

Answer the following questions :

(1) a - Consider the operator  $\hat{A}$  ,

$$\hat{A}\psi(x) = \psi^*(x)$$

i - is  $\hat{A}$  Hermitian ?

(5 marks)

ii - What are the eigenfunctions of  $\hat{A}$  ?

(5 marks)

iii - What are the eigenvalues of  $\hat{A}$  ?

(5 marks)

b - Prove that for the free-particle Hamiltonian  $\hat{H}$  is Hermitian .

(10 marks)

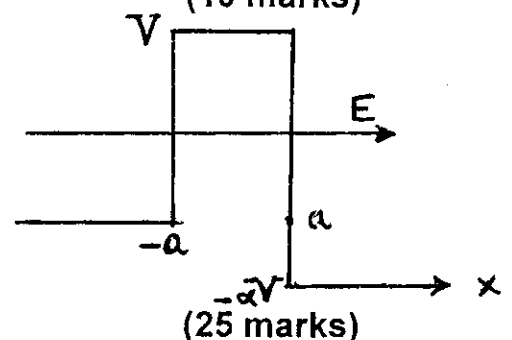
(2) a - Calculate the expectation value of the potential energy for a harmonic oscillator.

(15 marks)

b - Derive the grounded state wave function of the harmonic oscillator

(10 marks)

(3) Calculate the transmission coefficient for the shown configuration if the energy of the incident beam is smaller than the potential energy  $V$ .  $\alpha$  is constant.



(25 marks)

(4) Consider a one-dimensional box centered at the origin, its walls at

$x = \frac{1}{2}L$  ,  $x = -\frac{1}{2}L$  . At  $t = 0$  the particle in the state :

$$\Psi(x,0) = \sqrt{\frac{2}{21L}} \left[ \cos\frac{\pi x}{L} + 2 \sin\frac{2\pi x}{L} + 4 \cos\frac{3\pi x}{L} \right]$$

a - What is  $\Psi(x,t)$  ?

(6 marks)

b - What is the probability  $P(E_n)$  ?

(6 marks)


c - Calculate  $\langle E \rangle_{t=0}$  .

(6 marks)

d - Calculate the expectation value of parity

(7 marks)

فزياء حيوية

	TANTA UNIVERSITY FACULTY OF SCIENCES			
	DEPARTMENT OF PHYSICS			
	EXAMINER: <i>PROF. DR. RAYED A. H. GHAFAY</i>			
TITLE:	<i><u>molecular biophysics 1</u></i> <i>Bio-Physics Students</i>		CODE:BP3112	
DATE:	16/01/2017	TERM: 1 <sup>st</sup>	TOTAL MARKS:200	PERIOD: 2 H <sup>rs</sup>

فضلا اجب عن الاسئلة الاتيه:

1- By using the Stokes- Einstein equation prove that the diffusion constant of a particular molecular species depends on the nature of the molecule and the solvent? And derive the relationship between the molar mass and the diffusion constant of a molecule?

2- Define the following:

- a- Fick's law formulas;                      b- Flux of particles;                      c-  
Osmosis;
- d- t Hoof's law;                                      e- Plasmolysis;                                      f-  
Reverse osmosis;
- g- Molar conductance; and                      i- electrophoretic mobility?


- Explain physically the osmosis process between roots and ground water?

3- Estimate and explain the condition of the vessel's burst?

- Explain the factors which contributing to the semipermeable nature of membranes showing how you can apply the Fick's law to the transport of molecules across a biomembrane?

4- Name the molecular models and explain how you can get on one kind of energy of a diatomic molecule?

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<b>Tanta University- Faculty of Science-Department of Physics</b> <b>Examination for Senior (Third level) Students of Biophysics</b>			
	<b>Course title</b>	<b>Biophysics of nervous system</b>	<b>course code:BP3154</b>
<b>Date:</b>	26/ 1/ 2017	<b>term:</b> 1st	<b>Total assessment marks:</b>
			<b>Time allowed:</b> 2hours

