Faculty of Science
Chemistry Department

Dec. 23, 2019
Time : 3 Hours

Photochemistry and Reactive Intermediates (313C)

Final Exam. For The 3rd level Students

Note: Support your answer with Chemical Equations whenever possible.

Answer on the Following Two Sections: (50 Marks)

Section A : Photochemistry: (25 Marks)

Answer on the Following Questions:

I]- Answer **only Four** of the following : (2 X 4 = 8 Marks)

1- Describe the different sources of light with special reference to solar light ?.

2-Explain the product Quantum yield method used for determination the reaction mechanism in Photochemistry.

3-Discuss briefly Franck –Condon principle and the possible mechanisms of Photochemical cleavage of organic compounds.

4-Discuss the photoisomerization process during the processes of vision .

5- Indicate the mechanism of heating by Microwave Radiations.

II] – Mark right (√) or wrong (X) on **only Four** of the following statements, and **Explain** your answer : (2 X 4 = 8 Marks)

1- Quartz filter transmitting ≥ 300 nm radiations can be used in Visible light photolysis of organic compounds. ( )

2- Photochromism is the change of color by the absorbed wavelength ( )

3- Ungerade → Gerade transition is a Symmetry allowed transition. ( )

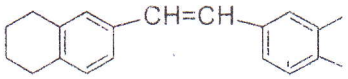
4- Photodimerization of 1- butene has a Product Quantum Number more than one . ( )

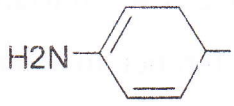
5- U.V. radiations have lower frequency than visible light. ( )

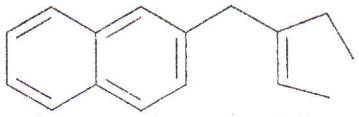
ملحوظة هامة : الأسئلة 3 صفحات

III] Complete only Four of the following reactions and discuss the reaction mechanism: [9 Marks]

a - 1,3-Cyclohexadiene + $^1O_2$ $\xrightarrow{hv}$? (2 Marks)

b-  $\xrightarrow{hv}$? (2 Marks)

c-  $\xrightarrow[H2SO4]{Microwave}$? + ? (2 Marks)

d-  $\xrightarrow{hv}$? (2 Marks)

e- 1,3-butadiene (abs. 250nm) $\xrightarrow[Benzophenone]{hv\ (500\ nm)}$? (3 Marks)

Section (B): Reactive Intermediates: (25 Marks)

Answer on the Following Questions:

1] Write on *two only* of the following (use equations) **(9 Marks)**

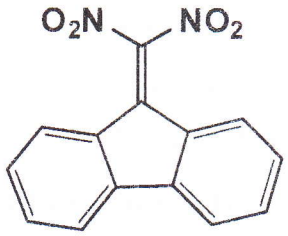
a. The trifluromethyl and cyclopropyl radicals are σ radicals, while the ethyl and cyclohexyl radicals are π radicals. (Explain this statement)

b. Compare between the addition of both singlet and triplet carbenes to olefins.

c. A carbon radical has seven electrons in its valence shell, while carbocation has only six. (Explain this statement)

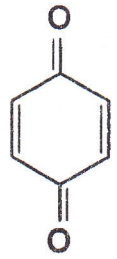
2] Suggest the suitable mechanism and products for *Only Four* of the following reactions. Write the name of the suggested mechanism, indicate each step using arrows. (16 Marks)

I-



$\xrightarrow[MeOH]{MeO^-}$?????

II-



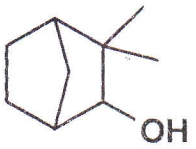
[4+2], heat

????? 

[4+2], heat

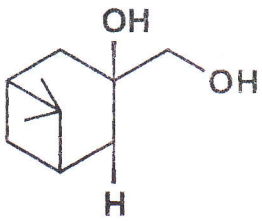
?????

III-



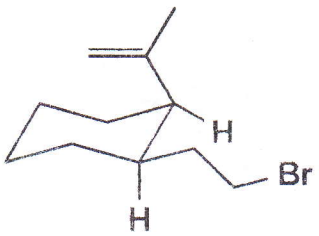
$\xrightarrow[AlCl_3]{H^+}$?????

IV-



$\xrightarrow[Py]{TsCl}$?????

V-



$\xrightarrow[heat]{Bu_3SnH,\ AIBN}$?????

Good Luck

Prof. A. A. Abdel-Wahab & Prof. Dr. M.A. Abdel-Rahman

3-

Assiut University
Faculty of Science
Chemistry Department

Academic year 2019/2020

Time allowed: 3 hours

Final Exam. for Course no. C-333 (Radiochemistry)

Answer the following two questions: -

Question No. 1 *(30 Marks)*

A- From the following data given below;

Co - 57
271.80 d
ε
γ 122, 136, 14,...
e^-

Sketch the decay scheme of Co-57.
Write the complete decay equations of Co-57.
How many Co-57 atoms are present in 1 mCi of Co-57 activity?
Insert spin and parity of the parent and the daughter nuclei.
What is the specific activity of carrier free Co-57?

B- Define the following items:
Compton scattering, Sievert, Exposure dose, Specific ionization,
Mass stopping power of a material, Internal conversion, Equivalent dose.

C- How much time it would take for the decay of 8/9 of a sample of Ge-68 ($T_{1/2}$ = 280 d).

D- Calculate irradiation time necessary to produce 600 mCi (22.2 GBq) of Mo-99 by irradiating 4 g of U-235 in the nuclear reactor whose thermal neutron flux is 2×10^{14} n/cm^2/s
(Assume the formation cross section of Mo-66 is 20 *mb* ($T_{1/2}$ of Mo-99 is 67 hr.).

E- Calculate the activity of a Na-22 source which gives a dose of 64 μSv/h at 1 m.
Na-22 emits one gamma photon of energy of 1.28 MeV/disintegration.

F- The dose rate of 2 m from a particular gamma source is 400 μSv/h.
At what distance will it give a dose rate of 25 μSv/h.

Question No. 2 *(20 Marks)*

A- Define the following items:
Nuclear reaction cross section, Excitation function of a nuclear reaction, Annihilation process, Photoelectric effect, Neutron capture, and Isomeric transition process.

B- What is the time intervals during which Ga-67 ($T_{1/2}$ = 3.2 d) decay to 37% of the original activity.

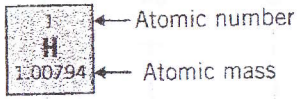
C- What kind of decay would you expect for I-125 and I-132?

D- What is the minimum thickness of lead shielding required for reducing the radiation level from Co-60 source from 10 R min^{-1} to 10 mR h^{-1} (htv = 1.25 cm for lead).

E- The half-lives of Mo-99 and Tc-99m are 67 hr and 6 hr, respectively, and both are in transient equilibrium in a sample. If the Mo-99 activity is 75 mCi (2.8 MBq), what is the activity of Tc-99m? (assume 87% Mo-99 decay to Tc-99m).

