Mansoura University   3rd Level Exam.
Faculty of Science   January 2015
Physics Department   Time allowed : 2 hrs

Molecular Spectroscopy 329 ف

Answer the following questions.

1-a- Compare between the following two energy levels.
     The allowed rotational energy levels of a rigid diatomic molecule &
     The allowed vibrational energy levels of a diatomic molecule undergoing anharmonic
     oscillations.   (15 marks)
  b- The "Born-Oppenheimer approximation" represents a diatomic molecule that can
     execute rotations and vibrations quite independently. Explain.   (15 marks)

2-a- State and then discuss in detail the microwave activity of the following molecules
          HBr   – $^{13}C^{16}O$ – CS_2 – CH_4 (10 marks)

  b- State and then discuss in detail the Infra Red (IR) activity of CO_2 molecule for the
     bending & asymmetric stretching modes of vibration.   (10 marks)

  c- Calculate the relative population including degeneracy of N_3 / N_0 of a rigid
     diatomic molecule where the rotational constant B=10 cm^{-1} and T=300 K°.
     Comment.   (10 marks)

3- The spectrum of a certain diatomic molecule executing anharmonic oscillation exhibits
   a fundamental transition centered at 1876.06 cm^{-1} and first overtone at 3724.2 cm^{-1}.
   Estimate the following
     a-the equilibrium frequency of oscillation $\overline{\omega}_e$ b-the anharmonicity constant χ_e
     c-the zero point energy ε_0 in cm^{-1} and Joule.   d-the force constant k
   {The masses of the molecule are m_1=2.325x10^{-26} kg, m_2=2.656x10^{-26} kg}   (20 marks)

(c=3x10^{10} cm/s   h=6.625x10^{-34} J.s   1eV=1.6x10^{-19} J   m=9.11x10^{-28} g   k=1.38x10^{-23} J/K°)

                         Best Regards

                                                  Prof.   A. El-Khodary

Mansoura University   Academic Level: 3rd Level
Faculty of Science   Program: Biophysics
Physics Department   First Term Exam:25/12/2014
Subject: Phys. 327   Time Allow: 2 hours
Physics: Polymer Physics   Full Mark: 80 Marks

Answer (ALL) Questions:

1) A- There are many popular techniques used to the study polymer structure, discuss this sentence and describe the X-ray technique.   [13 Mark]

    B- Write briefly on:
         a- Electrical conductivity of polymer.   [7 Mark]

2) A- Discuss in details the first order phase transitions in polymer. [10 Mark]

    B- Write briefly on:
         a- Effect of temperature and pressure on polymerization. [10 Mark]

3) A- Define the following: [9 Mark]
         a- The physical states of polymer.
         b- The Ceiling temperature.
         c- Copolymer and its different types .

    B- Discuss two different methods used to determine the glass transition temperature Tg, Mention only three factor affecting it.   [11 Mark]

4) Compare between: [20 Mark]

         a- Thermoplastic and Thermosets polymer.
         b- Branched and Crosslinked polymer.
         c- Atactic and Isotactic polymer.
         d- Anionic and Cationic polymerization.

"With Good Luck"

Examiners:
 - Dr. Maysa Ismail.   Prof. Dr. M. El-Tonsy

MANSOURA UNIVERSITY
FACULTY OF SCIENCE
MATHEMATICS DEPARTMENT
FINAL EXAM 2014/2015G

FIRST SEMESTER
TIME: 2 Hours
MATH 301: Biostatistics
TOTAL MARKS: 80 Marks

Level 3, Programs: Biophysics, Microbiology, Chemistry & Botany, Chemistry & Zoology and Environment Science.

Answer The Following Questions

Question 1:

(a) Patients were treated for insomnia by some drug. Recorded below are the hours of sleep the patients got during the second night after treatment began:

(i) Complete the following table: [9 Marks]

True class interval	Midpoint	Frequency	Relative frequency	Cumulative frequency
2.55 – 4.55	3.55	…	…	13
4.55 – 6.55	…	17	0.34	…
… – …	…	…	…	43
… – …	…	1	0.02	…
… – …	…	…	0.08	48
… – …	…	0	…	…
… – …	…	…	…	…

(ii) What percentage of patients got 6.55 or less hours of sleep during the second night after treatment? [4 Marks]

(iii) Graph a cumulative frequency distribution. [4 Marks]

(b) Let $P(A) = 0.4$ and $P(A \cup B) = 0.7$. Find $P(B)$ if: [9 Marks]

(i) A and B are independent.   (ii) A and B are mutually exclusive.   (iii) A subset of B.