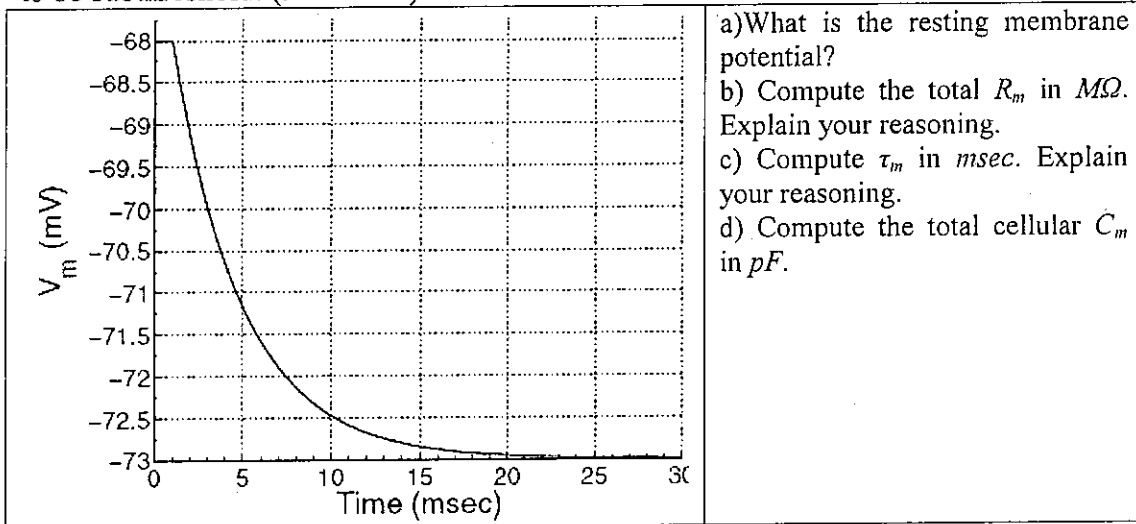
(Answer the following question)

**First question (25 marks)**

a- Discuss in brief the mechanisms of diseases and drugs in cells of nervous system?

(10 marks)

b- A negative stimulus of  $-20pA$  was applied to a membrane at  $t = 1msec$  and produced the following trace. Note that hyperpolarizing pulses are always considered to be subthreshold. (15 marks)



- a) What is the resting membrane potential?
- b) Compute the total  $R_m$  in  $M\Omega$ . Explain your reasoning.
- c) Compute  $\tau_m$  in msec. Explain your reasoning.
- d) Compute the total cellular  $C_m$  in pF.

**Second question (25 marks)**

a- Describe with drawings the different mechanisms of neurons connections? (13 marks)

b- Discuss in brief with drawings and mathematical relations multicompartment models for branches and soma of neurons? (12 marks)

**Third question (25 marks)**


a- Describe in brief Traub model of the pyramidal neurons? (10 marks)

b- Explain in details Hodgkin-Huxley model for modeling the potassium conductance? (15 marks)

**Fourth question (25 marks)**

a- Prove that the equation of mathematical core conductor for the passive potential propagation in dendrites given by  $\lambda^2 \frac{\delta^2 V_m}{\delta x^2} = \tau_m \frac{\delta V_m}{\delta t} + V_m$ ? (15 marks)

a- Write short notes on the following: 1) neural imaging by optical technique and 2) Functional Magnetic Resonance Imaging? (10 marks)

	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS		
	EXAMINATION FOR JUNIORS (THIRD LEVEL) STUDENTS OF PHYSICS (SEMESTER 1)		
COURSE TITLE:	ELECTRICAL CIRCUITS دوائر كهربائية طلاب المستوى الثالث (شعبة الفيزياء والفيزياء الحيوية)		COURSE CODE: PH3151
DATE: 2	JANUARY, 2016	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100 TIME ALLOWED: 2 HOURS

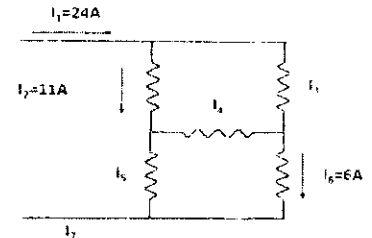
**Answer The Following:**

**First question:**

{24 Marks}

- a) Define the following: (12Marks)
- 1) Kirchhoff's current law.
  - 2) Kirchhoff's voltage law.
  - 3) Norton's Theorem.

- b) Determine the magnitude and the correct direction of the unknown currents in the network of figure 1.

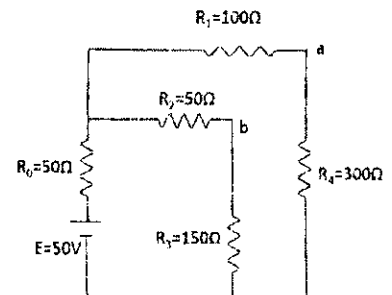


**Fig. 1** (12 Marks)

**Second question:**

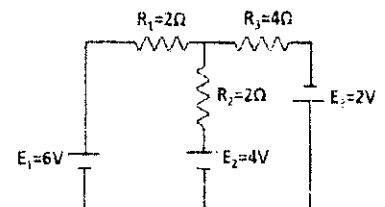
{28 Marks}

- a) For the network shown in figure 2 find:
- 1) The total Resistance  $R_T$ .
  - 2) Calculate the voltage  $V_{ab}$ .



**Fig. 2** (14Marks)


- b) Find the current in each branch of the network in figure 3 using branch-current analysis.