Constants; m_p = 1.00727 u, m_n = 1.00866 u, $N_A = 6.023 \times 10^{23}$ mole^{-1}, 1b = 1×10^{-24} cm^2,
1 Ci = 3.7×10^{10} Bq, R = 1000 mR

Good Luck
Prof. R. M. Mahfouz



Metals | Metalloids | Nonmetals

Physical State at Room Temperature

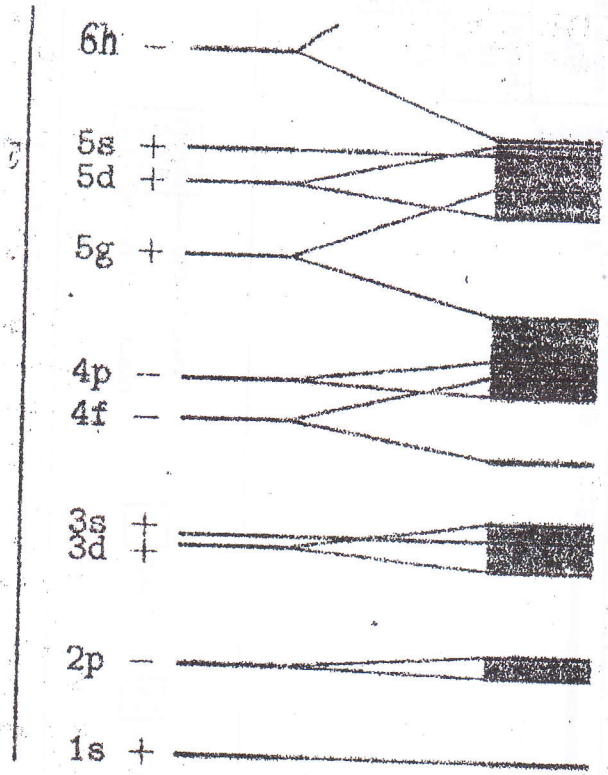
Black = Solid
Blue = Liquid
Red = Gas

Periods	IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII			IB	IIB	IIIA	IVA	VA	VIA	VIIA	Noble gases 0
1	1 H 1.00794																	2 He 4.00260
2	3 Li 6.941	4 Be 9.01218											5 B 10.811	6 C 12.011	7 N 14.00674	8 O 15.9994	9 F 18.99840	10 Ne 20.1797
3	11 Na 22.98977	12 Mg 24.3050											13 Al 26.98154	14 Si 28.0855	15 P 30.97376	16 S 32.066	17 Cl 35.4527	18 Ar 39.948
4	19 K 39.0983	20 Ca 40.078	21 Sc 44.95591	22 Ti 47.88	23 V 50.9415	24 Cr 51.9961	25 Mn 54.9380	26 Fe 55.847	27 Co 58.93320	28 Ni 58.6934	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.61	33 As 74.92159	34 Se 78.96	35 Br 79.904	36 Kr 83.80
5	37 Rb 85.4678	38 Sr 87.62	39 Y 88.90585	40 Zr 91.224	41 Nb 92.90638	42 Mo 95.94	43 Tc 98.9072	44 Ru 101.07	45 Rh 102.90550	46 Pd 106.42	47 Ag 107.8682	48 Cd 112.411	49 In 114.82	50 Sn 118.710	51 Sb 121.76	52 Te 127.757	53 I 126.09447	54 Xe 131.29
6	55 Cs 139.90543	56 Ba 137.327	57 *La 138.9055	72 Hf 178.49	73 Ta 180.9479	74 W 183.85	75 Re 186.207	76 Os 190.2	77 Ir 192.22	78 Pt 195.08	79 Au 196.96654	80 Hg 200.59	81 Ti 204.3833	82 Pb 207.2	83 Bi 208.98037	84 Po 208.9824	85 At 209.9871	86 Rn 222.0176
7	87 Fr 223.0197	88 Ra 226.0254	89 †Ac 227.0278	104 Unq 261.11	105 Unp 262.114	106 Unh 263.118	107 Uns 262.12	108 Uno[b] (265)	109 Une[b] (266)									

*	58 Ce 140.115	59 Pr 140.90765	60 Nd 144.24	61 Pm 144.9127	62 Sm 150.36	63 Eu 151.965	64 Gd 157.25	65 Tb 158.92534	66 Dy 162.50	67 Ho 164.93032	68 Er 167.26	69 Tm 168.93421	70 Yb 173.04	71 Lu 174.967
†	90 Th 232.0381	91 Pa 231.0359	92 U 238.0289	93 Np 237.0482	94 Pu 244.0642	95 Am 243.0614	96 Cm 247.0703	97 Bk 247.0703	98 Cf 251.0796	99 Es 252.083	100 Fm 257.0951	101 Md 258.10	102 No 259.1009	103 Lr 262.11

[a] Atomic masses are the 1989 values given in the Table of Atomic Masses and Numbers (opposite) but rounded, where appropriate, to the fifth decimal place.

[b] The 1989 report of the IUPAC listed no value of atomic masses for this element. The value in parenthesis is a best estimate.



−	$6h_{11/2}$ = $1h_{11/2}$	12		82
+	$5d_{3/2}$ = $2d_{3/2}$	4		70
+	$5s_{1/2}$ = $3s_{1/2}$	2		66
+	$5g_{7/2}$ = $1g_{7/2}$	8		64
+	$5d_{5/2}$ = $2d_{5/2}$	6		56
+	$5g_{9/2}$ = $1g_{9/2}$	10		50
−	$4p_{1/2}$ = $2p_{1/2}$	2		40
−	$4f_{5/2}$ = $1f_{5/2}$	6		38
−	$4p_{3/2}$ = $2p_{3/2}$	4		32
−	$4f_{7/2}$ = $1f_{7/2}$	8		28
+	$3d_{3/2}$ = $1d_{3/2}$	4		20
+	$3s_{1/2}$ = $2s_{1/2}$	2		16
+	$3d_{5/2}$ = $1d_{5/2}$	6		14
−	$2p_{1/2}$ = $1p_{1/2}$	2		8
−	$2p_{3/2}$ = $1p_{3/2}$	4		6
+	$1s_{1/2}$ = $1s_{1/2}$	2		2

Faculty of Science
Assiut University
Chemistry Department

Time:3 hrs
Dec.2019

Final Inorganic Chemistry Exam(C-321) For Third Level Students

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Answer the following questions:

Question Number One: (16 marks)

1-(i)-Write the IUPAC name of the following:

a) $[PdI_2(ONO)_2]$, b)$[Co(en)_2NH_3Br]Cl$, c)$K[Pt(NH_3)Cl_3]$

(ii) What kinds of isomerism that compounds (a) and (b) above can possess?

