

Chemistry Department,

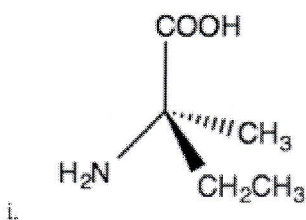
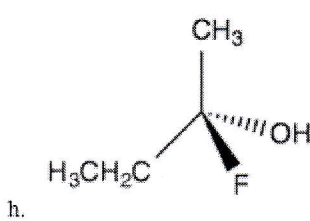
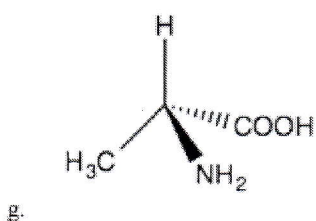
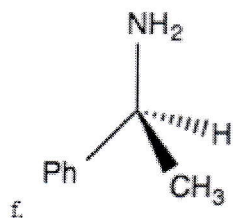
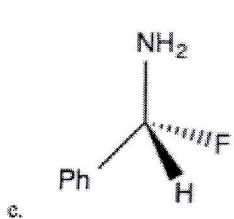
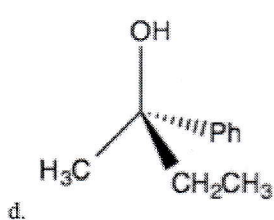
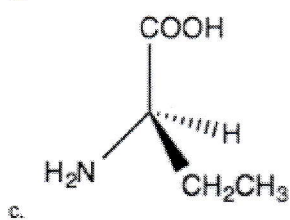
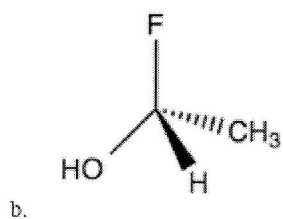
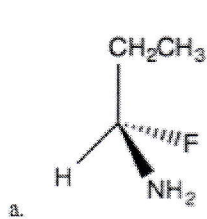
Faculty of Science,

Assiut University

Final Exam. In Stereochemistry for Master students(Organic Chemistry)

Answer The following questions:

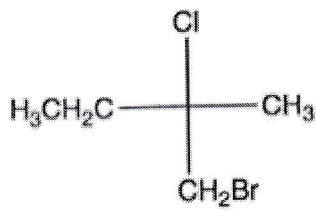
1..Determine the configuration of each of the following molecules:



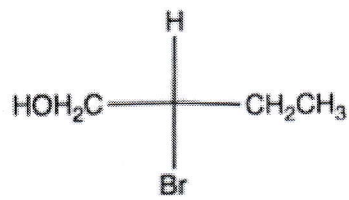
2.Determine the configuration (R or S) of each of the following molecules.

(5)

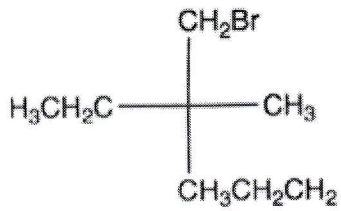
a.



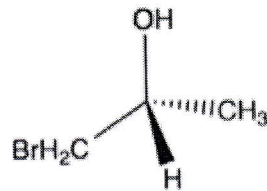
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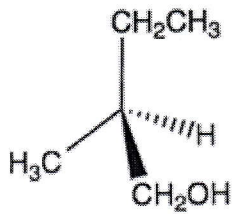
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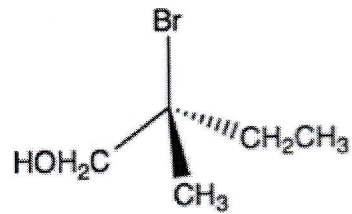
d.



e.

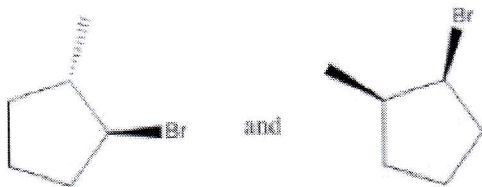


f.

