المستوى الرابع كيمياء
كيمياء البوليمرات ٢٠١٢

Mansoura Univ. **Second Term**

Fac. Of Sci.,Chem. Depart. **Fourth year chemistry**

Subject:Chemistry **level 4 , Date, 30-6-2012**

Courses:Org. Chem. 436 **Time, 2 hrs , Full mark,80 marks**

Polymer chemistry exam

1-(a) Write short notes on three only of the following topics.(3x 8 marks)

(I) Conversion of functional groups.

(ii)Polycondensation and stepwise polymerization.

(iii)Preparation of syndiotactic polypropylene by bimetallic Ziegler Natta catalysts .

(iv) Emulsion polymerization .

(b) Explain two methods for determination of number average molecular weight .(10 marks).

2-(a) Describe the mechanism of polymerization when using the following initiators KNH2 , TiCl3C2H5 and H2SO4 in preparation of different polymers.(11 marks)

(b) Give a brief account on the advantages of the copolymerization process and explain the kinetics of the free radical vinyl copolymerization . (15 marks).

3-(a) Complete the following sentences (5 x 1.5 mark).

(I) Azeotropic copolymerization equation is ---------- .

(ii) ----CH2—CH----- $\xrightarrow{\Delta}$ ---------- .
CN

(III) 2------CH2-----CH------ + H2N-CH2—CH2-NH2 ------→ ---------- .
COCl

(iv) The equation that relates osmotic pressure and Mn is ----------.

(v) when r1 = r2 = 0 , the copolymerization equation is ----------.

(b) Put √ or x on the correct answer of the following sentences (5 x1 mark).

(I) Vinylchloride gives anionic polymerization. ( ).

(ii)Acrylonitrile gives cationic polymerization. ( ).

(iii) Acrylamide gives Ziegler Natta polymerization. ( ).

(iv) When Mw = Mn the polmer is highly distributed .( ).

(v) polypropene has Tg under zero temperature. ( ).

(c) Write only on two of the following subjects . (7.5 marks).

(I) Polymerization of conjugated diene .(4.5 marks).

(ii) Glass transition temperature (Tg) of polymers .(3 marks).

(iii) Mechanism of inhibitors . (3 marks).

Best wishes

أ.د/ السيد عبد الحميد عبد الرازق

المستوى الرابع كيمياء - كيمياء تخليقية ك ٤٣٥

Mansoura University
Faculty of Science
Department of Chemistry

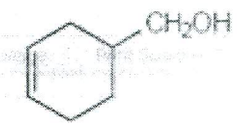
Eighth Semester
Date 23-06.2012
Time: Two Hours
Full Mark (60)

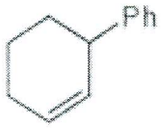
Exam. of Course 435(Organic Chemistry) (Organic Chemistry-2)
For 4th Level Chemistry Students

1- A- What are the criteria for useful bond disconnections?

B- How would you make the following target molecules:

i- ii-



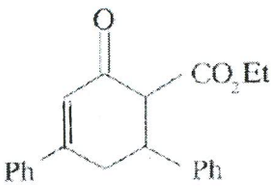


2- A- Design a logical synthesis for:

B- Draw out the forward synthesis of 4-phenyl-2-butanone?

3- A- Disconnect the following compounds to their synthons and suggest a synthesis for each one:

i- ii-



B- Based on the umpolung strategy, explain benzoin condensation.