(iii) Write the formula of the following compounds:

(a) Hexaamminechromium(III)hexacyanocobaltate(III)

(b) ammonium tetrathocyanatodiamminechromate(III).

(iv)In the light of HSAB concept , predict which direction the following reactions will go.

$CoF_2+HgBr_2 \rightleftharpoons CoBr_2+HgF_2$

$HgO+H_2S \rightleftharpoons HgS+H_2O$

$AlI_3+3NaF \rightleftharpoons AlF_3+3NaI$

2- Complete the following:

a) Octahedral complexes MX_5Y have.....form as all six corners are.....while MX_4Y_2 have..... isomers such as the following example.....

b) The depression of freezing point measurement depends on ..... If a molecule dissociates into.....it will give.....the expected depression for a single particle.

c) The compound $Ni(NH_3)_4(NO_3)_2.2H_2O$ gives square planar complex have the structure .....or octahedral structure .....depending on the number of unpaired electron spins present in the complex.

d) The complex $[Pt(NH_3)_2Cl_2]$ is square planar and exists in two structures .....and ..... depending on .....

3- State the effective atomic number rule and calculate that for $[Fe(CN)_6]^{3-}$.

اقلب الورقة من فضلك

Question Number Two (17 marks)

a) Explain how pure titanium can be extracted from rutile ore.
b) Write short note on he following:
(i) Catalytic activity of transition metals
(ii) Metallic character and related properties for transition meatals.
c) Calculate the uncorrected magnetic momentof $CuSO_4.5H_2O$ at 293K using Gouy method which gave X= $1.70x10^{4-}$ (the MW is 250.18 and the density is2.29 gcm^{3-}).
d) Give reasons for only four of the following:
(i) Transition metals show variable oxidation states.
(ii) Anhydrous Co^{2+} compounds have different color than hydrated ones.
(iii) Cu(I) compounds are colorless and diamagnetic while Cu(II) compounds are colored and paramagnetic.
(iv) V^{2+} compounds are more basic than V^{3+} and V^{4+} compounds.
(v) Fe, Co and Ni act as good catalysts.

Question Number Three (17 marks)

a) Write briefly on only two of the following:
(i) Oxides and oxy-acids of group vi-B.
(ii) Affinity for oxygen of platinum metals.
(iii) Oxidation states of Cu, Ag and Au compounds in aqueous solutions.
(iv) Action of strong and weak bases on zinc- group elements.
b) Answer only two of the following:
(i) State the different uses of vanadium.
(ii) Write the name and chemical formula of the different ores of Mn in the nature.
(iii) Compare between the oxidation –reduction strength of Fe, Co and Ni in the oxidation states +2 and + 3.
c) Do as shown in brackets: (answer only two)
(i) The aqueous solution of Fe^{3+} salts are acidic and $Fe(OH)_3$ is less basic than $Fe(OH)_2$. [explain]
(ii) Cu group metals almost unreactive. [give reason]
(iii) Chromyl chloride. [method of preparation]
d) Write the chemical equations for the following:
(i) Hydrolysis of $TiCl_4$ and $ZnCl_4$.
(ii) Action of acids on Cr metal in absence and presence of air.

Atomic numbers: Sc=21, Ti= 22, V=23, Cr=24, Mn=25, Fe=26, Co=27,Ni=28, Cu=29, Zn=30
C= 12, N=14, Kr=36.

Good Luck

ا.د. سعيد ابراهيم ا.د. سحر الجيار ا.د. اسماء ابراهيم

Assiut University
3rd & 4th Levels
14-1-2020
Two Hours

Faculty of Science
First Term
No. 363
50 Marks

Botany & Microbiology Department
Chemistry & Microbiology and Microbiology
Physiology of Fungi
Final Examination

I. Discuss FOUR ONLY of the following [20 marks]: -

1. Adaptation phase in yeast.
2. Different kinds of fungal tropism **(count only).**
3. Fungal photoreceptors.
4. How does the fungus face the extream low temperatures?
5. Different relationships between fungi and other organisms **(count only).**

II. Complete the following sentences [5 marks]: -

1. Differences in fungal cell walls depend up on....., ..., ..., ..., ... and .....
2. Factors affecting on fungal growth includes ....., ...and .....
3. The medium volume in culture vessels must be ..... for ..... ,.....
4. Nutritional factors includes ....., ..., ... and .....
5. Some fungi unable to grow on the glucose but grow on starch because .....
6. Effect of light on fungi include ....., ..., ...

III. Compare between the FIVE ONLY of the following [15 marks]: -

1. Synthesis for another and assist relationships.
2. Agatating and surface cultures.
3. Effect of CO_2 and water on fungal growth.
4. Different effects of fungicide on the fungal cell.
5. Effect of phosphorus and copper on the fungal nutrition.
6. Fungi and plant in symbiotic relationship.

IV. Answer FOUR ONLY of the following [10 marks]: -

1. **Arrange the** (carotenoids, melanin, glycolipids and chitin) **molecules in the fungal cell.**
2. **Draw and count only the growth curve of Aspergilii.**
3. **Arrange the most resistance fungal parts** (multicellular and pigmented conidia; vegetative mycelium; unicellular and hyline conidia; multicellular and pigmented ascospores; and hyaline conidia) **to environmental stress and give the resons.**
4. **To obtain the pure fungal strain you must follow many steps (count only).**
5. **pH value devides the fungi into many groups (mention these groups).**

With My Best Wishes and Good Luck
Prof: Eman Mostafa Mohamed

Assiut University
Faculty of Science
Chemistry Department

Academic year 2019/2020

Time allowed: 2 hours

Final Exam. for Course no. C-301 (Radiochemistry)

Answer the following two questions: -

Question No. 1 *(30 Marks)*

A- From the following data given below;

Na - 22
2.60 y
β^+ 0.54,...
γ 1.28 MeV

Sketch the decay scheme of Na-22.
Write the decay equations of Na-22.
How many Na-22 atoms are present in 1mCi of Na-22 activity?
Insert spin and parity of the parent and daughter nuclei.
What is the specific activity of carrier free Na-22.

B- Define the following items:
G-value, Linear attenuation coefficient, *EC* process, Absorbed dose, *LET*, Cross section of a nuclear reaction, and Photoelectric effect.

C- Calculate the number of Co-60 atoms ($T_{1/2}$ = 5.3 y) produced in a 10-mg of cobalt metal exposed for 2 minutes to a thermal neuron flux of 2×10^{13} n/cm^2/s in a reactor (σ = 37 *b*).

D- A sample of 1.00×10^{-10} g of Mo-99 ($T_{1/2}$ = 67 h) is freshly prepared at t = 0.
i) What kind of equilibrium exists between Mo-99 and Tc-99m?
ii) Calculate the time of maximum growth.
iii) At that time what will be the activity of Tc-99m present?

