المستوى الثالث

كيمياء /علم الحيوان

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF CHEMISTRY			
	FINAL EXAMINATION FOR ALL DOUBLE MAJOR THIRD LEVEL STUDENTS			
	COURSE TITLE:	(Coordination Chemistry)		COURSE CODE: CH3246
DATE:	1,JUNE 2017	TERM: SECOND	TOTAL ASSESSMENT MARKS 50	TIME ALLOWED: 2 HOURS

Answer the following Questions:

1-) For each complex define the following: **(Total marks 20)**

1-Name 2- The type of isomerism

3- The type of hybridization 4- Calculate the magnetic moment

I-) $[Mn(H_2O)_6]Cl_2$ **(5marks)** II-) $K_2[Zn(CN)_4]$ **(5marks)**

III-) $K_2[Ni(NO_2)_4]$ **(5marks)** IV-) $Na_3[Co\ Cl_6]$ **(5marks)**

2-)A -)Iron ion forms an inner diamagnetic complex ion containing the cyano ligand. Derive the formulae of the complex. **(4marks)**

B-) Discuss the effect of central metal ion and its charge on Δ_o value. **(4marks)**

C-) Manganese (II) ion forms inner complex ion with cyano ligands. Calculate the magnetic moment value of the complex. **(4marks)**

D-) Discuss the hydration isomerism with example. **(3marks)** **(Total marks 15)**

3-) A-) Wite full account on Jahn-Teller effect with examples **(5marks)**

B-) What is the formula of the following complex: **(2marks)**
Tetrammine copper (II) hexachloro copperate (II)

C-) For the two complexes: **1-)** Hexammine cobalt(III) chloride **(8marks)**
2-) Potassium hexacyano ferrate (II)

a-) Draw the d- orbital splitting indicate the number of electrons in t_{2g} and e_g

b-) Calculate the CFSE value and magnetic moment for each complex. **(Total marks 15)**

Note : (Atomic number for Mn 25, Fe 26, Co 27, Ni 28, Cu 29 & Zn 30)

Good Luck

Examiners: Prof. Dr : Kamal Elbaradie, Prof. Dr: Ekhlas Abd Elhay

(٥)

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF CHEMISTRY			
	Final Examination of for third year students (Double major)			
	COURSE TITLE	Organic Spectroscopy		COURSE CODE: CH3248
DATE:	JUN. 2017	TERM: SECOND	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

Answer the following questions: (100 marks) (Each question 20 marks)

1] a) Discuss the chemical shift of hydrogen attached directly to a Π- bonded carbon and give the relative order of downfield shift of:

Acetylenic, vinylic, aldehydic and aryl hydrogen compared to alkyl hydrogens.

b) Is the δ value of a given kind of hydrogen proton a constant value? Find the δ value and the observed shift from TMS in HZ of a signal in a 100- MHZ instrument? That is 162 HZ in a 60-MHZ instrument.

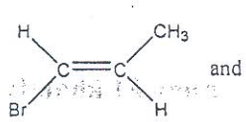
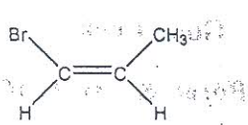
2] a) Draw the ^{1}HNMR spectra with multiplicity, peak accounting and showing relative chemical shifts for the following structures:

i) *p*- CH_3-C_6H_4-CH $(CH_3)_2$ ii) C_6H_5-O-CH_2-CH_2Cl

iii) *o*-CH_3-O-C_6H_4-COOH iv) CH ≡ C-CH_2-O-CH_3

b) Use ^{1}HNMR spectroscopy to distinguish between the following geometric isomers:

i) Cis –stilbene and trans-stilbene.

ii)  and 

3] a) 4-Heptanone shows two important characteristic peaks in its mass spectrum due to ions at m/e = 86 and m/e = 58. Explain the fragmentation pattern of the compound.

b) How do you explain that m/e = 57 and m/e = 44 ions is formed in the mass spectrum of pentanal.

c) Give the typical fragmentation pattern in *n*-propyl benzene.

