glass electrode ? (5 marks)

Q3) Q14) An alloy sample containing Cu and weighing **4 g** is dissolved in acid and diluted to 250ml ,

10.0ml aliquot is placed in a 100ml volumetric flask , and 50ml of a suitable supporting electrolyte and 0.2% Triton X 100 solution are added .The sample is diluted to the volume with water, the polarogram is recorded. The stander solution ,63.5 ppm Cu gave 7.2μA , I_d for the sample was 3.9 μA**. Calculate %** of copper in the sample (5marks)

Q4) A 107.1 mg alloy sample is dissolved in 100 ml of H_2SO_4 containing Fe^{2+} .There is added 20 ml of Ce^{3+} and the solution is placed in an electrolysis cell for coulometric titration .A constant current of 48.65mA is used ,and the endpoint is reached in 415.6 sec. Calculate the percentage of Fe in the sample .(Fe =56) (3marks)

Q5) Explain how polarography can be used in qualitative and quantitative analysis ?(5marks)

Q6)When is it necessary or not necessary to remove O2 in polarographic measurement ? (4marks)

Q7) Define : (3marks

a) Polarograme , b) stripping voltammetry

c) Ion selective electrode