Mansoura University
Faculty of Science
Physics Department
Subject: Phys. 327
Physics: Polymer Physics

Academic Level: 3rd Level
Program: Biophysics
First Term Exam:28/12/2015
Time Allow: 2 hours
Full Mark: 80 Marks

Answer (ALL) Questions:

1) A- Discuss in details the first and the second order phase transitions in Polymer. [12 Mark]

B- What are the difference between the physical state of polymer and the phase. [6 Mark]

C- Explain the physical meaning of:
glass-transition – Polymerization – Relaxation Time [6 Mark]

2) Compare between: [20 Mark]
a- Anionic and Cationic polymerization.
b- Cis- and trans- isomerism.
c- Polymer and Copolymer.
d- Atactic and Isotactic polymer.

3) Write briefly on: [20 Mark]
a- Ceiling Temperature.
b- Electrical conductivity of polymer.
c- X-ray technique to study polymer structure.
d- Effect of temperature on polymerization rate.

4) A- Mention three factors affecting the glass-transition temperature and Explain one of them. [8 Mark]

B- Describe Differential Scanning Calorimetry Analysis. [8 Mark]

"With Good Luck"

Examiners:
1- Dr. Maysa Ismail. *2- Prof. Dr. M. El-Tonsy.*

Mansoura University Faculty of Science Department of Physics Course code : Bio Phys 310 Course title : Biophysical Radiation		3rd Level Biophysical students Program: Bio Physics First Semester (2015/2016) Final-Term Exam Date 31/12/2015 Time allowed: 2 hours Full Mark: 80 Marks

Answer the following questions Marks

(1a) What are the different forms of energy and give examples of particulate radiations, its physical properties and origin 7

(1b) Calculate the maximum and minimum wavelength in cm of UV- radiation . 7

(1c) Differentiate between

mass defect Δ and mass decrement δ , isotopes and isobar , ionization and excitation 7

(1d) Calculate the total number of atoms and the total mass of ^{201}Tl present

in 10 mCi (370 MBq) of ^{201}Tl ($t_{1/2}$ = 3.04 d) 7

(2a) Explain the radioactive decay by alpha particle emission and the properties of alpha decay . 8

(2b) What is the atomic number , density and type of the predominant photon interaction of the following materias : soft tissue , NaI (crystal) and lead . 8

(2c) What is annihilation . Calculate the energy equivalent of the mass of the electron in joules and MeV (Given : The mass of the electron = 9.1×10^{-31} Kg) 8

(3a) Explain with equations and figures Compton scattering .

In a Compton experiment an electron attains a kinetic energy of 0.100 MeV when an X – ray of energy 0.500 MeV strike it . Determine the wavelength of the scattered photon if the electron is initially at rest . 7

(3b) If the HVL of lead for the 140 keV photons of ^{99m}Tc is 0.3 cm of lead . Calculate the linear attenuation coefficient of lead for the 140 keV photons of lead needed to reduce the exposure of a point source of radiation by 70 % . 7

(3c) Discuss with figure radiosensitivity and cell cycle . 7

(3d) Write on the different types of radiosnsitizers . 7

Best Wishes, Ass.Prof. Ahmed Abu El-Ela

Mansoura University
Faculty of Science
Physics Department

3rd Level Exam.
January 2016
Time allowed : 2 hrs

Molecular Spectroscopy Phys 329

Answer the following questions.

1-a- Discuss the different types of the magnetic dipole moments. Comment on the techniques used in the radio frequency region. (15 marks)

b- A diatomic molecule can execute rotations and vibrations quite independently. Explain this approximation. (15 marks)

2-a- State and then discuss in detail the microwave activity of the following molecules
HF – $^{13}C^{16}O$ – CH_3F – $^{16}OC^{18}O$ (10 marks)