4] Explain the following by using the mentioned spectroscopic methods:

a) o-Nitroacetanilide is deep yellow but the p- nitroacetanilide is yellow (UV & IR).

b) The ketonic and enolic forms of ethyl benzoyl acetate (UV, IR and ^{1}HNMR).

c) Benzamide and acetamide (IR & ^{1}HNMR).

d) How will you distinguish between benzaldehyde and cinnamaldehyde (UV, IR and ^{1}HNMR).

e) The effect of solvent on the absorption spectro of propanal and propanone (UV & IR).

f) How could you distinguish between the following compounds ; propanoic acid, propanoic unhydride and propanamide.

5] An organic compound with molecular formula C_4H_8O, having the following spectroscopic data:

UV: λ_{max} 276(nm), ε 43 (n-hexane)

λ_{max} 242(nm), ε 37 (ethyl alcohol)

IR: υ in cm^{-1} 1715 (s) and 2988(m) (solid phase).

^{1}HNMR: τ (tau) values in $CDCl_3$ and TMS as standard reference 7.52 (q), 7.88(s), 8.93(t), in the ratio 3:3:2 (J= 7.1 HZ).

Mass data: $M^{\cdot+}$ = 72 (61 %); m/e = 57 (100%) ; m/e= 29 (41%) and a broad peak at m/e= 14.75 (2.1%).

Find out the structure of the above compound, and explain all the given spectroscopic data.

Good Luck

Prof. Dr. Mohamed A. El- Borai & *Ass. Prof. Dr.* Sahar El-khalafy

1969	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF ZOOLOGY			
	EXAMINATION FOR LEVEL THREE STUDENTS OF CHEMISTERY / ZOOLOGY			
	COURSE TITLE:	Physiology 1		COURSE CODE: ZO3242
DATE:	JUNE, 2017	TERM:SECOND	TOTAL ASSESSMENT MARKS:15 0	TIME ALLOWED: 2 HOURS

Part I..... (75 Points)

1.Mention :

(15 points)

The mechanism of biological oxidation .

(25 points)

2. What is the fate of:

a.Glucose in the body. b.Pyruvate.

3. Explain:

a.Glucose / Alanine cycle. (15 points)

b.Action of:

1.Lactate dehydrogenase. (10 points) 2.Glucose -6- phosphatase. (10 points)

Part II..... (75Points)

1.Answer the following questions:

a-Compare between diffusion and active transport . (15 points)
b-What is the importance of motility in the alimentary canal? (10 points)

2. Mention the role of: (15 points)

a-Cholecystokinin. b-Erepsin.
c-Lysozyme. d-Enterogastrone. e-Secretin.

3.Explain : (10 points)

a-Factors affecting enzyme action .

4.Give short nots on :

a-Protein absorption. (5 points)
b-Functions of bile salts. (5 points)
c-The haustral contractions. (5 points)
d-Pinocytosis (10 points)

EXAMINERS	DR. ZEINAB ATTIA	DR. HALA ABDELAZEEM

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF ZOOLOGY			
	EXAMINATION FOR LEVEL THREE STUDENTS OF CHEMISTERY / ZOOLOGY			
	COURSE TITLE:	Physiology 1		COURSE CODE: ZO3242
DATE:	JUNE, 2017	TERM:SECOND	TOTAL ASSESSMENT MARKS:15 0	TIME ALLOWED: 2 HOURS

Part I..... (75 Points)

1.Mention :

(15 points)

The mechanism of biological oxidation .

(25 points)

2. What is the fate of:

a.Glucose in the body. b.Pyruvate.