Good Luck

Prof. Dr. Mohamed Abbas Metwally

المستوى الرابع - كيمياء - الأطياف الإلكترونية والمغناطيسية ك ٤٢٤

Mansoura University
Faculty of Science
Chemistry Department
Subject: Chem. (424)
Inorganic
Chemistry

Second Term
B.Sc. Students
Date: 12/06/2012
Time Allowed: 2 hrs

Answer the following questions

Electronic Spectra and Magnetochemistry

Answer the following questions:- **(Total Marks 80)**

1- Put (√) or (X) for the following:- **(24 Marks)**

i- Colorimeter is used to measure the electronic spectra in the 200-1000 cm^{-1} range.
ii- The intensity of magnetization equals the magnetic per area.
iii- The energy of IR includes rotational, vibrational and electronic transitions.
iv- 1Å equals 10^{-10} cm.
v- The volume susceptibility is the ratio of I/B.
vi- The charge-transfer in case of HgI_2 is of the type $L \rightarrow M$.
vii- The ampltiude is used to deferenciate between electromagnetic radiations.
viii- Permiability equals B/I.
ix- B equals $eh/4\pi mc^2$.
x- The difference between spin-orbital couplings equals BH.
xi- $n \rightarrow \pi^*$ transition is higher in energy than $\pi \rightarrow \pi^*$.
xii- $[Cu(H_2O)_6]Cl$ has a regular octahedral structure.
xiii- Spin-orbital coupling represents 2S+1.
xiv- Zr^{4+} salts are easily reduced than Ti^{4+}.
xv- Fe^{2+} reacts with 1,10-phenthroline forming a red color.
xvi- MnO_4^- ion has a deep violet color.

2-- Write short notes on the follwing: **(28 Marks)**

i- Effect of Russell-Saunders in case of P^2 system.
ii- Determination of magnetic moment using the turnning magnet.
iii- The relation between ε and selection rules.
iv- Racah parameters.
v- Counter-ion spectra.
vi- Mullikan symbols.
vii- Calculation of number of microstates.

(P.T.O)

3- Comments on the following: **(16 Marks)**

i- **The broadness of the d-d band in case of d-block metal complexes.**
ii- **The value of orbital magnetic moment equals half the value of spin magnetic moment.**
iii- **$[Ti(H_2O)_6]^{3+}$ has three transition states.**
iv- **The effect of π-bonding on the value of Δ.**

4- Determine the ground term and the magnetic moment for the following: (12 Marks).

i- **$[Cr(H_2O)_6]Cl_2$ (At. No. = 24).**
ii- **$[Fe(NH_3)_6]Cl_3$ (At. No. = 26).**
iii- **$[CuCl_2]^-$ (At. No. =29).**
iv- **$[[Co(CN)_6]^{3-}$ (At. No. = 27).**

Good Luck

Prof. Mohsen M. Mostafa

كيمياء - آلية التفاعلات غير العضوية (٤٢٣ ك)

Mansoura University
Faculty of Science
Chemistry Department
Subject: Mechanism of Inorganic Substitution Reactions
Course Symbol :423 Chem

Chemistry Students
Exam date: 09.06.2012
Allowed time: 2 hours
Total marks= 80
Level: 4th

Final Exam for 4th Level Chemistry Students

Answer the Following Questions:

1-I) ***Write short notes on the following: -*** (10 Marks)

a) Labile complexes.

b) Garrick's explanation for S_N1 dissociation mechanism of base hydrolysis reaction of $[Co(NH_3)_5Cl]^{2+}$.

II) Show how the trans- effect can be used to distinguish between cis- and trans- isomers of $[PtA_2X_2]^0$ type complexes (A=NH_3or amine, X=Cl^-). (6 Marks)

2) ***Complete the following statements***:- (14 Marks)

a) According to Orgel, the formation of .....bond between.....and.....ligand, L..... the stability of the.....coordinated state complex. Thus.....the activation energy for its formation and.....up the reaction.

b) Substitution reactions in Pt (II) square planar complexes proceed by.....(S_N..) mechanism involving either.....or the.....ligand as the nucleophilic agent.

c) Electron-transfer reactions occur by two mechanisms; .....or.....and .....or..... ..

