		TANTA UNIVERSITY	
		FACULTY OF SCIENCES	
		DEPARTMENT OF PHYSICS	
	EXAMINER:	PROF. DR. RIYAD A.M. GHAZY	
COURSE TITLE:	*molecular biophysics01*		COURSE CODE: BP3112
DATE:	01/01/2022	TERM: 1ST	TOTAL ASSESSMENT MARKS:200	PERIOD: 2 HES

Answer the following -

1-   A: Write-down the kinds of physical models of molecules?

B: The observed vibrational frequency of iodine molecule(I_2) is $\tilde{v}=\omega_e=213$ cm^{-1}. Knowing the mass of each iodine atom(m=21.08x10^{-26} Kg);

-    Name the kind of that molecule;

-    Calculate its reduced mass; and

-    Calculate the elastic constant of that molecule.

2-   A: Write-down the state of Fick's law for diffusion and its different formulas?

B: Derive an equation by which one can determine the quantum value of the rotational energy of a diatomic molecule?

3- A: Explain the diffusion phenomena showing the role of diffusion constant D, frictional coefficient f, molecular radius r, molecular mass M, and time of diffusion t? Give a numerical example?

B: "Electrical current in cells and organisms is not carried by electrons." Explain showing the following: Ohm's law, conductivity, molar conductance, Kohlrausch law, electrophoretic mobility with its kinds, and molar conductance.

4- Explain in details the physics of t'Hoof's law in terms of osmosis process and its pressure Showing the following: role of osmosis process in plant cells; reverse osmosis process, osmosis between plant's roots and groundwater through turgor process,   plant's standing up; and tall tree?

EnD

Answer the following questions (Each question 25 Marks)

Q1: Discuss Neuronal imaging and Neural stimulation and their importance?

Q2: Write short notes on:

1. The Traub model of Pyramidal neuron
2. The lumped models and multicompartment models for neural branches
3. Synapse function (with drawing)

Q3: Describe Hodgkin-Huxley model for potassium current and discuss properties of neuronal action potential?

Q4: Derive a relation for passive propagation of action potential in dendrites (core model) and then give notes about solitary conduction?

With best regards
Associate Prof. Reda Morsy

Question 1: choose the correct answer

1- Liver is called a (first class – second class – third class) liver

2- Spatial positions of various parts of the human body can be described referring (Cartesian – spherical – cylindrical)

3- …….. is rotational motion that brings 2 adjoining long bones closer to each other (flexion – extension – abduction)

4- ……… denotes rotation in opposite direction of flexion (extension – abduction – Liver)

5- ……… is the movement away from the longitudinal axis of the bod (abduction - extension – flexion)

6- The rotation of the head could be to the (left – right – both)

7- The axial skeleton is composed of (22 - 33 – 44) bones of the skull

8- The human skeleton is acted on by approximately (420- 430 – 440) different skeletal muscles

9- The average length of the vertebral column among adult is (71 – 61 – 51) cm

10- the vertebral column protects the (nerve cord – liver – stomach)

11- most of the bod weight lies (in front of – behind – between) the vertebral column during standing

12 -there are (12 – 13 – 14)pairs of ribs in thoracic cage

13- there are (126 -127 -128) bones in the appendicular skeleton

14- in the appendicular skeleton there are (300 – 400 – 500)act on them to cause movements

15- the (wrist – leg –lamb) consist of 8 carpal bones

16- spongy bone is present at the expanded areas like (head – wrist – leg)

17- ………. (flat bones – spongy bones – hard bones) form the roof of the skull

18- ………. (sutural bones - flat bones - spongy bones) are small ,flat and oddly

19- .... (sesamoide bones - sutural bones - flat bones) are usually small , round and flat

20- Cells constitute approximately (2 – 5 – 8)% of the mass of a typical bone

21- According to Newton's first law the force equal to (ma - mc - hg)

22- The size and the shape of the ball in Newton's law must be (take into account - neglected - deleted)

