Mansoura University
Faculty of Science
Chemistry Department
Subject: Biochem 279
Course: Biochemical molecules and amino acids

Second Term Exam 2015/2016
2nd Level Chemistry students
Date: 18.05.2016
Time allowed: 2 hours
Total Mark: 80 Marks

Answer the following questions:

(Provide your answer with formula, equation, pathways, figures or tables wherever possible)

1- Write about titration of amino acids and formal titration

(25 Marks)

2- Show and discuss the primary and secondary structure of proteins

(25 Marks)

3- Discuss factors which affect enzymatic activity

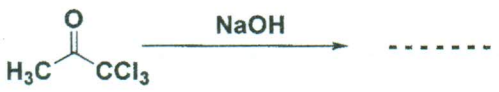
(30 Marks)

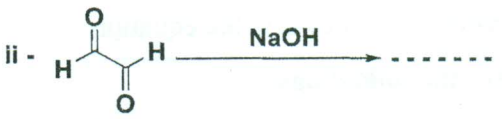
With best wishes

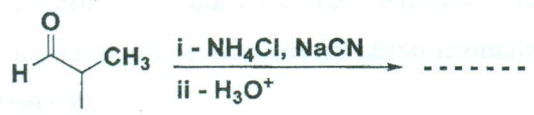
Prof. Dr. Mohamed ElFar

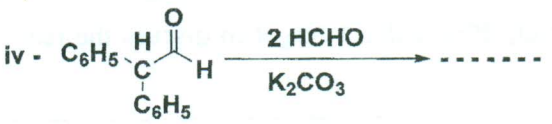
Mansoura University Faculty of Science Chemistry Department Subject: Chemistry Course(s): Chem.233 Organic Reactions Mechanism II	Second Term 2nd Level Chemistry Students Date: May, 2016, 22 -5-2015 Time Allowed: **2** Hours Full Mark: **60** Marks

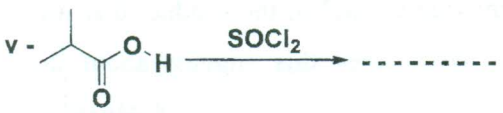
Q. 1 Give the structure of the product for each of the following reactions. ***Please do not forget to* discuss *and draw out the reaction mechanism in each one.*** **(20 Marks)**

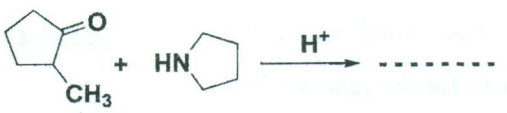
i - 

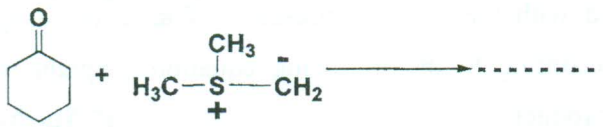
ii - 

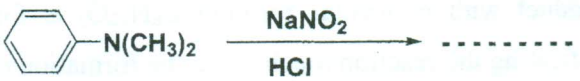
iii - 

iv - 

v - 

vi - 

vii - 

viii - 

Q. 2 a) In each of the following pairs of compounds decide which one that fits the description.

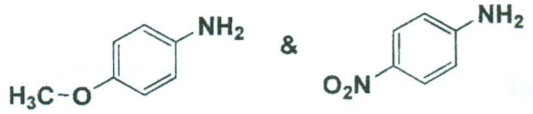
Explain your answer **(15 Marks)**

i-- More reactive toward cyanohydrin formation

ii- Has higher PKa value

iii- More suitable for ylide synthesis with Ph_3P/Bu-Li

iv- Much stronger base



v- More reactive toward amminolysis

vi- Have higher equilibrium constant for hydration

vii- reacts with $C_6H_5SO_2Cl$ forming product soluble in $AgNO_3$

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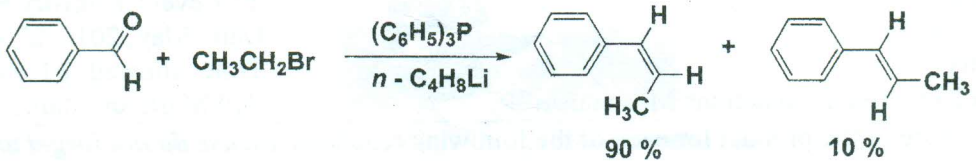
b - For the following reaction, the results shown below are obtained: **(5 Marks)**



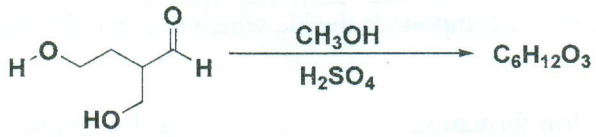
Write all steps involved in the formation of the reaction products with explanation the difference in percent of the two products as shown in the equation.