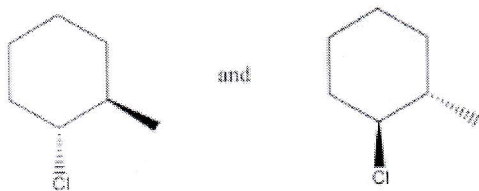


3. Determine whether each of the following pairs are enantiomers:

a.



b.

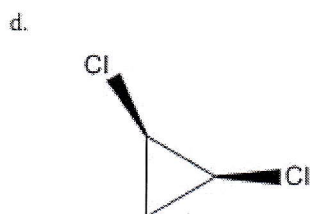
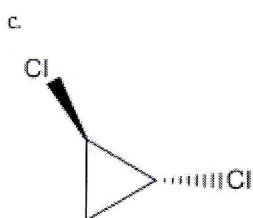
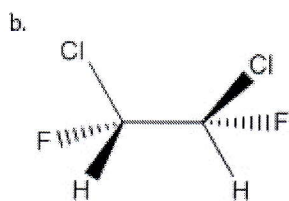
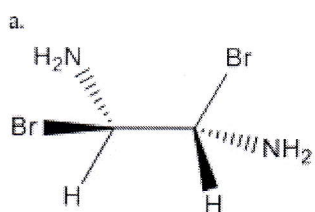


c.



(2)

4. Determine whether each of the following molecules is chiral or achiral.



5. Draw the following compounds:

a. (R)-2-bromo-1-butanol

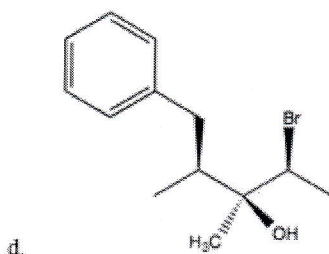
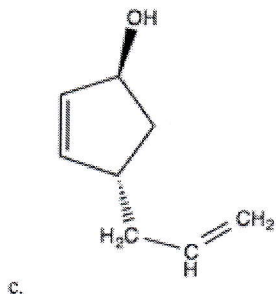
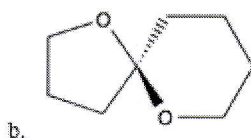
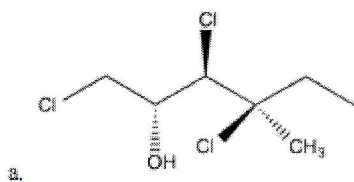
b. (2R,3S)-2-chloro-3-pentanol

c. (S)-1,2-dichloropentane

d. (2R,3S)-2,3-dibromoheptane

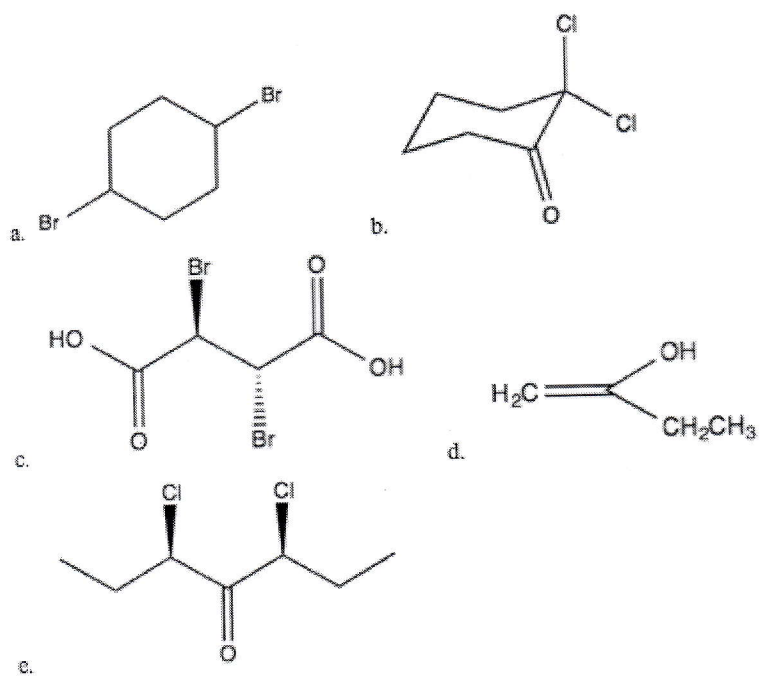
6. Draw the Fischer Projections for the 4 stereoisomers of 3-bromo-4-chloropentane.