3. Explain:

a.Glucose / Alanine cycle. (15 points)

b.Action of:

1.Lactate dehydrogenase. (10 points) 2.Glucose -6- phosphatase. (10 points)

Part II..... (75Points)

1.Answer the following questions:

a-Compare between diffusion and active transport . (15 points)
b-What is the importance of motility in the alimentary canal? (10 points)

2. Mention the role of: (15 points)

a-Cholecystokinin. b-Erepsin.
c-Lysozyme. d-Enterogastrone. e-Secretin.

3.Explain : (10 points)

a-Factors affecting enzyme action .

4.Give short nots on :

a-Protein absorption. (5 points)
b-Functions of bile salts. (5 points)
c-The haustral contractions. (5 points)
d-Pinocytosis (10 points)

EXAMINERS	DR. ZEINAB ATTIA	DR. HALA ABDELAZEEM

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF ZOOLOGY			
	EXAMINATION FOR LEVEL THREE STUDENTS OF CHEMISTERY / ZOOLOGY			
	COURSE TITLE:	Physiology 1		COURSE CODE: ZO3242
DATE:	JUNE, 2017	TERM:SECOND	TOTAL ASSESSMENT MARKS:15 0	TIME ALLOWED: 2 HOURS

Part I..... (75 Points)

1.Mention :

(15 points)

The mechanism of biological oxidation .

(25 points)

2. What is the fate of:

a.Glucose in the body. b.Pyruvate.

3. Explain:

a.Glucose / Alanine cycle. (15 points)

b.Action of:

1.Lactate dehydrogenase. (10 points) 2.Glucose -6- phosphatase. (10 points)

Part II..... (75Points)

1.Answer the following questions:

a-Compare between diffusion and active transport . (15 points)

b-What is the importance of motility in the alimentary canal? (10 points)

2. Mention the role of: (15 points)

a-Cholecystokinin. b-Erepsin.

c-Lysozyme. d-Enterogastrone. e-Secretin.

3.Explain : (10 points)

a-Factors affecting enzyme action .

4.Give short nots on :

a-Protein absorption. (5 points)

b-Functions of bile salts. (5 points)

c-The haustral contractions. (5 points)

d-Pinocytosis (10 points)

EXAMINERS	DR. ZEINAB ATTIA	DR. HALA ABDELAZEEM

1969	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF ZOOLOGY			
	EXAMINATION FOR LEVEL THREE STUDENTS OF CHEMISTERY / ZOOLOGY			
	COURSE TITLE:	Physiology 1		COURSE CODE: ZO3242
DATE:	JUNE, 2017	TERM:SECOND	TOTAL ASSESSMENT MARKS:15 0	TIME ALLOWED: 2 HOURS

Part I..... (75 Points)

1.Mention :

(15 points)

The mechanism of biological oxidation .

(25 points)

2. What is the fate of:

a.Glucose in the body. b.Pyruvate.

3. Explain:

a.Glucose / Alanine cycle. (15 points)

b.Action of:

1.Lactate dehydrogenase. (10 points) 2.Glucose -6- phosphatase. (10 points)

Part II..... (75Points)

1.Answer the following questions:

a-Compare between diffusion and active transport . (15 points)
b-What is the importance of motility in the alimentary canal? (10 points)

2. Mention the role of: (15 points)

a-Cholecystokinin. b-Erepsin.
c-Lysozyme. d-Enterogastrone. e-Secretin.

3.Explain : (10 points)

a-Factors affecting enzyme action .

4.Give short nots on :

a-Protein absorption. (5 points)
b-Functions of bile salts. (5 points)
c-The haustral contractions. (5 points)
d-Pinocytosis (10 points)

EXAMINERS	DR. ZEINAB ATTIA	DR. HALA ABDELAZEEM

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF ZOOLOGY			
	EXAMINATION FOR LEVEL THREE STUDENTS OF CHEMISTERY / ZOOLOGY			
	COURSE TITLE:	Physiology 1		COURSE CODE: ZO3242
DATE:	JUNE, 2017	TERM:SECOND	TOTAL ASSESSMENT MARKS:15 0	TIME ALLOWED: 2 HOURS

Part I..... (75 Points)

1.Mention :

(15 points)

The mechanism of biological oxidation .