**Fig. 3** (14 Marks)

Please turn over  
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	TANTA UNIVERSITY FACULTY OF SCIENCE DEPARTMENT OF PHYSICS		
	EXAMINATION OF (THIRD YEAR) STUDENTS OF PHYSICS (CREDIT HOURS)		
COURSE TITLE:	Atomic spectroscopy		COURSE CODE: PH3141
DATE: 31\12\2016	TERM: FIRST	TOTAL ASSESSMENT MARKS:100	TIME ALLOWED: 2HOURS

**Question(1):-**

- Derive that the ratio between the major and minor axes is equal the ratio between the azimuth and principle quantum numbers.  $k/n = b/a$  (15Marks)
- Find out the longest wavelength of Balmer series transitions of hydrogen atom, then find the end of the series. ( $m=9.035 \times 10^{-28}g$ ,  $e=4.77 \times 10^{-10}$  e.s.u.  $h= 6.0547 \times 10^{-27}$  erg sec) (5 Marks)
- Compare between positron and positronium. (5 Marks)

**Question(2):-**

- Derive that the group velocity of the De Broglie waves is the same as that of the particle. (10 Marks)
- Discuss in details about:- (15Marks)  
Diffraction Grating Spectrograph- Wien's displacement Law  
Energy level diagram of hydrogen atom

**Question(3):-**

- Derive the Rutherford scattering formula, where: (20 Marks)

$$N(\theta) = \frac{N_1 n t z^2 e^4}{(8\pi\epsilon_0)^2 r^2 T^2 \sin^4(\theta/2)}$$

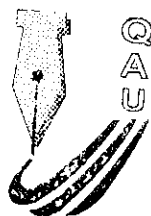
- The wavelength of the photoelectric threshold of Tungsten is 230 nm. Determine the energy of the electrons ejected from the surface by ultraviolet light of wavelength 180 nm. (5Marks)

**Question(4):-**

- State the three Bohr's assumptions and write the equation of each one with the meaning of each symbol. (15 Marks)
- Discuss Compton experiment in details. (10 Marks)

EXAMINER	DR. Shrouk F. Elashry
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أطيب التمنيات بالتوفيق ☺



وحدة ضمان الجودة  
كلية العلوم - جامعة طنطا  
QUALITY ASSURANCE UNIT  
FACULTY OF SCIENCE - TU

فيزياء تجريبية

Tanta University- Faculty of science

Physics Department-Final Exam – January 2016-2017

BP3156 for 3<sup>rd</sup> year- Time: 2 h

Answer the following question :

(25 marks for each one)

1-If the position vector connecting the origin O to the point A on a body is given by  $\vec{r} = (-2\cos 60 \hat{e}_1 - 2\sin 60 \hat{e}_2) \text{ m}$ . Find the moment of the force  $\vec{F} = (2 \hat{e}_1 + 20 \hat{e}_2) \text{ N}$  acting through the point A on the body.

2-(a) Prove that the linear momentum is conserved ( i. e.),

$$\sum_i \vec{F}_i - \frac{dL}{dt} = 0, \text{ where } F_i \text{ an external force, } L \text{ is the linear momentum.}$$

(b) Compute the moment generated by dumbbell weight 20 kg at the shoulder of an athlete whose arms 0.66m, and makes an angle  $30^\circ, 45^\circ, 90^\circ$  with vertical axis.

3- Determine the conditions of jumping considering a model of mass M representing the weight of the upper body is connected to two slender rods each of length L.

4-Prove that the angular acceleration for the swinging motion of a rod with uniformly distributed mass in a vertical plan is given by :

$$d^2\theta / dt^2 = - (3g/2L) \sin \theta$$

where  $\theta$  is angle between slender rod and the vertical , dm is mass rod element , L is its length , g is acceleration of gravity.

فيزياء ترمين



Tanta University  
FACULTY OF SCIENCE

PHYSICS DEPARTMENT

Course Title

Energy Physics Exam

Course Code PH3132

Date || Jan 2017

Term : First

Total Assessment Marks : 100

Time Allowed : 2 hours

**Answer the following questions:**

1.a. An 80 kg skydiver has a speed of ( 60 m/s) at an altitude of ( 800 m) above the ground. Determine his kinetic energy, potential energy and his total mechanical energy (  $g=10 \text{ m/s}^2$ ). ( 8 Marks)

b. Explain the thermodynamics laws. ( 8 Marks)

c. Explain the importance of "Energy Conservation" and discuss its issues. ( 9 Marks)

2.a. Define the following:

Electrical energy, critical mass, binding energy, black body, and nuclear forces. ( 10Marks)

b. Explain the "Energy Balance Equation". ( 5 Marks)

c. Draw a schematic diagram to explain the wind mill function. (10 Marks)

3.a. Explain what is meant by "Global Warming" and greenhouse gases. (10 Marks)

b. Draw a schematic diagram of the "Flat-Plate Solar collector" and describe its function. (10 Marks)

c. Draw a diagram to explain how to make use of sensible heat storage of solar energy. (5 Marks)

4.a. Discuss the advantages of renewable energy resources (10 Marks)

b. Explain the difference between fusion and fission nuclear reactions and how to generate useful energy out of them. (10 marks)

c. Describe briefly how it is possible to generate energy out of hydropower. (5 Marks)

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