3) ***Give the possible mechanism <u>for two only of the following reactions</u>:-*** (18 Marks)

a) $[Co(NH_3)_5Cl]^{2+} + [Cr(H_2O)_6]^{2+} + 5H_3O^+ \longrightarrow [Co(H_2O)_6]^{2+} + [Cr(H_2O)_5Cl]^{2+} + 5NH_4^+$

b) $[Co(NH_3)_5CO_3]^+ + H_3O^+ \longrightarrow [Co(NH_3)_5H_2O]^{3+} + H_2O + CO_2$

c) Cis $[PtA_2LX] + Y^- \longrightarrow$ Cis & trans-$[PtA_2LY] + X^-$

4) ***True and false (circulate the correct response):*** (12 Marks)

a) T – F S_N1CB and S_N2 displacement mechanisms follow the same rate laws and give the same hydroxo product.

b) T – F Substitution reactions of Pt(II) square planar complexes are not stereo-specific.

c) T- F Polarization theory explained the trans effect of groups such as CO, NO and PR3.

d) T – F Substitution on ethylene diamine in $[Co(NH_3)_5Cl]^{2+}$ complex makes the reaction to proceed by S_N2 association mechanism.

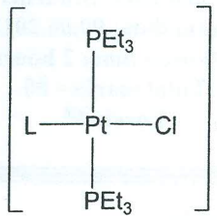
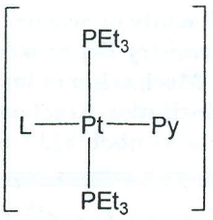
4) ***Arrange the following in the order of increasing the property indicated in brackets*** (20 Marks) ***indicating the reasons if it is possible***

a) $[Co(NH_3)_4Cl_2]^+$ & $[Co(NH_3)_5Cl]^{2+}$. (Rate of aquation)

b) Cis $[Co(en)_2Cl_2]^+$& $[Co(trien)Cl_2]^+$. (Rate of aquation)

c) $[Pt(Py)_2Cl_2] + {}^{36}Cl$ (in H_2O, DMSO and ROH). (Rate of substitution)

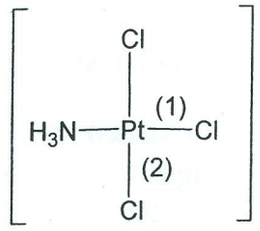
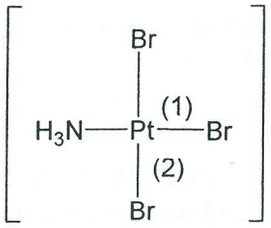
Turn over→

iv) *trans*  + Py $\underset{\text{EtOH}}{\overset{25^0C}{\rightleftharpoons}}$ *trans*  + Cl^-

L= H, methyl, phenyl, p-methoxy phenyl

a) (Trans directing ability of the group).

b) K_1 and $K_2(min^{-1})$

v)  & 

(a) (b)

i) Bond length of bond(1):..... >.....

ii) Bond length of bond (2):..... .> .....

With Best Wishes

Dr.O.El-Gammal

ع كيمياء - نظرية المجموعات والتماثل (كيم ٤٢٢)

Chemistry Department
Faculty of Science
Mansoura University

Date: 5th June 2012
Time: 2 hours
Marks: 80

Final Exam in Symmetry and Group Theory for Fourth Level Chemistry Students (Chem 422)

Answer The Following Questions

1)Complete or choise in the following: (25 marks)

1- BH_3 has ..... point group while $B(OH)_3$ point group is .....; Please draw both

2- CCl_4 has ..... geometry,..... elements of symmetry and ..... point group, which makes it (low – high) degree of symmetry molecule

3- ..... is an example of Cs point group; please draw

4- $[PtCl_4]$ has (square-planar – tetrahedral) geometry and ($C_3 – C_2 – C_4$) axes of rotation

5- CO_3^{2-} has ..... geometry and ($C_{3v} – D_{3h}$) point group; Please draw.