Question 2:

(a) Suppose we measure the duration of labor (in hours) for a sample of pregnant woman and obtain:

Duration of labor	0.5 – 2.5	2.5 – 4.5	4.5 – 6.5	6.5 – 8.5	8.5 – 10.5	10.5 – 12.5	12.5 – 14.5
Frequency	10	15	30	20	10	8	7

Find approximate values for: [18 Marks]

(i) The sample mean, mode and median.   (ii) The variance and coefficient of variation.

(b) The probability that a patient recovers from a rare blood disease is 0.45. If 20 people are known to have contracted this disease. [9 Marks]

(i) What is the probability that at least 3 survive.

(ii) What is the probability that exactly 8 survive.

(iii) What is the expected number and variance of the patients that be survived.

Question 3:

(a) Suppose that in the population of healthy females, the red blood count (divided by $10^{12}/l$) has an normal distribution with a mean of 4.8 and a standard deviation of 0.3. What is probability that the red blood count is: [12 Marks]

(i) greater than 5,   (ii) less than 3.8,   (iii) between 4.2 and 5.4

(b) Certain tubes manufactured by a company have a mean lifetime of 900 hr., and standard deviation of 50 hr. Find the probability that a random sample of 64 tubes taken from the group will have a mean lifetime between 895 and 910 hrs. [9 Marks]

(c) The probability that a student, selected at random from a certain College, will pass a certain economics course is 4/5 and will pass both economics and statistics courses is 1/2 What is the probability that he will pass statistics if it is known that he had passed economics? [6 Marks]

Hint: $\Phi(0.67) = 0.7486$, $\Phi(0.8) = 0.7882$, $\Phi(1.6) = 0.9452$, $\Phi(2) = 0.9773$, $\Phi(3.33) = 0.9994$.

Good Luck

Examiners: Dr. A. Mustafa, Dr. F. Sheha and M. Abdel Rahman.

Mansoura University
Faculty of Science
Physics Department
Course: Phys. 314

Quantum Mechanics

First Term Exam. Jan. 2015
3rd year Phys. and Bio-phys.
Allowed Time: 2 hours
Full Mark: 80

Answer the following questions:

[1-a] Write on the basic postulates of quantum mechanics.   [5 Marks]

[1-b] A beam of mono-energetic particles of energy E moves freely in x-direction is subjected to a potential jump of height $V_0 < E$. Determine the reflection and transmission coefficients of the beam and compare the results with those calculated classically.
                                                                             [15 Marks]

[2-a] Using the time-independent perturbation theory to estimate the first order corrections on the energy eigen-values and their corresponding eigen- functions of a particle moves in a perturbed system.   [12 Marks]

[2-b] Verify that $[x^2, P_x] = 2ihx$, and calculate $[E, t]$.   [8 Marks]

[3-a] Solve the one-dimensional Schrodinger equation to determine the allowed energy levels of a particle moves freely inside an infinite potential well of width L.   [12 Marks]

[3-b] If this potential is perturbed by $H' = V_0$ in the region $0 < x < L/2$, calculate the 1st order correction on the ground state energy of the particle.   [8 Marks]

[4-a] Determine the allowed energy levels and the corresponding eigen functions of a one-dimensional harmonic oscillator.   [15 Marks]

[4-b] Discuss the degeneracy of a spherical harmonic oscillator and calculate its value for the 2nd excited state energy level (N=2).   [5 Marks]

WITH OUR BEST WISHES

Examiners: Prof. Dr. A. R. Degheidy   and   Dr. E. B.Elkenany

Mansoura University
Faculty of Science
Physics Department
Subject: Molecular
biophysics
Physics

Second Term Exam
3st Year Biophysics Students
Date:12 Jan /2015
Time Allowed: 2 hours

1) Write short notes on the following:-

a) – Nucleotides………………………………… **(4marks)**

b) – Dehydration synthesis……………………………… **(4marks)**

c)- Carbohydrates …………………………… **(4marks)**

d)- Lipids…………………………………… **(4marks)**

2)   **a) Compare between the light microscope and electron microscope**……(10 marks)
b) **Compare between different types of RNA** …………………..(10 marks)

3)- Explain the following words
a)- transcription , translation and elongation………………………(15 marks)
b)- Phospholipids……………………………(5marks)
c) – Steroids………………………..(5 marks)

4) a_ Prove The resolution is proportional to the wavelength
(5 marks)

b- Compare between types of guns in electron microscope
…………………………(5 Mark)

c- Explain the Electron-specimen interaction…………………(5marks)
d- different types of electron microscopes ……………………..(8 marks)

Good luck
Dr. fatma elzhraa

| Mansoura University
Faculty of Science
Chemistry Department
Subject: Chemistry
Course(s) : Volumetric
gravimetric analysis | كلية العلوم
جامعة المنصورة | First Term
Date : Jan, 2015
Time Allowed: 2 hours
Full Mark : 60 Marks
Third Biophysics Students |