7. Label each asymmetric carbon with R or S.

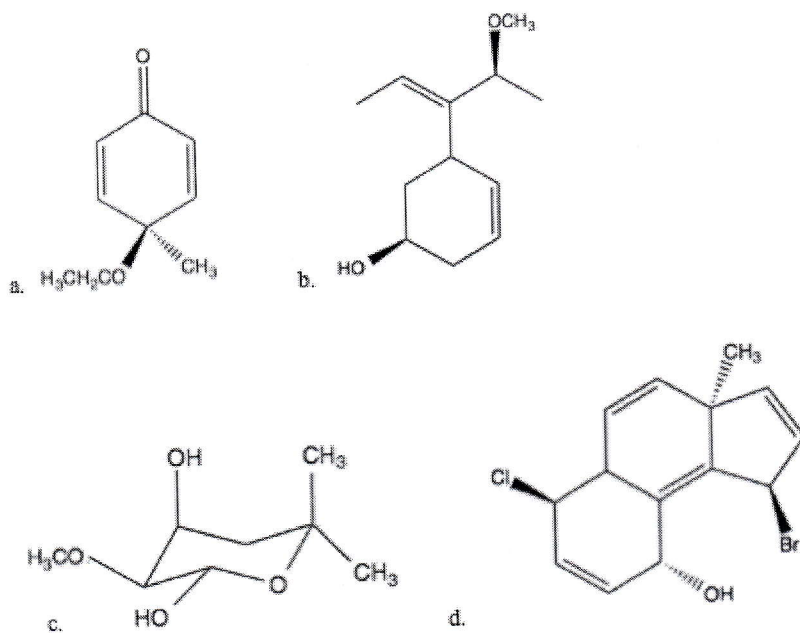


(5)

8. Determine if the following molecule is chiral or achiral.

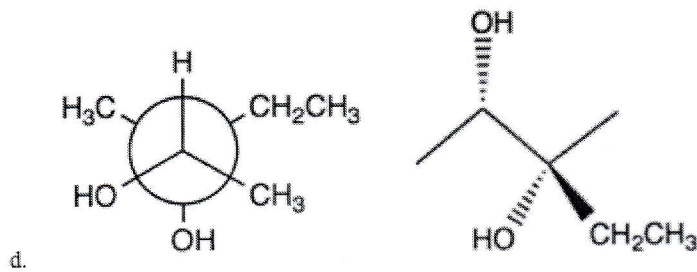
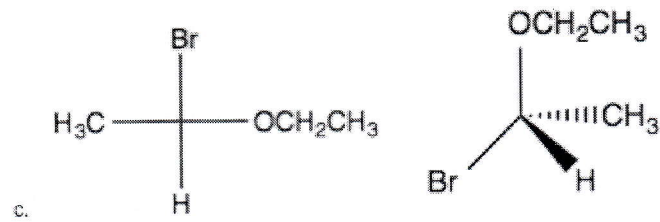
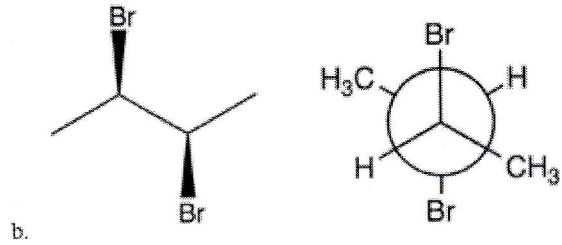
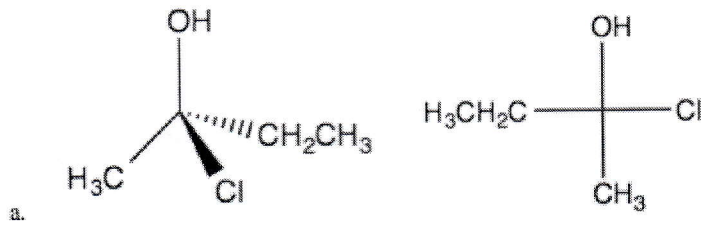