(25 points)

2. What is the fate of:

a.Glucose in the body. b.Pyruvate.

3. Explain:

a.Glucose / Alanine cycle. (15 points)

b.Action of:

1.Lactate dehydrogenase. (10 points) 2.Glucose -6- phosphatase. (10 points)

Part II..... (75Points)

1.Answer the following questions:

a-Compare between diffusion and active transport . (15 points)

b-What is the importance of motility in the alimentary canal? (10 points)

2. Mention the role of: (15 points)

a-Cholecystokinin. b-Erepsin.

c-Lysozyme. d-Enterogastrone. e-Secretin.

3.Explain : (10 points)

a-Factors affecting enzyme action .

4.Give short nots on :

a-Protein absorption. (5 points)

b-Functions of bile salts. (5 points)

c-The haustral contractions. (5 points)

d-Pinocytosis (10 points)

EXAMINERS	DR. ZEINAB ATTIA	DR. HALA ABDELAZEEM

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF ZOOLOGY			
	EXAMINATION FOR LEVEL THREE STUDENTS OF CHEMISTERY / ZOOLOGY			
1969	COURSE TITLE:	Physiology 1		COURSE CODE: ZO3242
DATE:	JUNE, 2017	TERM:SECOND	TOTAL ASSESSMENT MARKS:15 0	TIME ALLOWED: 2 HOURS

Part I..... (75 Points)

1.Mention :

(15 points)

The mechanism of biological oxidation .

(25 points)

2. What is the fate of:

a.Glucose in the body. b.Pyruvate.

3. Explain:

a.Glucose / Alanine cycle. (15 points)

b.Action of:

1.Lactate dehydrogenase. (10 points) 2.Glucose -6- phosphatase. (10 points)

Part II..... (75Points)

1.Answer the following questions:

a-Compare between diffusion and active transport . (15 points)
b-What is the importance of motility in the alimentary canal? (10 points)

2. Mention the role of: (15 points)

a-Cholecystokinin. b-Erepsin.
c-Lysozyme. d-Enterogastrone. e-Secretin.

3.Explain : (10 points)

a-Factors affecting enzyme action .

4.Give short nots on :

a-Protein absorption. (5 points)
b-Functions of bile salts. (5 points)
c-The haustral contractions. (5 points)
d-Pinocytosis (10 points)

EXAMINERS	DR. ZEINAB ATTIA	DR. HALA ABDELAZEEM

TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF MATHEMATICS				
EXAMINATION FOR JUNIORS (THIRD YEAR) STUDENTS OF ZOOLOGY, BIO-CHEMISTRY				
COURSE TITLE:	BIOSTATISTICS			COURSE CODE:ST3202
DATE:20 JUNE, 2017	TERM: SECOND	TOTAL ASSESSMENT MARKS: 50		TIME ALLOWED: 2 HOURS

Answer the Following Questions: **Total Mark: 50**

Q1. To test the lifetime of batteries, 12 toy drummers are fitted with new batteries of one of three types: Ever ready, Endurance, Energizer. The length of time (in hours) that the drummers continue to drum are summarized on the table below

Ever ready	4.7	5.1	5.2		
Endurance	8.4	5.1	5.4	5.4	
Energizer	5.1	5.2	5.2	5.4	5.6

Determine whether there is significant difference between the mean lifetimes of the three types of batteries at $\alpha = 0.05$. **(15 Mark)**

Q2: Some leaves of a certain tree are collected to extract a drug from them. A study is done to determine if there is a correlation between the height of the leaves and the concentration of the drug.