23- There are (layers - rooms - roofs) of muscles in the muscular system

24- The muscles have the capacity to extend at the hip and flex at (knee - eyes - arm) 5- the muscles stabilizer the (shoulders - legs - hands)

26- when an agonist contacts to produce a (particular - normal - vertical) movement

27- according to Newton's first law a building is at rest because its (weight - mass - velocity)

28- the force is (directly - inversely - none of them) proportional to the mass

29- the magnitude of acceleration will be (equal - larger - smaller) the magnitude

30- the result force on the object must equal to (zero - 100 - 1)

31- Muscles are composed of (bundles - regions - rooms)

32- Bundles of skeletal muscle fibres encased by a connective tissue layer called (epimysium - fiber - muscles)

33- Bundles are separated from each other by (connective tissue fiber - paranchematic layer - skeletal muscle)

34- Fibers converge at each end of the muscle to form (tendons - arm - trachea)

35- Approximately (70% - 20% - 10%) of all tendon injuries are sports related 6- Muscle fibres measure as much as (30 - 50 - 10) cm in length

37- muscle fibres can produce a tensile force of (50 - 10 - 2) N/cm

38- shallow (pear shaped - circular shaped - oval shaped) cavity of the scapula

39- tendons (only - not only - both of them) transmit the muscle force of the end of the bones

40- density is directly proportional to the (mass - velocity - power)

41- The axial skeleton composed of (22 - 55 - 73) bones

42- (7 - 10 - 22) bones associated with the skull

43- The axial skeleton acted on by approximately (420 - 440 - 405)

44- The vertebral column protected the (spinal cord - kidney - liver)

45- The human skeleton is divided into (two - three - four) regions

46- The vertebral body is in the form of a (flat cylinder - oval - square)

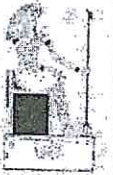47- The disks (allow - not allow - both of them) motion between the vertebrae

48- The motion of the head with respect to the shoulders is called (gliding motion - harmonic motion - forced motion)

49- Skeletal muscles (support - weak - hurt) the scapula

50- There are (parallel - coaxial - series) bones that support the forearm

Question 1: put true or false

1. The only direct connection between the shoulder girdle and the axial skeleton isthe joint between the sternum and ribs.
2. approximately 710 muscles pull on various parts of the skeleton
3. The transverse plane is made up of the X1 and X2 axes.
4. The vertebral body is in the form of a flat cylinder
5. The vertebral body is found anteriorly and the vertebral arch is found posteriorly in the vertebra
6. The axial skeleton is attached with approximately 420 different muscles
7. The intervertebral disks make up approximately 50% of total length of thevertebral column
8. erector spinae is the main muscle group in the lower back
9. about 40 of the body weight is composed of muscles
10. The neck muscles pull on the skull in a second class lever system
11. The action of biceps on the fore, arm constitutes a first class lever system
12. Cross section, is an imaginary sectioning of human body that is parallel to thesagittal plane
13. The ribs arise on thoracic vertebrae are connected to the sacrum by cartilaginousextension.
14. There are 12 pairs of the ribs in the thoracic cage
15. Transverse plane passes through the hip bone and lies at a right angle to the long axis of the body
16. Spatial positions of various parts of the human body can be described referringto a spherical coordinate.
17. The tibia is excluded from the knee joint and does not transfer weight to the ankle and foot.
18. the knee and elbow are example of hinge joints
19. a ball-and-socket joint allows rotation in four direction
20. muscles are composed of bundles of long and thin cells called the epimysium
21. muscle fibers measure as much as 30 cm in length.
22. roughly one third of matrix of bone consists of collagen fibers
23. Bone, is a bi dead tissue
24. ligaments support the joints by holding the ends of bones together