9. How many chiral centers does each of the following molecules contain?



(0)

10. Are the following pairs of compounds enantiomers, diastereomers, or the same compound?



Good luck

Prof. Ahmed Elkhawaga

**Natural Products Exam. Of M.Sc. Students of  
Organic Chemistry 644C**

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**Answer the following questions:**

**I-Shikimates are a group of natural products the majority of which are aromatic.**

- a) Classify the different groups of shikimates, give an example of each.
- b) Write on the dimerization of phenylpropanoids to lignans.

**II-a) Formulate the equations by which  $\beta$ -glycoside and  $\alpha$ -glycoside can be synthesized.**

- b) Illustrate the method of preparation of Indican.
- c) Convert Indican to 2,3,4,6 tetra-O-methyl – D-glucoside.

**III- a) Write on the following natural products:**

Oestriol, Progesterone, Cortisone

b) Starting with cholesterol show how can you synthesize:

Dehydroepiandrosterone, Testosterone, Oestradiol

**IV- Write notes on the following vitamins, mention one method for preparation of each:**

Phytonadione (Vitamin K<sub>1</sub>)

Riboflavin (Vitamin B<sub>2</sub>)

Pyridoxine (Vitamin B<sub>6</sub>)

**V- a) Write short notes on flavones and isoflavones, discuss the effect of potassium hydroxide on each of them.**

b) Explain each of Kostanecki and Robinson synthesis of flavones.

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*Good Luck,,,*

Faculty of science

September 2014

Chemistry Department

Time : 3 hrs

**Molecular Spectroscopy Exam For M.Sc. Students (C- 631)**

Answer the Following Questions:

(100 marks)

Section (A)

( 50 marks )

I-a-How can you differentiate between the vibrational spectra of cis-dichloroethylene and trans-dichloroethylene.

b -Describe the Raman effect by classical mechanic.

c- Drive the symmetrical coordinates of formaldehyde for planar vibrations.

d- Solve time dependent Schrödinger equation.

e- Explain Doppler effect of observed radiation frequency.

II-a- State the point group of the following molecules :

( m-dichlorobenzene , 1,3,5 trichlorobenzene). Define the active Raman symmetry species of these compounds.

b- If NMR experiment is performed using magnetic field of 13500G, at what frequency would the resonance occur for the following nuclei

$C^{13}(g=1.405)$  ,  $O^{17}(g= -0.757)$  ,  $F^{19}(g=5.257)$ .

c- Calculate the Maxwell-Boltzmann distribution for proton having  $I=1/2$  at  $300K^{\circ}$  and in the field 13500G.  $^1H(g=5.885)$ .

d- Drive the electronic molecular orbital of chlorobenzene.

e- Calculate the Doppler shift in frequency and wavelength for an assembly of molecules moving within the range of velocity  $\pm 1 \times 10^4$  cm  $S^{-1}$ . (Explain the difference)

{ $h=6.626 \times 10^{-34}$  JS ,  $N= 6.023 \times 10^{23}$  mol $^{-1}$  ,  $c=3 \times 10^8$  m $S^{-1}$  ,  $e= 1.602 \times 10^{-19}$  C}

*Prof. Dr. Anwar El-Shahawy*

باقي الاسئلة في الصفحة التالية

(5)

**Section(B):**

**50 marks**

**Answer the Following Questions:**

**I- a-** Write the different kinds of complexes and discuss the characterization and analytical application of Ion-Association complex for (crystal violet- cadmium-bromopyrogallol red) .