Question No. 2 *(20 Marks)*

A- How long will it take for 10-mCi (370 MBq) sample of P-32 ($T_{1/2}$ = 14.3 d) and 100-mCi (3.7 GBq) sample of Ga-67 ($T_{1/2}$ = 3.3 d) to have the same activity.

B- Define the following items: -
Inelastic collision of neutrons with matter, Annihilation process, Sievert, and Anti-neutrino

C- Calculate the mass attenuation coefficient for 1 MeV gamma-ray for NaI.
(a_u for Na and I atoms are 2.32 and 12.03 b/atom, respectively).

D- The reaction ^{33}S (n,p) ^{33}P is exoergic by 0.533 MeV. The mass of ^{33}S is 32.971458 u.
What is the mass of ^{33}P?

E- Calculate the maximum kinetic energy of the β^- emitted in the radioactive decay of He-6.

Constants; m_p = 1.00727 u, m_n = 1.00866 u, $N_A = 6.023 \times 10^{23}$ mole^{-1}, 1b = 1×10^{-24} cm^2,
1 Ci = 3.7×10^{10} Bq, $m_{Li\text{-}6}$ = 6.0151223 u.

Good Luck

Prof. Dr. R. M. Mahfouz

PERIODIC TABLE OF THE ELEMENTS

1 H 1.00794 ← Atomic number ← Atomic mass

Metals | Metalloids | Nonmetals

Physical State at Room Temperature

Black = Solid
Blue = Liquid
Red = Gas

Periods	IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIII			IB	IIB	IIIA	IVA	VA	VIA	VIIA	Noble gases 0
1	1 H 1.00794																	2 He 4.00260
2	3 Li 6.941	4 Be 9.01218											5 B 10.811	6 C 12.011	7 N 14.00674	8 O 15.9994	9 F 18.99840	10 Ne 20.1797
3	11 Na 22.98977	12 Mg 24.3050											13 Al 26.98154	14 Si 28.0855	15 P 30.97376	16 S 32.066	17 Cl 35.4527	18 Ar 39.948
4	19 K 39.0983	20 Ca 40.078	21 Sc 44.95591	22 Ti 47.88	23 V 50.9415	24 Cr 51.9961	25 Mn 54.9380	26 Fe 55.847	27 Co 58.93320	28 Ni 58.6934	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.61	33 As 74.92159	34 Se 78.96	35 Br 79.904	36 Kr 83.80
5	37 Rb 85.4678	38 Sr 87.62	39 Y 88.90585	40 Zr 91.224	41 Nb 92.90638	42 Mo 95.94	43 Tc 98.9072	44 Ru 101.07	45 Rh 102.90550	46 Pd 106.42	47 Ag 107.8682	48 Cd 112.411	49 In 114.82	50 Sn 118.710	51 Sb 121.757	52 Te 127.60	53 I 126.09447	54 Xe 131.29
6	55 Cs 139.90543	56 Ba 137.327	57 *La 138.9055	72 Hf 178.49	73 Ta 180.9479	74 W 183.85	75 Re 186.207	76 Os 190.2	77 Ir 192.22	78 Pt 195.08	79 Au 196.96654	80 Hg 200.59	81 Tl 204.3833	82 Pb 207.2	83 Bi 208.98037	84 Po 208.9824	85 At 209.9871	86 Rn 222.0176
7	87 Fr 223.0197	88 Ra 226.0254	89 †Ac 227.0278	104 Unq 261.11	105 Unp 262.114	106 Unh 263.118	107 Uns 262.12	108 Uno[b] (265)	109 Une[b] (266)									

*	58 Ce 140.115	59 Pr 140.90765	60 Nd 144.24	61 Pm 144.9127	62 Sm 150.36	63 Eu 151.965	64 Gd 157.25	65 Tb 158.92534	66 Dy 162.50	67 Ho 164.93032	68 Er 167.26	69 Tm 168.93421	70 Yb 173.04	71 Lu 174.967
†	90 Th 232.0381	91 Pa 231.0359	92 U 238.0289	93 Np 237.0482	94 Pu 244.0642	95 Am 243.0614	96 Cm 247.0703	97 Bk 247.0703	98 Cf 251.0796	99 Es 252.083	100 Fm 257.0951	101 Md 258.10	102 No 259.1009	103 Lr 262.11

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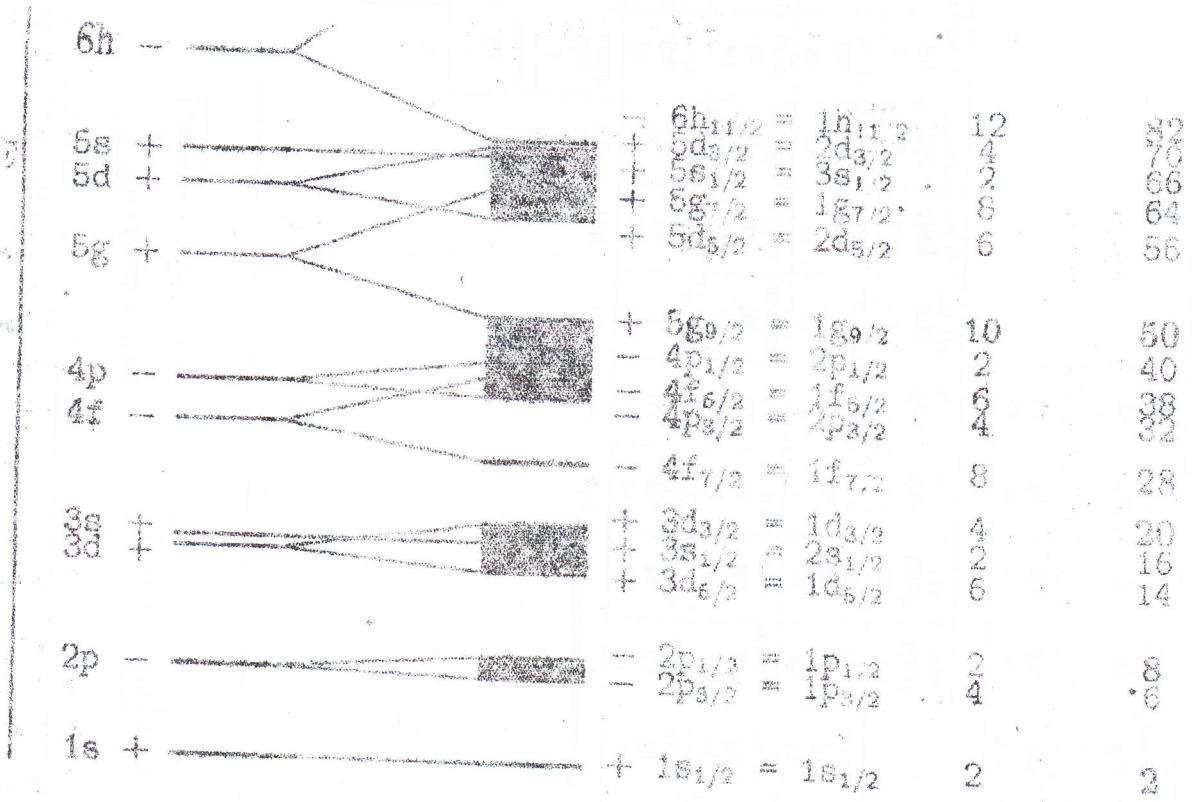
[b] The 1989 report of the IUPAC listed no value of atomic masses for this element. The value in parenthesis is a best estimate.