Answer The Following Questions

1.a) Mention the requirements for successful gravimetric method. **[7.5 Marks]**

b) Calculate the pH of the solution that results when 50 ml of 0.02 M $Ba(OH)_2$ are mixed with 100ml of 0.04 M HCl. **[7.5 Marks]**

2.a) Explain the behavior of acid – base indicator and its pH range. **[7.5 Marks]**

b) Mohr titration of 0.4137g sample required 35.82 ml of standard 0.1 M Ag NO_3 calculate the percentage of chloride in the sample. (atomic wt. of Cl = 35.5). **[7.5 Marks]**

3.a) Discuss the metallic indicators in EDTA titrations. **[7.5 Marks]**

b) Calculate the Ksp value for Ag_2CrO_4 its solubility 2.5×10^{-2} g/L (Mol. Wt. = 322). **[7.5 Marks]**

4.a) Define the following (mention the law and example if present) . **[10 Marks]**
    1. Buffer capacity   2. Co- precipitation
    3. Rejection of a result .   4- Types of determinate errors.
    5- Accuracy

b) Give the reason of **[5 Marks]**
    1. Volhard's method must be carried out in acidic solution while Mohr's method in neutral solution.
    2. EDTA titration is very useful for titration of mixtures of different cations. .

With best Wish

Dr. W. M. Abou El-Maaty

Mansoura University	First semester 2014-2015	3rd Level Biophysical students
Faculty of Science	Date 29/12/2014	Full Mark : 80 Marks
Physics Department		Allowed Time : 2 Hours
Course Code : Bio-Physics 310		Course Title : Biophysical Radiation

Answer all the following questions :   Marks

1a- What are the different forms of energy and show in table the characteristics of the different electromagnetic radiations ((Type , Energy(eV), Frequency(Hz) and Wavelength(cm))).   7

1b- Calculate the shift in wavelength of an X-ray of wavelength 0.400×10^{-10} m that undergoes a 90° Compton scattering from an electron.   7

1c- Define the following with examples :

     Nuclide - Radionuclides - Isotopes - Isotones - Isotones - Isobars - Isomers 7

1d- Derive the law of radioactivity.   7

2a- What are the properties of alpha decay.   7

2b- Differentiate between negative electron emission decay and electron capture.   7

2c- Illustrate Compton scattering and Photoelectric effect. Write short notes on

     each type?   7

2d- Give the meaning of linear energy transfer LET and range.

Calculate the energy in MeV of alpha particles with mean range of 5 cm in air at NTP. 7

3a-A photon beam passes normal to a 20 mm sheet and is attenuated to half its original intensity. The sheet is now rotated through an angle of 40° . Find the intensity of the beam as it now emerges from the sheet .   4

3b- Define the following: Radiation Absorbed Dose , Dose equivalent ,

     Half Value Layer and   mass attenuation coefficient   7

3c- Discuss with figure the direct and indirect action of radiation on DNA.   7

3d- Write on : Cell line   --   Cell differentiation -- DNA polymerase and ligase   6

Best wishes: **Dr. Ahmed Abu El-Ela**   D.Maysa Esmael

Mansoura University Faculty of Science Department of Physics Course Code: Phys. 311 Title: Solid State Physics		First Semester (Jan. 2015) Exam Type (Final): 3rd Year (Physics, Biophysics) Time: Two Hours Full Mark: 80 Mark

Answer **only three** questions from the following

1- a: Density of FCC copper is 8.96 g/cm^3 and its atomic mass is 63.54 g/atom. Find the Bragg angle for the first order reflection from the planes (110) at $\lambda = 0.5$ Å. Will there be any higher order reflections? [14 Mark]

b: Derive a relation for the separation distance between planes in a crystalline structure. Is that relation valid for all types of lattices? [13 Mark]

2- a: The energy of interaction of two atoms a distance r apart can be written as:

$U(r) = -(a/r) + (b/r^7)$ where a and b are constants.

(i) Show that for the particles to be in equilibrium, $r = r_0 = (7b/a)^{1/6}$.

(ii) In stable equilibrium, show that the energy of attraction is seven times that of the repulsion in contrast to the forces of attraction and repulsion being equal. [14 Mark]

b: Which type of cubic lattice has the highest packing density? Give a proof. [13 Mark]

3- a: Describe an experimental method for determination of the separation distance between planes in a crystalline structure. [14 Mark]

b: Can gamma rays be used to study the crystalline structure? Explain! [13 Mark]

4- a: Show that the bulk properties of a solid does not depend on its volume . [14 Mark]

b: Write down the atomic radii r in terms of the lattice constant a, for:

(i) Simple cubic structure, *(ii)* FCC structure, *(iii)* BCC structure. [13 Mark]

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