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

3-a- The spectrum of a certain diatomic molecule executing anharmonic oscillation exhibits R and P branches. Knowing $R_{(0)}=2147.08\ cm^{-1}$ and $R_{(1)}=2150.86\ cm^{-1}$. Estimate
a- The rotational constant B b-The moment of inertia I
c- The bond length r
{the reduced mass of this molecule $\mu = 1.138 \times 10^{-26}$ kg} (15 marks)

b- Calculate the relative population including degeneracy of N_2 / N_0 of a rigid diatomic molecule. ($B=10\ cm^{-1}$).
Calculate N_2 / N_0 for a diatomic molecule executing anharmonic oscillation (the spacing between vibrational levels is $10^3\ cm^{-1}$).
Compare and comment. ($T=300\ K^\circ$) (15 marks)

($c=3\times10^{10}$ cm/s $h=6.625\times10^{-34}$ J.s $1eV=1.6\times10^{-19}$ J $m=9.11\times10^{-28}$ g $k=1.38\times10^{-23}$ J/K°)

Best Regards

Prof. A. El-Khodary

Mansoura University
Faculty of Science
Physics Department

3rd Level Exam.
January 2016
Time allowed : 2 hrs

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Best Regards

Prof. A. El-Khodary

Mansoura University Faculty of Science Department of Physics Course Code: Phys. 311 Title: Solid State Physics		First Semester (Jan. 2016) Exam Type (Final): 3rd Year (Physics, Biophysics) Time: Two Hours Full Mark: 80 Mark

Answer **only three** questions from the following

1- a: Sketch the planes (112), (201) and (123) in a tetragonal lattice. [14 Mark]

b: Find the reciprocal lattice of FCC lattice and its volume. [13 Mark]

2- a: At what angle will a diffracted beam emerge from the (111) planes of a face centered cubic crystal of unit cell length 0.4 nm? Assume diffraction occurs in the first order and that the x-ray wavelength is 0.3 nm. Which wavelength would make diffraction from the (222) planes? [14 Mark]

b: Let the interaction energy between two atoms be given by:

$$U(r) = -\frac{A}{r^2} + \frac{B}{r^6}$$

If the atoms form a stable molecule with an inter-atomic distance of 0.4 nm and a dissociation energy of 3 eV, calculate A and B. [13 Mark]

3- a: Define Madelung constant and explain how to calculate it for NaCl crystal. [14 Mark]

b: Show that the condition of diffraction in the reciprocal lattice is similar to that in the real lattice. [13 Mark]

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

b: The unit cell of α-iron has a BCC structure with a lattice constant of 2.75 Å. Find

i) the density,

ii) the free volume per unit cell,

iii) number of atoms per mm^2 in the plane (101).

(Relative atomic mass of iron is 55.85 g/mole, $N_A = 6.022\times10^{23}$ $mole^{-1}$) [13 Mark]

أطيب التمنيات : أ.د. حمدى دويدار

لجنة التصحيح: أ.د. حمدى دويدار – أ.د. جمعة الدمراوى

Mansoura University **Faculty of Science** **Chemistry Department** **Subject: Volumetric & Gravimetric Analysis** **Course(s) : Chem.(315)**	كلية العلوم جامعة المنصورة	**First Term** **3rd Biophys. Students** **Date : Jan., 2016** **Time Allowed : 2 hours** **Full Mark : 60 Marks**

Answer the Following Questions

Section (A) Mcq (30 Marks)

1. The chief requirements of gravimetric method to be sucuessfull are
a) ..... b) .....
c) ..... d) .....

2. Which one of these sentence is correct.
a) The mass of carbon-12 atom is equal to 12 dalton.
b) The Dalton is equall to 12 times the mass of carbon – 12.