Height (X)	2	4	7	5	3	5	6	4	7	3
Concentration(Y)	3	5	9	7	4	6	7	6	8	5

(i)Calculate Pearson correlation coefficient (r). (ii)Find the regression line $y = a + bx$.
(iiiTest at $\alpha = 0.05$, is there a significant positive correlation between the height and the concentration? **(12 Mark)**

Q3: The following paired observations show the chemical results employed in 5 samples which carried out by a senior and junior analyst in a laboratory **(11 Mark)**

Senior	30	22	25	19	26
Junior	26	19	20	15	19

At $\alpha = 0.05$, is there a difference in the mean of the senior and the junior results?.

Q4: A quality control manager of a company that operate 4-shifts want to test is there a dependency between the quality of the production (accept or not accept) and which the shift is produced? The data collected is as follows. Test at $\alpha = 0.01$, is there a dependency them? **(12 Mark)**

	Shift 1	**Shift 2**	**Shift 3**	**Shift 4**
Acceptable	10	10	15	5
Not acceptable	15	5	5	35

You May Use: $F_{(0.05,2,9)} = 4.26,\ F_{(0.05,2,11)} = 3.98,\ \chi^2_{(0.01,8)} = 20{,}09, \chi^2_{(0.01,3)} = 11.34,$

$t_{(0.05,8)} = 1.86, t_{(0.05,9)} = 1.833,\ , t_{(0.05,4)} = 2.132, t_{(0.025,4)} = 2.776$

With all my Best Wishes

EXAMINERS	PROF.DR. MEDHAT EL DEMSESY	DR. WAFAA ANWAR ABD EL-LATIF

	Tanta University ☼ Faculty of Science Zoology Department		
	Final Exam. for Juniors (3rd Year Students) of Chemistry / Zoology		
Course title:	Animal Ecology and Behavior		Course code: ZO 3244
Date: 22 / 6 / 2017	Term: Second	Total assessment marks: 150	Time allowed: 2 hours

Part (I) : Animal Ecology (75 marks)

(I) Answer the following questions

A- Write short notes on the following:

- Types of predators. (5 marks)
- Some antipredator adaptations. (5 marks)
- Types of ecological pyramids. (9 marks)
- Emergent properties of community. (5 marks)

B- Compare between three models of population growth? (12 marks|)

C- Given that $K = 400$ and $r = 0.1$, what is N_3, if $N_o = 200$? (5 marks)

(II) Choose the correct answer (Total 34 marks, 2marks each)

1- An organism that creates its own food is called

A. A producer B. A consumer C. A scavenger D. A decomposer

2- Which of the following two organisms are producers?

A. Plants and phytoplankton B. Plants and consumers

C. Phytoplankton and chlorophyll D. Phytoplankton and herbivores

3- Consider this food chain: algae ⟶ water fleas ⟶ minnows ⟶ trout ⟶ bear. The minnows in this food chain are

A. Tertiary carnivores B. Secondary carnivores

C. Primary carnivore D. Herbivores

4- What is a consumer that eats both plants and animals?

a. a producer b. a herbivore c. an omnivore d. a carnivore

5- The community of living organisms with non-living organisms as they exist in their natural, undisturbed environment is known as _____.

a) carbons b) decomposition c) biota d) ecosystem

6- All of the populations in an ecosystem form a _____.

A: group B: community C: family

7- Exponential growth may be graphed (time versus population size) in a(n) shaped curve.

A) S B) K C) C D) J

8- A _____ links trophic levels and depicts the transfers of energy and materials.

A) food web B) pyramid of numbers

C) pyramid of energy D) pyramid of biomass

9- During the stable equilibrium phase of a logistic growth curve _____.

A) growth is slow B) growth is accelerating C) there is little if any growth

10- The maximum number of individuals of a given species that can be supported by a given area on a sustained basis is known as _____.

A) biotic potential B) carrying capacity
C) exponential growth D) environmental resistance

11- The carrying capacity of a population corresponds to the _____ phase of the logistic growth curve.