Q. 3: Answer the followings

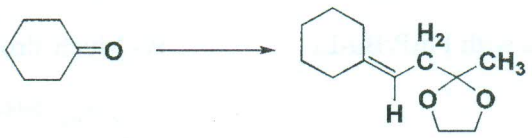
a) Compare the behavior of aniline ($C_6H_5NH_2$) and acetanilide ($C_6H_5NHCOCH_3$) toward mononitration with Conc. HNO_3. Please don't forget to discuss the reaction mechanism based on resonance structures for each case **(6 Marks)**

b) Base catalyzed reaction of bezaldehyde in presence of sodium methoxide CH_3ONa, the product that was isolated was found to be benzyl benzoate ***C_6H_5-CO-O-CH_2-C_6H_5***. What does this suggest about the mechanism for the reaction? **(5 Marks)**

c) When 4-hydroxy-2-(hydroxymethyl)butanal is treated with methanol in presence of an acid catalyst, product with molecular formula $C_6H_{12}O_3$ is formed according to the following equation. Explain with indicating the reaction mechanism the formation of such product **(5 Marks)**



d) What is meant by ylide? Then indicate what type of ylide required for the following reaction. A mechanism of reaction is required **(4 Marks)**



Good Luck ***Examiner: Dr. Ebrahim Abdel-Galil***

Mansoura University Faculty of Science Chemistry Department Subject: Quantum chemistry Course: Chem. 244		Second year Major Chemistry Students Time Allowed: 2 hours Full Mark: 80 Marks Date: 15/5/2016

Answer the following question:

Question One (20 mark):

A:- Explain graphically how emitted radiation from a heated body is dependent on its temperature. (7 mark)

B:- Prove that $\hat{H}\psi = E\psi$ (7 mark)

C:- Explain: the lowest energy level for $H_2C=CH-CH=CH-CH=CH=CH_2$ □ $H_2C=CH-CH=CH-CH=CH-CH_2$ and Comment on your result. (6 mark)

Question Two (20 mark):

A:- Describe a function of a particle moves in a one dimensional box ? (7 mark)

B:- Determine Heisenberg uncertainty in momentum and position of electron moving in a system, if uncertainty in velocity is 10^{-7} m/s. (7 mark)

C:- Compare between the photon concept according to Einshtein and Compton? (6 mark)

Question Three (20 mark):

A:- One of quantum theory **Postulate** explain the Heisenberg principal (illustrate by example) (7 mark)

B:- When a photon colloid with a matter, the expected effect is highly dependent on the photon energy, explain (three cases). (7 mark)

C:- Explain the conditions which must be satisfied for a wave function to be acceptable as a solution of Schrodinger eqn. ?? (6 mark)

Question Four (20 mark):

A:- Illustrate what are the corrections which made by **Bohr** to correct the value of Heisenberg const. (4 mark)

B:- Zeeman effect.....Stark effect..... (2 mark)

C:- What do you understand from the following ? (12 mark)

1- $\hat{A}\,\psi_1 = a\,\psi_1$
$\hat{A}\,\psi_2 = a\,\psi_2$

2- $\hat{A}\,\hat{B} - \hat{B}\,\hat{A} = zero$

3- $5.\frac{\delta}{\delta x}e^x = 5e^x \quad , \quad \frac{\delta}{\delta x}.5e^x = 5e^x$

4- $\frac{d}{dx}[f_{(x)} + g_{(x)}] = \frac{d}{dx}f_{(x)} + \frac{d}{dx}g(x)$

5- $\int_{-\infty}^{\infty} \psi * \hat{A}\,\psi\, dt = \int_{-\infty}^{\infty} \psi\, \hat{A}\, \psi * dt$