3. Which one of these sentence is correct
a) The Normolity of sulphoric acid is twice its molarty
b) Molarty of sulphoric acid is twice its normality

4. What is the pH of 1.5×10^{-4} mol.L^{-1} solution of $Ba(OH)_2$ assuming that $Ba(OH)_2$ is completely dissociated in a water solution ? **a.** 3.8 **b.** 4.2 **c.** 8.1 **d.** 10.5

5. A 25.0 mL solution of 1.00 moll^{-1} hydrochloric acid is diluted to 1.00L with distilled water. What is the resultant concentration of the solution produced ?
a) 2.50×10^{-2} molL^{-1} **b)** 1.25×10^{-1} molL^{-1}
c) $2.50 \times 10^{+1}$ molL^{-1} **d)** $1.25 \times 10^{+1}$ molL^{-1}

6. In a titration, 2.7 cm^3 of 0.100 mol dm^{-3} sodium hydroxide, NaOH, solution is added to 25.0 cm^3 of 0.125 mol dm^{-3} benzoic acid, C_6H_5COOH, solution. Calculate the pH of the resulting solution given that the pKa of benzoic acid is 4.19.
a) 3.17 b) 5.25
c) 1.74 d) 6.67

7. The pH of an acid solution is 6.20. Calculate the Ka for the acid. The initial acid concentration is 0.010M

8. For some titrations, phenolphthalein is a suitable indicator while methyl orange is unsuitable. For which one of the following titrations is this case ?
a) Acetic acid and ammonia solution
b) Acetic acid and sodium hydroxide solution
c) Hydrochloric acid and ammonia solution
d) Hydrochloric acid and sodium hydroxide solution

9. What is the solubility constant expression for $Zn_3(PO_4)_2$?
a) $Ksp = [Zn^{2+}]\,[PO_4^{3-}]$ **b)** $Ksp = [Zn^{2+}]^3[PO_4^{3-}]^2$
c) $Ksp = [Zn^{2+}][2PO_4^{3-}]$ **d)** $Ksp = [3Zn^{2+}]^3[2PO_4^{3-}]^2$
e) $Ksp = [Zn^{3+}]^2[PO_4^{2-}]^3$

10. Which of the following is the suitable pH for Mohr's method ?
a) pH <2 b) pH = 3-6.5
c) pH = 6.5-9 d) pH=10

11. A 0.0352 g sample of pure calcium carbonate (100.09 g/mol) was dissolved in acid and titrated to its endpoint with newly made EDTA titrant (0.010 M) according to the procedure given below. The starting burette volume was 0.10 mL. The ending burette volume was 35.52 mL. Calculate the exact concentration of the EDTA titrant. Show all work.
12. The solubility of lead chromate ($PbCrO_4$) is 4.5×10^{-5} g/L. Calculate the soubility product of this compound
13. Explain or define each of the following terms :
    a) Precision **b)** Accuracy
    c) Determinate error **d)** Peptization

Section (B) (30 Marks)

1. Explain the behavior of buffer solution and its pH.
2. Mention briefly Volhard method.
3. Dedicate the principal steps in precipitation method.
4. Explain the difference with example between solubility and solubility product.

With best Wishes

DR. W.Abou El-Maaty

Mansoura University
Faculty of Science
Botany Department
El-Mansoura, Egypt

جامعة المنصورة
كلية العلوم
قسم النبات
المنصورة - مصر

Final Examination in Botany
First Term: Jan. 2016

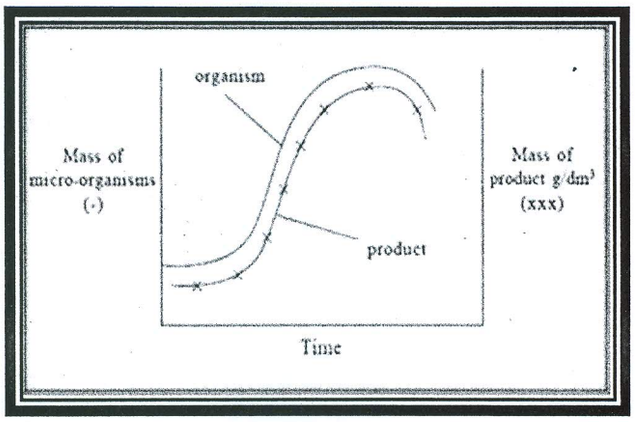
Educational Year: 3rd Level **Program:** Biophysics
Code: B(320) **Course:** Industrial Microbiology
Time: 2 hrs
Date: 14/01/2016 **Full mark:** 60 **Question mark:** 20

Answer the following questions:

Q.1-A- Define each of the following:

i. Conversion coefficient
ii. Yield coefficient (Y) and on what its value is depends

B- From this figure **discuss** the relation between the product formation and microbial growth



C- Differentiate between biostimulation and bioaugmentation

D- Demonstrate bioremediation of heavy metals

Q.2- A- Discuss in details Monod model of microbial growth kinetics.