6h −
5s +
5d +
5g +
4p −
4f −
3s +
3d +
2p −
1s +
− 6h11/2 = 1h11/2 12 92
+ 5d3/2 = 2d3/2 4 76
+ 5s1/2 = 3s1/2 2 66
+ 5g7/2 = 1g7/2 8 64
+ 5d5/2 = 2d5/2 6 56
+ 5g9/2 = 1g9/2 10 50
− 4p1/2 = 2p1/2 2 40
− 4f5/2 = 1f5/2 6 38
− 4p3/2 = 2p3/2 4 32
− 4f7/2 = 1f7/2 8 28
+ 3d3/2 = 1d3/2 4 20
+ 3s1/2 = 2s1/2 2 16
+ 3d5/2 = 1d5/2 6 14
− 2p1/2 = 1p1/2 2 8
− 2p3/2 = 1p3/2 4 6
+ 1s1/2 = 1s1/2 2 2

Assiut University
Faculty of Science
Chemistry Department

Date: December 2019
Time: 3 hours
Marks: 50

Environmental Analytical Chemistry Examination (C-343)

Answer the following questions: (50 Marks)

1- Answer only four of the following: (12 Marks)

a- Write short notes on the biological importance of Iron, Zinc and Copper ions.

b- Draw the chemical structure for each of the following compounds:

Nylon 610, Kodel, parathion and carboxin.

c- Complete the following equations:

i) Benzene + {O} $\xrightarrow[Epoxidation]{Enzymatic}$ ..... $\xrightarrow[rearrangement]{Nonenzymatic}$ .....

ii) Reactive Hydrocarbons $\xrightarrow{O_3}$ ..... $\rightarrow$ *Peroxy Acetyl Nitrate*

iii) $HgCl_2$ $\xrightarrow{Methylcobalamin}$ .....

iv) *Vinyl Chloride* $\xrightarrow{Polymerisation}$ .....

v) $K_2Al_2Si_6O_{16} + 2\ H_2O + CO_2 \longrightarrow$ .....

d- Describe the simplified representation of various regions of the atmosphere.

e- What are the procedures for sampling gaseous pollutants.

2- Answer only two of the following: (10 Marks)

a- Describe with diagram the main differences between Gas Chromatography (GC) and High Performance Liquid Chromatography (HPLC) as separation tools used in environmental analysis.

b- Explain with equations the poisonous effect of Carbon mono oxide in environment.

c- Define each of the following terms:

Acid rain – Ozone hole – Photochemical Smog – Troposphere – Lithosphere.

3- Answer only two of the following: (8 Marks)

a- What are the major industrial uses of Organo-Tin compounds in environment.

b- Discuss the toxicological effects of Acrylamide and Aflatoxin on human health.

c- Describe briefly the advantages of Graphite Furnace Atomic Absorption Spectrometry (GFAAS) used for environmental analysis.

أنظر خلفه باقي الأسئلة

4- Discuss briefly, with the aid of equations if applicable, only three of the following sentences: (9 Marks)

a) The main objectives and the processes involved in the tertiary treatment unit.
b) The inhibition mechanism of enzyme action via toxic heavy metals.
c) Eutrophication process and its adverse effect on aquatic life.
d) Mercury (Hg) is one of the most toxic heavy metals; however, its toxicity depends on its chemical state.

5- Differentiate between only two of the following: (6 Marks)

a) Air flotation versus vacuum flotation
b) Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) for the determination of the organic content in wastewater.
c) Temporary and permanent hardness

6- Put (√) or (X) in front of only Five of the following sentences, and correct the wrong sentences: (5 Marks)

a) Physical treatment unit is used to retain the coarse solids found in wastewater.
b) Increasing the dissolved oxygen (DO) concentration decrease the degree of water self-purification.
c) Excessive amounts of oil and greases in wastewater are removed by flotation unit.
d) Refractory organic compounds can be only removed by tertiary treatment units.
e) API separators have higher surface area and are more efficient than CPI separators in removing oil and solids.
f) Membranes separation techniques are used to remove very fine particles even dissolved salts.

"Good luck"

Examiners: Assc.Prof. Ahmed M. Kamal & Dr. Haitham M. El-Bery

Assiut University
Faculty of Science - Chemistry Department

Date: 11/1/2020
Time: 2 hours

Colloids and Surface Chemistry Examination for 3rd Level Applied Industrial Chemistry Students (Chem.303).

I. Colloids: (25 Marks)

Answer the Following Questions:

1 - Explain what is meant by Only Three from the following terms : (6 Marks)

i- Associated Colloids. ii- Protective colloids.

iii- Electro dialysis. iv- Tyndall effect.

2 - Describe a method for the preparation of Only Three from the following: (6 Marks)

i- Colloidal platinum. ii- Graphite sol.

iii- water in Oleic acid emulsion. iv- Calcium acetate gel.

3- Mark (√) for the correct sentence and (x) for the wrong one: (4 Marks)

i- Pearl is an example of solid dispersed in solid.

ii- Gold sol moves to the negative electrode.

iii- The process of fast removing ions from a sol by diffusion through a permeable membrane is called electroosmosis.

iv- The dispersal of a precipitated material into colloidal solution by the action of an electrolyte in solution is called peptization.

4- Mark (√) on the correct answer: (4 Marks)

i- The presence of the double layer in colloids accounts for ..... .

a) kinetic properties b) electrical properties

c) optical properties d) stability of colloids

ii- If the sol particles in a given colloid move towards the cathode, the dispersion medium carries ..... charge.

a) no b) negative c) positive d) sometimes positive and sometimes negative

iii- The movement of the dispersion medium under the influence of applied potential is known as ..... .

a) osmosis b) electro-osmosis c) diffusion d) electrophoresis

iv- ..... do not show Tyndall effect.

a) Suspensions b) Colloidal solutions c) Gels d) True solution

5. a) Give the structure of the colloidal ion of As_2S_3 sol . (2 Marks)

b) Complete the following:- (3 Marks)

i) ..... is a common thixotropic gel , and the dispersed phase in emulsions are generally ..... charged.

ii) ..... can be obtained by hydrolysis, whereas ..... sol may be obtained by reduction method.

iii) Mercury sols can be obtained by ....., whereas edible jelly can be obtained by .....