6- $\psi_m, \psi_n : \int_0^a \psi_m \psi_n dx = zero$

With my best wishes

Dr. Shady M. El-Dafrawy

Mansoura University **Faculty of Science** **Chemistry Department** **Subject: Nuclear& Bonding Chemistry** **Course(s) :Chem. 222**		**Second Term** **Second Year Chem.** **Date : 29.05. 2016** **Time Allowed: 2 hours** **Full Mark : 60 Marks**

Section A:" Nuclear Chemistry"

Answer the following Questions: (15 Marks for each question)

Q1.a) Write briefly on the units of radioactivity (curie and rutherford) showing how you detect and measure the radiation. (4 Marks)

b) $^{27}_{13}Al$ is stable isotope but $^{24}_{13}Al$ is expected to disintegrate by:

(i) α emission. (ii) β emission. (c) positron emission. (iv) proton. (4 Marks)

c) One gram of $^{198}_{79}Au$ ($t_{1/2}$= 65 years) decays by β emission to produce stable Hg. Answer the following:- (i) Write the nuclear reaction for the process.

(ii) How much Hg will be present after 260 hrs. (4Marks)

d) Explain the difference between chemical and nuclear reactions. (3 Marks)

Q2. a) Write brieflyon: (i) Types of isotopes. (5 Marks)

(ii) Uses in analytical chemistry and medicine.

b) Calculate the binding energy per nucleus in $^{35}_{17}Cl$? ($^{1}_{0}n$ = 1.008930 amu, $^{1}_{1}H$= 1.00787 amu and $^{35}_{17}Cl$= 34.9800 amu). (5 Marks)

c) At radioactive equilibrium, the ratio between atoms of two radioactive elements A/ B= 3.1×10^{9} If $t_{1/2}$ of A=2×10^{9} years, what is $t_{1/2}$ of the element B. (5 Marks)

Section B: "Symmetry& Bonding"

Answer the following questions

Q1-a) *Write short notes on three of the following:* (5 Marks)

i) Band theory showing the types of metals according to electrical conductivity.

ii) Superconductors with examples.

b)-Choose the appreciate answer of the following: (10 Marks)

1)In ccp, the spheres occupy.....of the total space with a centeral sphere surrounded by.....nearest neighbours.

i) 48%, 6 ii) 68%, 8 iii) 52%, 12 iv) 74%,8

2) The electrical conductivity of n- & p- semiconductor increases as the temperature is .....

i) increased ii) lowered iii) not changed

Please Turn over→

3.In hcp and fcc arrangements, the C.N. of each atom is.....

i) 6 b) 8 c) 12

4)..... has a negative ions in a.....array with positive ions in the .....holes with radius ratio 0.52.

i) CdI_2,fcc, tetrahedral ii) CaF_2,hcp, octahedral iii) NaCl, ccp, octahedral

5) Alloy such as Rb/Cs is.....miscible and is related to.....alloys.

i) partially, ionic ii) not, interstitial iii) completely, substitutional

6) CuSe alloy crystallizes with.....structure where each Se atom is surrounded.....by.....Cu atoms.

i) fluorite, tetrahedrallys, 8. ii) CdI_2, octahedrally, 6. iii) NiAs, octahedrally, 6.

7) Semiconductor are manufactured by addition of impurities of.....elements.

i) s-block ii) p-block c) lanthanides iv) actinides

8) According to Pauli's theory, the bonding in metals is essentially..... bonding.

i) ionic ii) hydrogen iii) covalent

9) A compound is formed by elements A and B. This crystallizes in bcc structure (**Draw**) where A ions are half as B ions and 4 A ions are tetrahedrally around each B ion. Thus C.N. ratio is 8:4. The simplest formula of the compound is.....

i) AB_2 ii) AB_3 iii) AB

10) CaC_2 like..... has a.....structure.except that linear C_2^{-2} ions oriented in the same direction.

i) CsCl, bcc ii) CdI_2, layered iii)NaCl, fcc iv)NiAs, hcp

Q2 a) The mechanical proporties of malleability and ductality of metals is related to their crystalline structure. Explain. (4 Marks)

b) Indicate with **drawing** the difference between hcp and ccp arrangements. (4 Marks)

c)- *True and false (circulate the correct response).* ***Correct the false one*** *:-* (7 Marks)

i) T – F bcc structure is less efficient at filling the space than ccp structure.

ii) T – F $K_2[Pt\ Cl_4]^{2-}$ adopts fluorite structure.

iii) T – F The electrical conductivity of a metal increases with increasing T.

iv) T – F Diamond has essentially the same structure as Zinc blende.

v) T – F $CdCl_2$ crystallizes with fcc structure (ABABAB....).

vi) T – F Zn blend is related to a fcc structure whilst wurtzite to ccp structures.