B- I. Explain the stages of penicillin production.

II. Differentiate between batch mode and fed batch mode of fermentation.

3- A- Describe the stages of lactic acid fermentation.

B- Differentiate between surface and submerged bioprocesses

C- What are the properties of a useful industrial microbe?

Examiners: **Assist. Prof. Dr. Mervat H. Hussein**
Dr. Ahmed S. Gebreil

جامعة المنصورة – كلية العلوم
قسم الرياضيات
التاريخ :18 / 1 / 2016 م
الدرجة الكلية : 80
الزمن : ساعتان

امتحان دور يناير 2016 م
المستوى : الثالث
اسم المقرر : احصاء حيوى
كود المادة : ر 301

برامج: فيزياء حيوى- ميكروبيولوجى - كيمياء و حيوان - كيمياء و نبات - علوم بيئة

Answer the following questions:

[Q1] a- Compute the Pearson's correlation coefficient r for the following data. Explain the reason for this value of r. **(10 Marks)**

x	1	2	3	4	5
y	3	5	7	9	11

b- Let X be the number of heads when a coin is tossed three times. **(12 Marks)**

Find i)The cumulative distribution function $F(x)$ ii) $E(2X+1)$ and $Var(3X+5)$

c- If the average number of visitors to a web server per minute is 6 . What is the probability that **(8 Marks)**

i) The number of visitors in one minute will be less than two ?

ii) There are exactly two visitors in 30 seconds ?

[Q2]a- The heights of 1000 students in a certain college are normally distributed with mean 68 inches and standard deviation 3 inches. How many of these students would you expect to have heights: i) More than 64 inches ii) Between 67 and 71 inches.

($\Phi(1.33)=0.908$, $\Phi(-1.33)=0.092$, $\Phi(1)=0.841$, $\Phi(-0.33)=0.371$) **(10 Marks)**

b-The contents of seven similar containers of sulfuric acid are 9.8 , 10.2 , 10.4 , 9.8 , 10.0 , 10.2 , 9.6 liters. Find 95 % confidence interval for the population mean μ , assuming the population is normally distributed.

($t_{(0.025,6)} = 2.447$, $Z_{0.025} = 1.96$) **(15 Marks)**

[Q3]a- The following table shows the weights (in kilogram) of 60 children **(18 Marks)**

weight	9.5 –19.5	19.5 –29.5	29.5– 39.5	39.5 –49.5	49.5– 59.5
frequency	5	10	18	20	7

Find i) The sample mode by two different methods. ii) The sample median.

iii) Graph the cumulative frequency and deduce the median from it.

b-If we choose randomly two tubes in succession from a shipment of 86 tubes of which 12 are defective. What is the probability that both tubes will be defective? **(7 Marks)**

مع أطيب التمنيات بالنجاح د. فاتن شيحه – د. عبد الفتاح مصطفى - د. محمد عبدالرحمن

Mansoura University Faculty of Science Physics Department	January 2016	Third Year Physics & Biophysics Time allowed: 2 hrs Full Mark: 80

Course: Quantum Mechanics Phys(314)

Answer the following questions:

[1-a] Write the Schrödinger equation in spherical coordinates and separate it into radial and angular parts and solve the angular equation. [15]

[1-b] Write on the main postulates of quantum mechanics. [5]

[2-a] Solve the time-independent Schrödinger equation to determine the allowed energy levels of a particle moving in a symmetrical finite potential well of depth V_0 and width 2L. [15]

[2-b] Discuss the Degeneracy of the lowest three energy states of a spherical harmonic oscillator. [5]