II. Surface Chemistry: (25 Marks)

Answer the following questions:

1- Show how you can estimate the value of heat of adsorption from Langmuir equation. (5 Marks)

2- How the porosity of solids could be assessed from adsorption isotherm data.(5 Marks)

3- On applying the BET equation for determining the S_{BET} of a catalyst using N_2 gas as adsorbate, the slope and intercept were 72.6 and 1.2, respectively. Calculate the value of S_{BET} take into your consideration that surface area occupied by one molecule of N_2 is 16.4 $Å^2$. (5 Marks)

4- Answer only two of the following: (10 Marks)

a- Compare between the chemisorption and physisorption.

b- Write short notes on the adsorption from gas mixture.

c- State the postulates and the mathematical expressions of Langmuir adsorption isotherm.

Good Luck

Examiners:
Prof. Maher M. Girgis
Dr. Mohamed N. Abd El-Hameed

Assiut University
Faculty of Science
Chemistry Department

Date:2/1/2020
Time: 2 hrs

Final Examination – 1st Term 2019/2020
Third Year – Industrial Chemistry (C-307)
Dye Chemistry

Answer the following:

1- Discuss the relation between colour and constitution in dye chemistry

2- Write the general characters of Vat Dyes.

3- Answer ONE of the following:

a) Industrial production of mordant Azo Dyes.

b) One synthetic method for preparation of INDIGO.

Examiner: Prof.Dr.Soaud A.M.Metwally

Assiut University
Faculty of Science
Chemistry Department

First semester (2019/2020)
Time: 2hrs

Final Exam For 3rd Year Students (Industrial Chemistry Programme Students-Oils, Soaps and detergents (C 309))

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

First question **(20 Marks)**

1. Define the following terms: **(6 Marks)**
   a) Fermentation.
   b) Saponification number.
   c) Acid value.
   d) Acetyl Number.

2. Draw the chemical structure of Stearo-diolein. **(4 Marks)**
   a) Calculate the Iodine number for Stearo-diolein.
   b) Calculate the Saponification value for Stearo-diolein.
[Mol.Wt of Stearo-diolein = 887.45; A.Wt. of iodine =127; Mol.Wt. KOH =56]

3. (2-Phenylethanol) is a major component of rose oils and is widely used in perfumery industry. Explain the mechanism of 2-Phenylethanol synthesis from benzene? **(5 Marks)**

4. Explain the reproductive effect of phenylethyl alcohol (PEA) which is one of the major components of perfumery industry? **(5Marks)**

Second question **(15 Marks)**

Answer **three only** from the following questions: **(5 Marks each)**

1. Explain in detail the different types and causes of rancidity?
2. Show with equations the biosynthesis of jasmones?
3. Illustrate the mechanism of the cleaning action of soap?
4. Compare between the RIFM and IFRA roles in the regulation process of the perfumes industry?

Third question **(15 Marks)**

Answer **three only** from the following questions: **(5 Marks each)**

1. Describe with equations the ethanol production using catalytic hydration method?
2. Discuss with equations the synthesis of O- and P- tertiary butylcyclohexyl acetate (OTBCHA and PTBCHA) from phenol?
3. Explain briefly the following statement:
"Naturalness" concept is not supported or promoted by the fragrance industry
4. Show with equations the biosynthesis of terpenoids?

Good luck

Dr. Ahmed Mahmoud Sayed

Assiut University
Faculty of Science
Chemistry Department

Date: January 2020
Time: 3 h.

Final Exam In Spectroscopy and Stereochemistry

for 3rd Level Students (311 C)

Answer the following TWO sections: (50 Marks)

Section (A): Spectroscopy (34 Marks)

Answer the following questions:

1- **Choose the correct answer for the following:** (7 Marks)

i- Which compound would be expected to show intense IR absorption at 2250 cm^{-1}?

a- CH_3CH_2COOH. b- $(CH_3)_2CHCN$. c- $CH_3CH_2CONH_2$. d- $(CH_3)_2CHOH$.

ii- What is the relative area of each peak in a quartet spin-spin splitting pattern?

a- 1:4:4:1. b- 1:2:2:1. c- 1:3:3:1. d- 1:1:1:1.

iii- What multiplicities are observed for the signals in the off-resonance decoupled ^{13}C spectrum of 2-chloropropene?

a- 2 Singlets and a doublet. b- A singlet and 2 doublets.

c- 3 Singlets. d- A singlet, a doublet and a triplet.

iv- ^1H nuclei located near electronegative atoms tend to be relative to ^1H nuclei which are not:

a- Resonanced. b- Shielded. c- Deshielded. d- None of the above.

v- Which species of the following is used to bombard with the sample for which mass Spectroscopy has been performed?

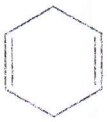
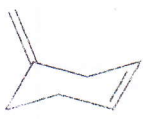
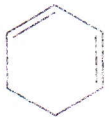
a- Neutrons. b- Protons. c- Electrons. d- Alpha particles.

vi- If the secondary alcohol is completely oxidized to ketone, IR spectrum showed:

a- Absorptions at 3500 and 1715 cm^{-1}. b- Absorption at 3500 cm^{-1}.

c- Absorption at neither 3500 nor 1715 cm^{-1}. d- Absorption at 1715 cm^{-1}.

vii- Which of the following is an example of a conjugated dienes?

a-  b-  c-  d- 

2- Deduce the identity of the following compound from the ^{1}H NMR data given: (4 Marks)

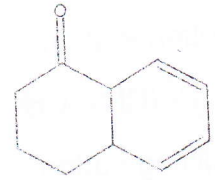
(i) Compound $C_9H_{10}O_2$:

δ 2.2 (3H, singlet), 5.0 (2H, singlet), 7.2 (5H, singlet) (ppm).

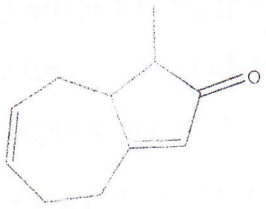
(ii) Compound $C_6H_{10}O$:

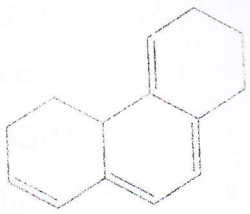
δ 1.1 (6H, doublet), 2.2 (3H, singlet), 2.5 (1H, septet) (ppm).