With Best Wishes

Examiners: Prof.Dr. G.M. Abu El-Reash & Prof.Dr. O.A.El-Gammal

الفرقة: الثانيـــــة الشعب: كيمياء-كيم/ح-كيم/ن- جيولوجيا -علوم بيئة-ميكروبيولوجي . المادة: رياضيات بحتة – ر201	كلية العلوم – قسم الرياضيات	دور مايو 2016 الزمن: ساعتـــــان التاريخ: 2016/6/1

أجب على الأسئلة الآتية:

[1] أ. اختبر وجود كل من النهاية التكرارية والنهاية العامة للدالة $f(x,y)=\frac{x^2y^2}{x^4+y^4}$ وذلك عندما تؤول النقطة (x,y) إلى النقطة $(0,0)$. **[10 درجات]**

ب. حل مسألة الشرط الابتدائي : $(x+y)^2\,dx-x^2\,dy=0$, $y(1)=1$. **[10 درجات]**

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[2]أ. إذا كانت الدالة z معرفة كالآتي : $z=\cos^{-1}\left(1+\frac{x^4+y^4}{(x-y)^2}\right)$ ، فاثبت أن $xz_x+yz_y=2(\operatorname{cosec} z-\cot z)$ **[10 درجات]**

ب. اوجد الحل العام للمعادلة : $(2y-\cos x)\,dx+x\,dy=0$. **[10 درجات]**

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[3] أ. اثبت أن قيمة التكامل : $\int_{(0,0)}^{(1,3)}(y^2-4xy-1)\,dx+(2xy-2x^2-3)\,dy$ لا تعتمد على شكل المنحنى الواصل من النقطة $(0,0)$ إلى النقطة $(1,3)$ ، ثم احسب قيمة التكامل. **[10 درجات]**

ب. حل المعادلة : $e^x y'-4xy^2=-e^x y$ **[10 درجات]**

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[4] أ. اوجد الحل العام للمعادلة : $(y^2\cos x+2y\sec^2 x-\frac{1}{x})\,dx+(2\tan x+2y\sin x)\,dy=0$ **[10 درجات]**

ب. استخدم نظرية "جرين" لتحويل التكامل $\int_c(3x^3-y^3)\,dx+(x^3+5y^3)\,dy$ إلى تكامل ثنائي ، ثم احسب قيمة التكامل الثنائي الناتج ، حيث c هو منحنى الدائرة $x^2+y^2=4$. **[10 درجات]**

أطيب التمنيات بالتوفيق ط

Mansoura University Faculty of Science Chemistry Department Subject : Chemistry Course(s):No.(245) Physical Chemistry of liquids and solutions		Summer Term Second year Students Special Chemistry-level 2 Date : Summer 2016 Time Allowed : 2 hours Full Marks : 60 Marks

Answer the following questions :

1 .a) Explain the partial molar quantities with special explanation of the partial molar volumes and their methods of determination of the last.

(10 marks)

b) The boiling point of benzene is raised from its normal value of 80°C to 80.4°C by the addition of 12.63 g of biphenyl $C_6H_5C_6H_5$, to 100 g benzene. What are the boiling point elevation constant and the heat of vaporization of benzene.(Atomic weights ,C=12 ,H= 1).

(10 marks)

2. a) Write shortly on the different colligative properties of solutions and their modified laws with explanation of Van't Hoff factor. (10 marks).

b) Calculate the free energies, enthalpies and entropies per mole solution at 303.15K for the mixing of 0.35 mole of pure benzene with 0.65 mole of pure toluene.(R = 8.31 J/mole.K).

(10 marks)

3. a) Write on the different applications of conductance measurements for different solutions.