**b-** Give a brief account on the determination of the concentration stability constant for the equilibrium  $ML + X \rightleftharpoons MLX$  using the molar ratio method .

**C-** Define the following terms:

Precision , Limit of detection(LOD) , Relative standard deviation , Limit of quantification(LOQ) .

**II- a-** Explain the theoretical consideration of the derivative spectrophotometry for the determination of metal ions .

**b-** Discuss the simultaneous spectrophotometric determination of Ni(II) and Fe(III) by using Zero-crossing method .

**C-** Write on the different possible types of errors in analytical chemistry .

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*Prof. Dr. Elham Y. Hashem*

**Good Luck**



(13)

# Appendix C

## Character Tables for a Selection of Point Groups

$C_2$	$E$	$\sigma_h$		
$A'$	1	1	$x, y, R_z$	$x^2, y^2, z^2, xy$
$A''$	1	-1	$z, R_x, R_y$	$yz, xz$

$C_4$	$E$	$i$		
$A_g$	1	1	$R_x, R_y, R_z$	$x^2, y^2, z^2$
$A_u$	1	-1	$x, y, z$	$xy, xz, yz$

$C_2$	$E$	$C_2$		
$A$	1	1	$z, R$	$x^2, y^2, z^2, xy$
$B$	1	-1	$x, y, R_x, R_y$	$yz, xz$

$C_{2v}$	$E$	$C_2$	$\sigma_v$	$\sigma'_v$		
$A_1$	1	1	1	1	$z$	$x^2, y^2, z^2$
$A_2$	1	1	-1	-1	$R_z$	$xy$
$B_1$	1	-1	1	-1	$x, R_y$	$xz$
$B_2$	1	-1	-1	1	$y, R_x$	$yz$

$C_{2h}$	$E$	$C_2$	$\sigma_h$	$i$		
$A_g$	1	1	1	1	$R_z$	$x^2, y^2, z^2, xy$
$A_u$	1	1	-1	-1	$z$	
$B_g$	1	-1	-1	1	$R_x, R_y$	$xz, yz$
$B_u$	1	-1	1	-1	$x, y$	

$C_{3v}$	$E$	$2C_3$	$3\sigma_v$		
$A_1$	1	1	1	$z$	$x^2 + y^2, z^2$
$A_2$	1	1	-1	$R_x$	
$E$	2	-1	0	$(x, y)(R_x, R_y)$	$(x^2 - y^2, xy)(xz, yz)$

$C_{4v}$	$E$	$C_2$	$2C_4$	$2\sigma_v$	$2\sigma_d$		
$A_1$	1	1	1	1	1	$z$	$x^2 + y^2, z^2$
$A_2$	1	1	1	-1	-1	$R_x$	
$B_1$	1	1	-1	1	-1		$x^2 - y^2$
$B_2$	1	1	-1	-1	1		$xy$
$E$	2	-2	0	0	0	$(x, y)(R_x, R_y)$	$(xz, yz)$

$C_{6v}$	$E$	$C_2$	$2C_3$	$2C_6$	$3\sigma_v$	$3\sigma_d$		
$A_1$	1	1	1	1	1	1		$x^2 + y^2, z^2$
$A_2$	1	1	1	1	-1	-1	$R_x$	
$B_1$	1	-1	1	-1	1	-1		
$B_2$	1	-1	1	-1	-1	1		
$E_1$	2	-2	-1	1	0	0	$(x, y)(R_x, R_y)$	$(xz, yz)$
$E_2$	2	2	-1	-1	0	0		$(x^2 - y^2, xy)$