3- Using the provided tables for rules of diene and enone absorption, calculate λ_{max} of the following compounds: (8 Marks)

a- 

b- 

c- 

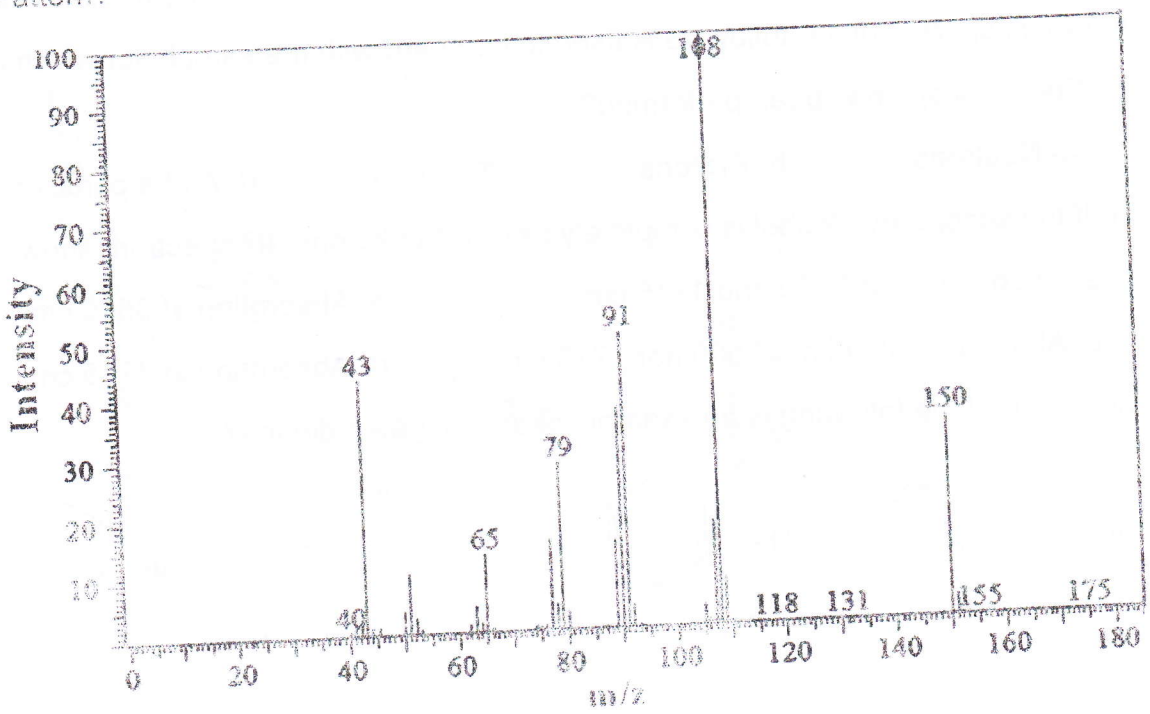
d- 

4- Define the following terms: (3 Marks)

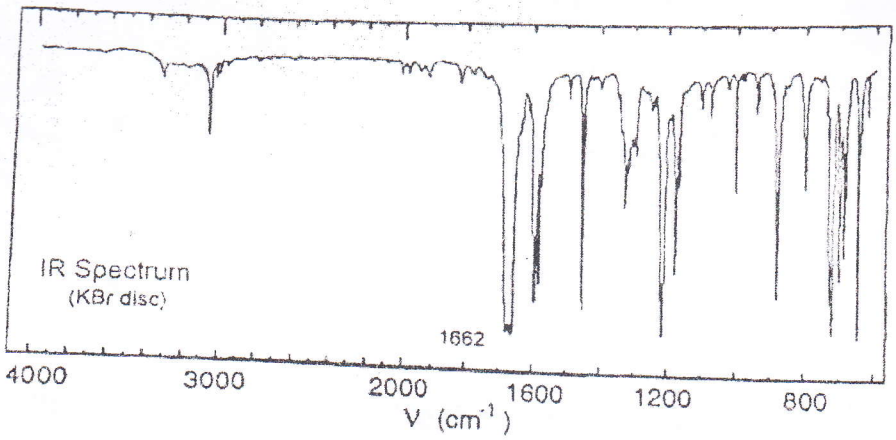
a- Auxochromes. b- Metastable ions. c- Hypthochromic shift.

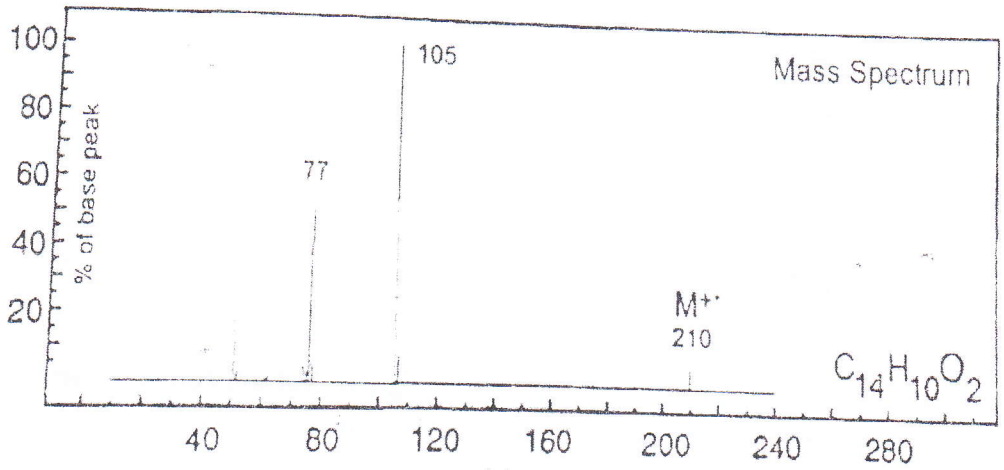
5- Discuss the β-cleavage with Mclafferty rearrangement for ketones giving an example? (3 Marks)

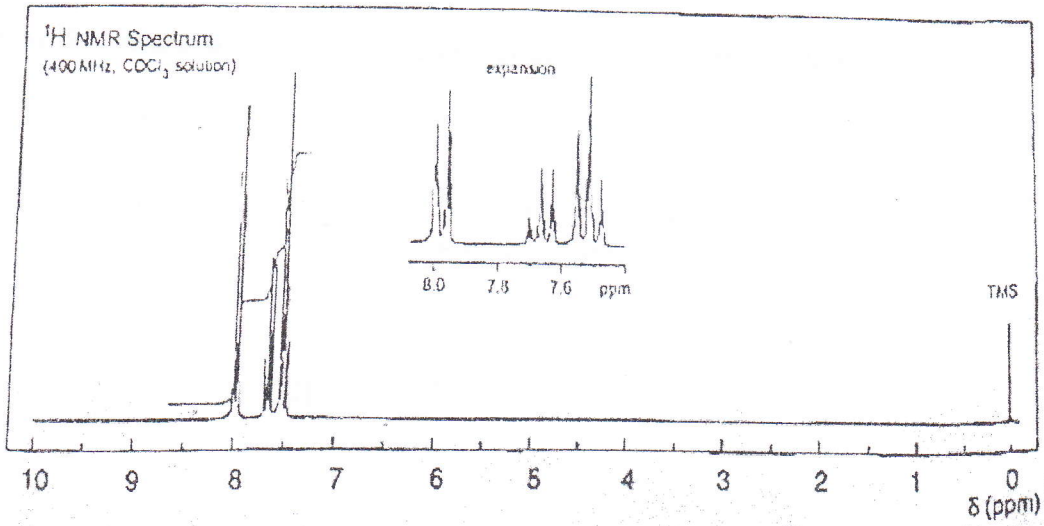
6- You are provided with MS spectrum, this spectrum belongs to $PhCH_2OCOCH_3$ or $PhCOOCH_2CH_3$ or $PhCH_2COOCH_3$. Indicate your answer with the fragmentation Pattern? (3 Marks)