(10 marks)

b) The specific conductance of $1x10^{-3}$ M of acetic acid at 20°C is $4.6x10^{-4}$ ohm^{-1}. The conductance values of the hydrogen and acetate ions at infinite dilution are 310 and 77 ohm^{-1} cm^2 mol^{-1}, respectively. Calculate the dissociation constant of acetic acid.

(10 marks)

With best wishes; Prof.Dr.Esam Gomaa

Mansoura University Faculty of Science Chemistry Department Subject: Chemistry Course: Chem. 234 ***Organic Spectroscopy***	Second Term 2rd Level : Chemistry program Date: 05 June. 2016 Time Allowed: 2 hrs Full Mark: **80** Marks

Answer All Questions;

Question 1: ***Select the correct answer*** **(30 Mark)**

1. ***A non linear molecule with (N) atoms generally has .....fundamental vibrational motions***

A) 3N - 3 B) 3N - 4 C) 3N – 5 D) 3N - 6

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2. ***How many different types (sets) of hydrogens are there in the following compound?***

A) 2 B) 3
C) 4 D) 5

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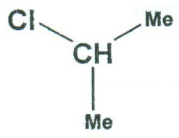
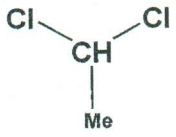
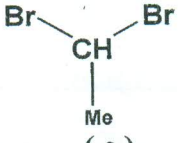
3. ***Which of the following gives the furthest (C-H) downfield shift from TMS in its proton NMR spectrum?***



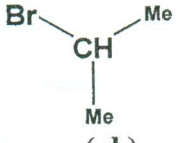
(a)



(b)



(c)



(d)

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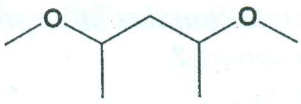
4. ***What is the splitting type of the <u>indicated methylene</u> hydrogens in the ^{1}H-NMR of the following compound?***

A) singlet B) doublet
C) triplet D) quartet



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5. ***The proton ^{1}H- NMR spectrum of 1,1,2-trichloroethane would appear as a***

A) downfield doublet and upfield quartet. B) downfield multiplet and upfield doublet.
C) downfield doublet and upfield triplet. D) downfield triplet and upfield doublet.

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6. ***^{1}H-NMR spectrum of a compound, $C_5H_{10}Cl_2$ has a triplet at δ 1.89 and a quartet at δ 3.72 in 6:4 ratio, respectively. Which compound below best matches the data?***

A) 1,1- Dichloropentane B) 3,3- Dichloropentane
C) 1,5- Dichloropropane D) No One of them.

---

7) ***Absorption of what type of electromagnetic radiation results in electronic transitions?***

A) UV ***B) IR*** ***C) X ray*** ***D) Radio waves***

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8)Which of the following has a C-H stretch that occurs at the highest stretching frequency? A) hex-1-ene B) hexane C) hex-2-yne D) hex-1-yne

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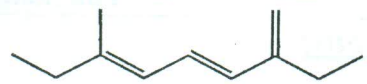
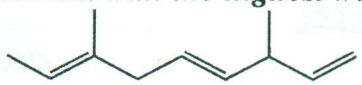
9) Which one of the following has a λ_{max} in its UV-visible spectrum with the highest wavelength?

A) 

B) 

C) 

D) 

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10) Which compound would be expected to show intense IR absorption at 3360 , 3185, 1685 cm-1?

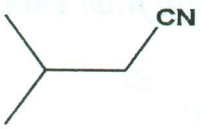
A) $(CH_3)_2CHCN$ B) $(CH_3)_2CHCOOH$

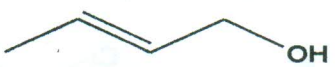
C) $CH_3CH_2CONH_2$ D) $(CH_3)_2CHCH_2NH_2$

---

11) Which compound would be expected to show intense IR absorption at 3300, 2220 cm-1?

a) $H_3CC{\equiv}CCH_2CH_3$ b) $HC{\equiv}CCH_2CH_2CH_3$

c) 

d) 

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12)Which of the following has a C-H stretch that occurs at the highest stretching frequency? A) hex-1-ene B) hexane C) hex-2-yne D) hex-1-yne