$D_{2d}$	$E$	$C_2$	$2S_4$	$2C_2'$	$2\sigma_d$		
$A_1$	1	1	1	1	1		$x^2 + y^2, z^2$
$A_2$	1	1	1	-1	-1	$R_x$	
$B_1$	1	1	-1	1	-1		$x^2 - y^2$
$B_2$	1	1	-1	-1	1	$z$	$xy$
$E$	2	-2	0	0	0	$(x, y)(R_x, R_y)$	$(xz, yz)$

$D_{2h}$	$E$	$C_2^z$	$C_2^y$	$C_2^x$	$i$	$\sigma_{xy}$	$\sigma_{xz}$	$\sigma_{yz}$		
$A_{1g}$	1	1	-1	1	1	1	1	1		$x^2, y^2, z^2$
$A_{1u}$	1	1	1	1	-1	-1	-1	-1		
$B_{1g}$	1	1	-1	-1	1	1	-1	-1	$R_x$	$xy$
$B_{1u}$	1	1	-1	-1	-1	-1	-1	1	$z$	
$B_{2g}$	1	-1	1	-1	1	-1	1	-1	$R_y$	$xz$
$B_{2u}$	1	-1	1	-1	-1	1	-1	1	$y$	
$B_{3g}$	1	-1	-1	1	1	-1	-1	1	$R_z$	$yz$
$B_{3u}$	1	-1	-1	1	-1	1	1	-1	$x$	

Special course (C-616) examination for master degree  
Students

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Answer the following questions ( 50 Marks)

1. a) " Surface plasmon resonance is one of the properties of the nano particles". Discuss this statement and giving the basic principles of this property.
- b) " Magnetic nano particles find many technical and biomedical applications". Comment on this statement with special reference to ferrofluids and supermagnetic materials.
2. a) Discuss both the chemical vapor decomposition(CVD) and the physical vapour deposition (PVD) methods used for formation of nanocomposite thin films.
- b) Suggest the operating mechanisms which interpret the effects caused by the ultrasound and microwave irradiations on the chemical reactions.

← أنظري الصفحة التالية

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( 50 Marks )

- 3-a- What terms in a complex with  $O_h$  symmetry correlate with the  $^3F$  and  $3p$  of a free atom with a  $d^3$  configuration ? Show by means of Orgel diagram their splitting energies.
- b- What is the origin of charge transfer bands in metal complexes? Show their classifications.
- c- Write down briefly on luminescence in complex compounds with the explanation of the luster red colour of the gem's appearance.
- d- The gas-phase ion  $V^{3+}$  has a  $^3F$  ground term. The  $^1D$  and  $^3P$  terms lie, respectively, 10 642 and 12 920  $cm^{-1}$  above it . The energies of the terms are given in terms of Racah parameters as  $E(^3F) = A - 8B$ ,  $E(^3P) = A + 7B$  and  $E(^1D) = A - 3B + 2C$ . Calculate the values of B and C for  $V^{3+}$ .
- 4- a- Show the noncrossing rule applied in Tanabe – Sugano diagram for a  $d^3$  configuration in a complex compound .
- b-i- Write briefly on the following :
- Nephelauxetic effect      TGA and DTA thermal analysis
- ii- The spectrum of  $[Cr(NCS)_6]^{3-}$  has a very weak band near 16 000 $cm^{-1}$ , a band at 17 700 $cm^{-1}$  with  $\epsilon_{max} = 160 dm^3 mol^{-1} cm^{-1}$ , a band at 23 800 $cm^{-1}$  with  $\epsilon_{max} = 130 dm^3 mol^{-1} cm^{-1}$  and a very strong band at 32 400 $cm^{-1}$  . Assign these transitions using the  $d^3$  Tanabe – Sugano diagram and selection rule considerations (Hint:  $NCS^-$  has low-lying  $\pi^*$  orbitals).
- c- Name and define the ionization and detection methods for the mass spectroscopy of materials.
- d- "Many octahedral complexes of  $Co(II)$  have a pale pink colour while the tetrahedral complexes of the same metal ion have intense blue colour ." (comment).