7- You are provided with IR, Mass and ^{1}HNMR spectra of a compound having the molecular formula $C_{14}H_{10}O_2$. Assign the suitable structure which agrees with the provided spectra, give reasons for your assignment and show the fragmentation pattern which confirms your answer. (6 Marks)







Good Luke

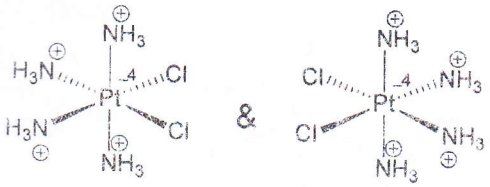
Dr. Ahmed Abdou Omar

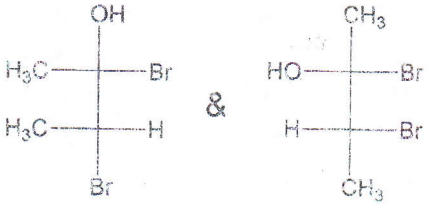
B: Stereochemistry (311 C) (16 degrees)

ملحوظة: الإمتحان في صفحتين

Answer Four only of the below questions (2 pages):

1- Write the relationship between the following pairs of compounds "enantiomers, diastereomers, constitutional isomers or identical compounds" **(4 degrees)**

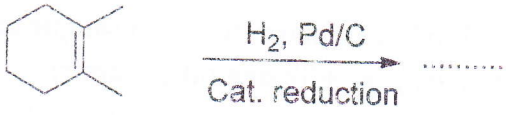
a) 

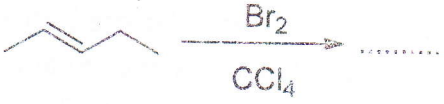
b) 

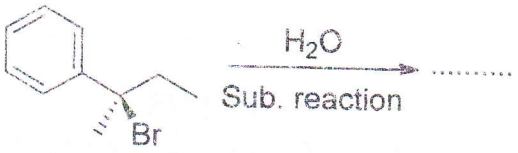
c) 

d) 

2- Complete the following reactions mentioning the stereochemistry of products **(4 degrees)**

a) 

b) 

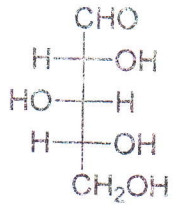
c) 

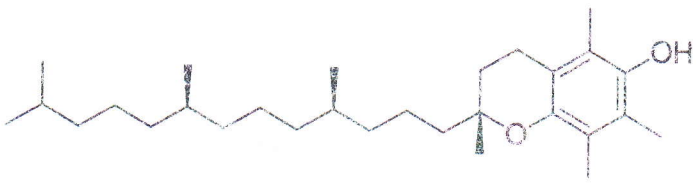
d) 

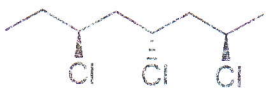
3- Write short notes about the following **(4 degrees)**

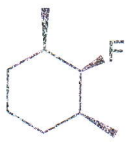
a) Geometrical isomerism
b) Chemical resolution of racemic mixtures
c) A chiral auxiliary
d) Axial chirality (Chirality without stereogenic centers)

4- Assign *R* or S configuration for each stereogenic center in the following compounds **(4 degrees)**

a) 

b) 

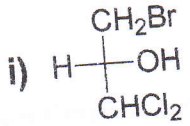
c) 

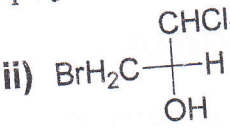
d) 

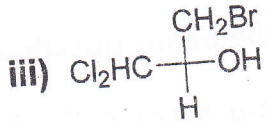
(4 degrees)

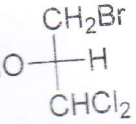
5- Choose the correct answers

a) ..... is the Fischer projection of (R) 3-bromo-1,1-dichloro-2-propanol.

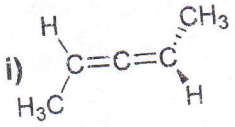
i) 

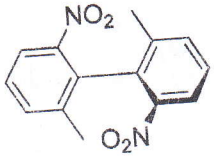
ii) 

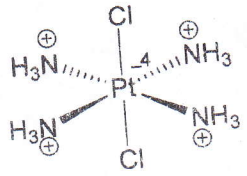
iii) 

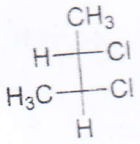
iv) 

b) ..... is an achiral compound.

i) 

ii) 

iii) 

iv) 

c) An optically pure (R)-stereoisomer of a molecule A has a specific rotation of – 20°. ..... is the $[\alpha]_D^{20}$ would be observed rotation for a mixture of the (R) and (S) stereoisomer where there is an enantiomeric excess of (S) equal to 60%.

i) 16° ii) -12° iii) 120° iv) 12°

d) When ..... of D-lactose is dissolved in 1 L of water and placed in a sample cell 5 cm in length, the observed rotation is +19.5° ($[\alpha]_D^{20} = +52$ deg·mL·g^{-1}·dm^{-1}).

i) 750 g ii) 75 g iii) 0.75 g iv) 7.5 g

Regards,

Dr. Ahmed I. A. SOLIMAN

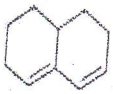
Woodward - Fieser rules for dienes

Base value for acyclic or heteroannular diene		214
Base value for homoannular diene		253
Increments for		
Double bond extending conjugation		+30
Alkyl substituent or ring residue		+5
Exocyclic double bond		+5
Polar groups:	-OAc	+0
	-OR	+6
	-SR	+30
	-Cl, -Br	+5
	$-NR_2$	+60
Solvent correction		+0

λ max. = Total

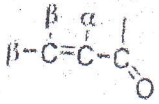
Acyclic

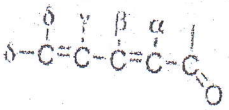
Heteroannular (*transoid*)



Homoannular (*cisoid*)

Woodward-Fieser Rules - Enones





Group		Increment
6-membered ring or acyclic enone		Base 215 nm
5-membered ring parent enone		Base 202 nm
Acyclic dienone		Base 245 nm
Double bond extending conjugation		30
Alkyl group or ring residue	α, β, γ and higher	10, 12, 18
-OH	α, β, γ and higher	35, 30, 18
-OR	α, β, γ, δ	35 30, 17, 31
-O(C=O)R	α, β, δ	6
-Cl	α, β	15, 12
-Br	α, β	25, 30
$-NR_2$	β	95
Exocyclic double bond		5
Homocyclic diene component		39