A) Lag B) exponential growth C) deceleration D) stable equilibrium

12- A population crash can occur after exponential growth causes population size to exceed the carrying capacity of the environment.

A) True B) False

13- Which of the following is a density-dependent factor that regulates population size?

A) Competition B) drought C) accidental fire D) earthquake

14-- Which of the following correctly describes an r-strategist?

A) long life span B) slow to mature
C) little or no care of offspring D) large individuals

15- The deceleration and stable equilibrium phases of a logistic growth curve are the result of _____.

A) biotic potential B) environmental resistance

16- A species which is of utmost importance in a community, such that its absence changes the entire character of the community is called the.....

A) keystone species. B) top dog. C) primary predator. D) primary guild.

17- Logestic term becomes negative when $N > K$, then population size ..... and it is positive when $N < K$, then population size .....

A) Decrease / increase B) increase / decrease
B) C) both equal D) zero/ increase

Part (II) Animal behavior (Total 75 marks)

Answer the following questions:

1. Choose from between the brackets the correct answer: (Total: 5 Marks)

a. Movement whose direction is dependent on the comparison intensities of stimulation on bilateral sense organs called (Klinotaxes....Tropotaxes.... Telotaxes).
b. The change of behavior, which takes place automatically with age called (learning.... Imprinting.... maturaion)
c. Experience influences the development of behavior in (perceptual sharpening .... supernormal stimulus .... Stimulus filtering).
d. Rattle snake locate its pray by responding to (radiant heat .... ultra violet rays .... visual senses).

e. *Nezara virdula* and codling moth give an example for (territorial.... social....genetic control of) behavior.

2. Fill in the blanks with the appropriate words **(Total:10 Marks)**

a. Behavior is a symphony of ..... guided by messages from .....
b. The animal alters its rate of movement, in random direction according to the intensity of stimulus in.....which subdivided into ..... and .....
c. The hormonal system in Barbary dove is influenced by a sequence of these hormones ....., ..., ..., ..., ...
d. Courtship on guppies *Poecilia reticulata* gives an example for .....
e. The phenomenon by which newly hatched gosling recognizing the first moving object and follow him for next few weeks called .....
f. Taste and smell are lumped as .....senses.

3. Adaptive behavior is indeed an essential part of animal equipment for survival. Using examples, discuss the statement. **(Total: 10 Marks)**

4. A study of gastropod *Pleurobranchia* gives an example for the interaction between different kinds of behavioral goals. Discuss!!!! **(Total: 15 Marks)**

5. Demonstrate with experiment the nonassociative learning in animal. **(Total: 15 Marks)**

6. Illustrate the characteristics of the insects' social life using honeybee *Apis millefera* as an example. **(Total: 10 Marks)**

7. Explain with example how genetics can affect the behavior of the animal. **(Total: 10 Marks)**

BEST WISHES

Examiner : Prof. Dr./ Mohamed khalil	**Prof . Dr. / Hala Adel-lateif.**
Prof. Dr./ Lamiaa Sharra	**Dr/ Basma AL-Assiuty**

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF CHEMISTRY			
	EXAMINATION FOR THIRD YEAR STUDENTS			
	COURSE TITLE:	MOLECULAR SPECTROSCOPY		COURSE CODE: CH 3240
DATE:	25-5-2017	TERM: SECOND TERM	TOTAL ASSESSMENT MARKS: 50	TIME ALLOWED: 2 HOURS

($^{12}C = 19.93\times10^{-27}$ kg; $^{16}O = 26.56\times10^{-27}$ kg; speed of light = $3x10^{10}$ cm sec^{-1}; h = $6.626\ x10^{-34}$ J sec)

(I) **Question 1: Choose the correct answer and give the reasons for your choice**

(2.5 Marks for each)