---

13) The IR spectrum of a sample contains absorption at 3950, 2950, 1620 cm -1 . To what class of organic compounds does this sample?

a) Alkyne. *B) Alkene.* *C) Esters.* *D) Alcohol.*

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14) Select The highest wave number of the following bonds :

A) C—H B) $H_2C{=}O$ C) $C{\equiv}N$ D) O—H

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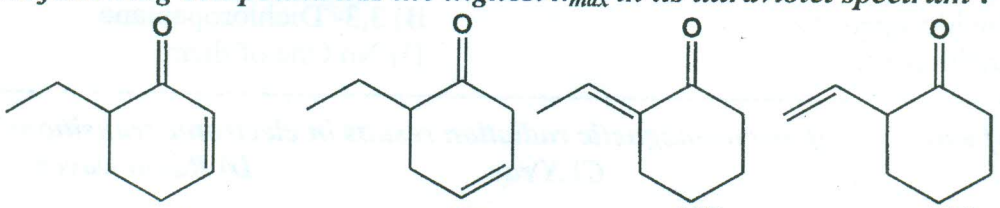
15) Which of the following compound has the highest λ_{max} in its ultraviolet spectrum ?

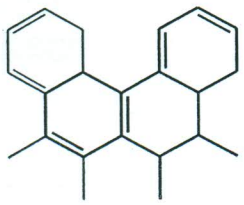


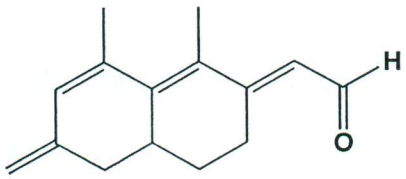
(A) (B) (C) (D)

Question 2: **(15 Mark)**

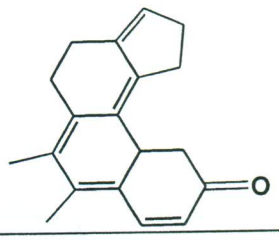
Use the Woodward-Fieser rules to predict the expected λ_{max} for the following compounds:

1)





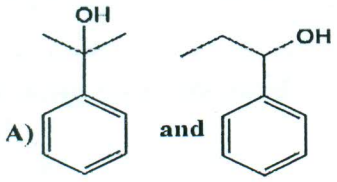
3)



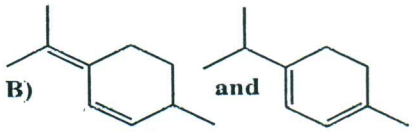
Question 3: **(15 Mark)**

A) Which is the best spectroscopic method(s) from the following IR, UV, 1H-NMR can be used to distinguish between the following pairs:

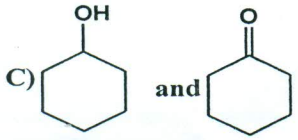
A)



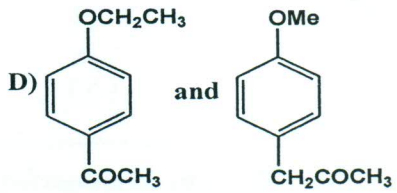
B)



C)



D)



B) Give a structure consistent with each of the following sets of spectral data:

a; $C_6H_{15}N$
^{1}H-NMR δ(ppm) : 1.20 (triplet, 9H) 2.44 (quartet, 6H).

b; $C_5H_{10}O_2$
^{1}H-NMR δ = 1.33 (singlet, 6H) & 4.27 (singlet , 4H)

c; $C_{11}H_{14}O_2$ " IR (Cm^{-1}) ν = 3010 , 1740, 1590 Cm^{-1} "
^{1}H-NMR δ = 1.43 (doublet, 6H) & 3.51 (singlet , 2H)
& 4.32 (heptet, 1H). , 7.12 (multiplet , 5H).

Question 4: **(20 Mark)**

Write shortly, what you know about :

A) The role the inductive effect in the value of the wave number (ν).
B) Modes of vibrations?
C) Define of the following:

Hook's Law.	;	IR inactive compounds	;	Bathchromic and Hypschromic .
Integration Curve.	;	Anistroic effect.	;	Shielding and deshielding effect .

With My Best Wishes ***Prof. Dr. El-Sayed I. El-Desoky***