[3-a] Find, the bound state energy levels and their corresponding eigenfunctions of a particle moving In a one-dimensional harmonic oscillator potential. [10]

[3-b] Using the operator method to deduce the Hamiltonian operator $\hat{H}$ of a harmonic oscillator in terms of $\hat{a}$ and $\hat{a}^*$, where $\hat{a} = \left(\sqrt{\frac{m\omega}{2\hbar}} x + i \frac{p_x}{\sqrt{2\hbar m\omega}} \right)$ and use it to estimate the allowed energy levels. Discuss the effect of $\hat{a}$ and $\hat{a}^*$ operators on the eigenfunctions of the harmonic oscillator. [10]

[4-a] Show how to explain the tunneling of low energy alpha particles from the radioactive substances of high potential barrier. [15]

[4-b] Write the components of the angular momentum operators $\hat{L}$ and calculate $[x^n, \hat{P}_x]$ and $[\hat{E}, t]$. [5]

With Our Best Wishes

Prof. Dr. A.R. Degheidy & Dr. B.Elkenany

Mansoura University
Faculty of Science
Botany Department
El-Mansoura, Egypt

جامعة المنصورة
كلية العلوم
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المنصورة - مصر

Final Examination in Botany First Term: Jan., 2016

Educational Year: Third Level **Program (Branch): Biophysics**

Course : Molecular Biophysics **Time: 2 hrs Date: 28 / 1 /2016 Full mark: 80**

Q-1- Choose the correct answer of 10 only (two marks/each):

1. What are the three basic steps of conventional PCR?
   a. Denature, anneal, & strand displacement
   b. Strand displacement, synthesis & release
   c. Denature, anneal & extension
   d. Reverse-transcription, anneal & extend

2. RNA is copied into complementary DNA (cDNA) by:
   a. Taq DNA polymerase
   b. Reverse transcriptase
   c. RNA polymerase II
   d. Uracil-N-Glycosylase

3. Which of the following is an advantage of nested PCR (nPCR)?
   a. Provides a quantitative assessment of initial starting copy number
   b. Second round PCR products can be a source of laboratory contamination
   c. Is less time consuming than single round conventional PCR
   d. Typically has high sensitivity and specificity

4. Which is not a property of real-time PCR assays?
   a. Incorporate dyes that bind double-stranded DNA
   b. Incorporate an internal hydrolysis probe
   c. Be performed at single temperature with no specialized instrumentation required
   d. Be interpreted as a plus / minus result or as a quantitative result

5. RNA is highly stable and can be frozen and thawed many times without degrading.
   a. True b. False

6. Which of the following is a character of histones?
   a. are special highly conserved proteins
   b. are divided into 5 classes
   c. are positively charged proteins that bind to DNA
   d. all of the above

7. Which of the following is not a character of chromosomes?
   a. Made up of nucleosomes
   b. Segregated through division
   c. Carry genes
   d. Diploid in normal gametes

8. The traits that produce by the genotype are called the phylogeny
   a. True
   b. False

9. the case in which a mutation in one gene masks the effect of another gene is called
   a. Dominance
   b. Epistasis
   c. Equilibrium
   d. Heterosis

10. Which of the following is a step of gene cloning
    a. Cut of DNA
    b. Isolation of DNA
    c. Join DNA
    d. All of the above

11. Genetic information is expressed through the transfer of information from.
    a. DNA to RNA to DNA
    b. RNA to protein to DNA
    c. Protein to RNA to DNA
    d. DNA to RNA to protein

Q2: Nominate 10 types of PCR and describe only one type. (20 Marks)

Q3: Answer the following using labeled diagram only: (20 Marks)

1- Supercoiled chromatin Loops.
2- Central dogma in molecular biology.
3- Difference in transcription between prokaryotes and Eukaryotes.

Q4: Answer the following. (20 Marks)

1. What are the characters of restriction enzymes?
2. What are the types of RNA?
3. Draw the genetic engineering map.

Best of luck: Dr. Ashraf A. Elsayed