1. For nitrogen molecule, the degeneracy of the rotational energy level with J=3 is.....
   a) 5 **b)** 9 **c)** 6 **d)** none of them
2. Which of these molecules will show a pure rotational (microwave) spectrum: CH_4, CH_3Cl, CH_2Cl_2, $CHCl_3$, $CH_2=CH_2$, benzene, SF_6?
   a) CH_3Cl, CH_2Cl_2, $CHCl_3$ **b)** CH_4, SF_6, CH_3Cl & $CH_2=CH_2$
   c) CH_2Cl_2, $CH_2=CH_2$, CH_4 & CH_3Cl **d)** All of them
3. A Raman spectrometer uses a He-Cd laser excitation source with a wavelength of 441.6 nm. Carbon tetrachloride produces a strong Raman shift at 460 cm^{-1} due to the totally symmetric stretch, so, the wavelengths in nanometers of the Stokes and anti-Stokes lines are .....
   a) 450.78 and 432.81 nm, respectively **b)** 480.25 and 420.54 nm, respectively
   c) 460.35 and 440.54 nm, respectively **d)** none of them
4. For transitions to be excited and observed in rotational spectroscopy, the following selection rules must be satisfied.
   a) $\Delta\mu \neq 0$, $\Delta J = \pm 1$ **b)** $\Delta J = 0, \pm1$ and $\Delta\mu = 0$ **c)** $\Delta J = \pm1$ and $\Delta\mu = \pm1$
5. Which of the following transitions is usually observed in the absorption spectra of ketones, ...

   a) $\sigma \rightarrow n$ b) $n \rightarrow \pi^*$ c) $n \rightarrow \sigma^*$ d) $n \rightarrow \pi$ e) $\sigma \rightarrow \sigma^*$

(I) **Question 2: Answer the following;**

1. Sketch the potential energy function of a harmonic oscillator and indicate the energy levels. How the anharmonicity affect the vibrational spectra of diatomic molecules. **(5 Marks)**
2. Calculate the number of normal modes of vibration for each: oxygen, acetylene, methane, benzene, and water. Explain your answer. **(5 Marks)**
3. Differentiate between dispersive Infrared and Fourier Transform spectrometers. (Confirm your answer by drawing). **(5 Marks)**
4. Show by drawing how isotopic substitution affects the rotational spectra of hydrochloric acid. **(3 Marks)**
5. What advantages does Raman spectroscopy have compared to IR spectroscopy, for structural characterization and process monitoring? **(4 Marks)**

(II) **Question 2: State true (√) or false (×) and give the reasons for your answer**

(2.5 Marks for each)

1. Linear diatomic molecules are microwave active. ( )
2. Methane absorbs IR radiations and it is Raman inactive. ( )
3. A linear tri-atomic molecule AB_2 shows only one Raman active mode of vibration. ( )

Go to the next page

4. Doppler broadening occurs in solid state, and decreases with temperature. ( )
5. The absorption spectra of iodine in gaseous state give broad bands ( )
6. Sample cells and solvents are of less problems in Raman than IR spectrometer. ( )

(II) **Question 4: complete each of the following;**

1. Generally, the intensity of the spectral line is governed by ....., ..., ..., however, the energy of transition is indicated by ....., ..., ...
2. The spectral band broadening is due to.....,.....,.....
3. The selection rules that must be satisfied in order to that an electronic transitions could be observed in UV-Vis absorption spectra are....., ...,.....
4. The vibrational frequency of; C=N, C=C, C=O and C=S bonds decreases following the order....., and the force constant of; C-N, C=N and C≡N bonds increases in the order.....

(III) **Question 5: Solve the following problem;** **(3 Marks)**

(III)

$^{1}H^{35}Cl$ shows a strong absorption of infrared radiation at 2991 cm^{-1}. By what factor do you expect this frequency to be shifted if deuterium is substituted for hydrogen in this molecule? The force constant is unaffected by this substitution.

Good Luck

Examiners	***Prof. Tarek A. Fayed*** ***Dr. Marwa N. El-Nahass***