6- In CO_2 molecule, each atom has ..... motions are ....., ... and ..... Degree of freedom is ....., they are classified as ....., ... and ..... (ν_{sym} - ν_{sym} - δ) is/are active IR due to .....; Please draw and explain.

2)Please name the symmetry elements and point groups of each of the following molecules:- (15 marks)

1) CS_2
2) cis-$[Pt(NH_3)Cl_2]$
3) SO_2
4) $H_2C=C=CH_2$
5) CH_2Cl_2
6) HBr

3)Choose the most correct answer:- (10 marks)

1) $[NiCl_4]^{2-}$ point group is

a) C_{4v} b) C_{4h} c) D_{4h} d) D_{4v} e) T_d

2) ..... Symmetry operations of NH_3

a) C_3, σv b) E, C_3, i c) E, C_3, σv d) E, $2C_3$, $3\sigma v$ e) E, $2C_3$, σv

3) ..... is belonged to $D_{\infty h}$ family

a) N_2 b) H_2O c) N_2O_4 d) a & b e) a & c

4) B_2H_6 is

a) linear molecule b) C_2 c) D_{2h} d) a & b e) b & c

5) Acetone has

a) E b) σh c) C_2 d) a &c e)a&b&c

4) True and Faulse; circulate the suitable response and please correct the false one (10 marks)

1- T - F Water molecule has two vibration modes; are IR and Raman inactive

2- T - F C2v point group molecule has 6 characters

3- T - F Reducible representation of identity (E) is -1

4- T - F NH_3 has point group of D_{3h}

5- T - F Number of non-shifted atoms in SO_2 through C_2 are 2

6- T - F Degree of freedom in both trans-H_2O_2 and N_2O_2 are 6

7- T - F Trans-$UO_2(AcO)_2$ has $\nu_{asy}(UO_2)$, which is active IR and Raman

5)In the molecules $POCl_3$ and cis-H_2O_2; Please find (20 marks)

a) Symmetry operations

b) Total number of operations (Characters)

c) Reducible and irreducible representations for each symmetry representation

d) Number of vibration motions

You are provided with the character tables

Table 1: C_{2V}

C_{2v}	E	C2	σ_{xz}	σ_{yz}
A_1	1	1	1	1
A_2	1	1	-1	-1
B_1	1	-1	1	-1
B_2	1	-1	-1	1

Table 2: C_{3V}

C_{3v}	E	C_3	σ
A1	1	1	1
A2	1	1	-1
E	2	-1	0

المستوى الرابع كيمياء - الفيف الجزيئي (ك ٤٤٣)

Mansoura University **Faculty of Science** **Physical Chemistry Dept.**		**B.Sc. Students (Chem.)**	
		Date:	**26 June 2012**
		Time Allowed :	**(2 hours)**
Course no. (Chem. 443)		**Full Mark:**	**(80 Marks)**
Molecular Spectroscopy Final Exam		***Prof. Dr. A.A. El-Khouly***	

Answer the following questions:

1- Calculate in **e.v.** the (**E**) of absorption of an **100** ηm **U.V.** radiant **&** also its wave-number; if its wavelength becomes **10** $^{-6}$ m. **(13 Marks)**

2- Illustrate & describe **2 types only** of pure rotation spectra. **(13 Marks)**

3- Write a full comparison between a **Band & Line Spectra.** **(13 Marks)**

4- Explain the **Vibrational Spectra** of CO_2 molecules including its **stretching** (Symm. & Asymm.) & its **bending** modes. **(13 Marks)**

5- Discuss the **differences** between **microwave-active** & **infrared- active** molecules referring to **some examples** of each. **(13 Marks)**

6- **Integrate** & **explain** mathematically the **moment of Inertia (I)** & the **rotational kinetic energy (E_K)** of a rigid-system (dumbell-shaped model) i.e. diatomic molecules. **(15 Marks)**

Best wishes

Prof.Dr./A.A.El-khouly