**Good luck ,,,,,**

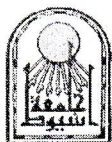
**Examiners : Prof.Dr. Aref M.Ali  
Prof.Dr.Asmaa Ibrahim**

**Answer the Following Questions**

- 1)- For  $\text{NH}_3$  molecule, determine the all symmetry operations and setup the multiplication table.
- 2)- Derive the Hamiltonian operator of a rigid rotator of diatomic molecule.
- 3)- Derive the angular momentum operator of diatomic molecule using Cartesian coordinates.
- 4)- Derive Hamiltonian operator of H atom.
- 5)- Derive the total energy operator of  $\text{H}_2$  molecule.
- 6)- Derive Hamiltonian operator of hydrogen molecular positive ion.
- 7)- Transfer angular momentum operator components from the Cartesian coordinates to the spherical coordinates.
- 8)- Apply simple Hückel Method on 1,3 butadiene molecule.
- 9)- Explain the configuration interaction theory between the configuration eigenfunction of the ground state and the singlet and triplet excited configuration eigenfunctions including the transitions between the two HOMO's and the two LUMO's using 1,3 butadiene as an example.
- 10)- Write the Coulomb repulsion integral and Coulomb exchange integrals on He atom in the ground state.
- 11)- Write the Hartree-Fock eigenvalue of diatomic or polyatomic molecules with only closed sub-shell including the Coulomb repulsion integrals and Coulomb exchange integrals.
- 12)- Apply Perturbation theory on He atom in the ground state.
- 13)- Calculate the ground state eigenvalue of H atom using SI units and convert the result to electron volts.

\*\*\*\*\*  
 $h = 6.626 \times 10^{-34} \text{Js}$ ,  $N = 6.023 \times 10^{23} \text{mol}^{-1}$ ,  $eV = 1.602 \times 10^{-19} \text{J}$ ,  $m_e = 9.11 \times 10^{-31} \text{kg}$   
 $\epsilon_0 = 8.854 \times 10^{-12} \text{C}^2 \text{N}^{-1} \text{m}^{-2}$ ,  $k = 1.38 \times 10^{-23} \text{JK}^{-1}$ ,  $c = 3 \times 10^8 \text{ms}^{-1}$   
\*\*\*\*\*

Prof Dr Anwar El-Shahawy



Assiut University  
Faculty of Science  
Chemistry Department



September 2014  
Time 3 hours

**Master Degree- Name of the student: Huda Ahmed**  
**Special Course Examination in Analytical Chemistry ( C-638)**

**Write on the following :**

- 1- Principle of classical Polarography and Amperometric titration .
- 2- Pulse and Differential – pulse voltammetry.
- 3- Anodic stripping voltammetry and its applications .
- 4- Adsorptive stripping voltammetry .

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Examiner : Prof.Dr. Mahmoud A.Ghandour



**Pre Master Exam in  
Biochemistry (651C)  
Academic Year 2013-2014  
Time: 3 hours  
Total Points: 100**



**Answer Six Questions Only Including The First.**

- I-Write on: (25 points)
- a- Lysosomal disorders.
  - b- Chondroitin sulfate.
  - c- Lung surfactant.
  - d- Unusual nitrogenous bases.
  - e- Neonatal Jundice.
- II- Describe functions and biochemical markers of various organelles of eukaroytic cell. (15 points)
- III- Discuss the separation of serum proteins. (15 points)
- IV- What are biological significance of amino acids? (15 points)
- V- Explain the thyroid function tests. (15 points)
- VI-What are various type of RNAs? Explain their functions (15 points)
- VII- Describe various biochemical functions of the liver (15 points)

Good Luck!

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Prof. Hossam El-Din M Omar