25. Tendons support, body or Guns such as liver and hold teeth in the jawbone
26. fibroblasts secrete hyaluronic acid.
27. shoulder can be example for ball and socket
28. shoulder joint allows the greatest range of motion of any joint in the body
29. the bone growth rate drops to about 10 % per year by age 3
30. Tendons are necessary to keep multiple bone segments in place than a large number of ligaments,
31. the muscle fibers are surrounded by a delicate network of reticular fibers calledthe endomysium.
32. the faster a fiber shortens, the less force it can exert
33. muscle fibers contains hundreds of smaller strands called myofibrils.
34. muscle cells convert chemical energy found in fatty acids and blood sugar glucose into movement The smallest contractile unit of my fibril is called a sarcomere
35. the force of contraction depends strongly on the temperature
36. in the contracted state, a muscle fiber can produce a tensile force of 50 N/cm ofcross sectional area
37. sarcomere is composed of thin and thick filaments, the the actin rich filaments iscalled thick filament and the myosin, rich filament is called thin filament
38. The humerus muscle is spades in shape.
39. The function of the pectoralis minor is to Move the shoulder girdle
40. Trapezoid muscles are located on the upper region of the back just below the neck
41. obliques are responsible for moving the lower body from side to side.
42. Actin and myosin are, vitamins molecules that are associated with motility inliving systems
43. Triceps, group of five muscles.
44. The arm contains 70 muscles.
45. The quad muscle, rectus femoris and the calf muscle act on a single joint
46. deltoids of the shoulder multipennate muscle group consists of 12 muscles located on the upper side of the arms
47. latissimus dorsi. is the smallest muscle grouped of the upper body
48. Adductors are located on the inside area of the lower leg
Gastrocnemius located on the back side of the lower leg below the knee
49. We call the motion of a body planar when all particles of the body moves in parallel plane (true - false)
50. In this eqn v=(dØ/dt)s[cosØ e¹+sinØ e²], the rod rotates counterclockwise when dØ/dt is negative (false – true)

Answer the following questions:

First question:- (25 Marks)

- Find the reflection and the transmission coefficient for a particle of a mass m incident from left, i.e, from x→ - ∞ , the step- potential $V(x)=\begin{cases} 0 & for\ x < 0 \\ V_0 & for\ x > 0 \end{cases}$ where V_0 is a real positive constant, the energy of the incident particle is less than the height of the barrier $E < V_0$.

Second question: - (25 Marks)

- Use the annihilation and a creation operators for calculating the eigenvalues of energy for a one dimensional Harmonic oscillator.

Third question:- (25 Marks)

- A particle of mass m moves inside a potential box its walls at $x = 0$ and $x = L$. At $t = 0$ the initial state function is $\psi(x, 0) = \frac{(3\phi_1+\phi_2+7\phi_5)}{\sqrt{59}}$, where $\psi_n = \sqrt{\frac{2}{L}} \sin \frac{n\pi x}{L}$

a- Prove that ψ is normalized.
b- What is the probability of finding the particle in each state
c- Calculate $\langle E \rangle$ at $t = 0$
d- What is $\psi(x, t)$

Fourth question:- (25 Marks)

- Calculate the adjoint operator of $\frac{d}{dx}$.
- Prove that the kinetic energy operator is Hermitian operator.

EXAMINER	Prof. Dr. Nabil Elsiragy
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Answer the following questions:

1. a. Discuss the thermodynamic laws . (10 marks)

   b. Define the following physical terms using SI units: Energy, Power, black body, efficiency, and Mechanical energy. (10 marks)

   c. Prove that j = C V (5 marks)

2. a. Define the electrical energy and discuss its characteristics.

   (10 marks)

   b. Compare between the "Binding Energy" and the "Nuclear Forces" inside the nucleus. (10 marks)

   c. Discuss the "Global Warming" issues. (5 marks)

3. a. Compare between nuclear fission and nuclear fusion reactions. Give examples showing the importance of both types.

   (10 marks)

   b. Discuss the storage of sensible and latent heat in thermal energy applications of solar energy. (10 marks)

   c. Discuss the "Energy Conservation" issues. (5 marks)

4. a. Draw a schematic diagram of the "Flat-Plate Solar Collector" and describe its working function. (10 marks)

   b. Draw a schematic diagram of the wind mill and describe its working function. (10 marks)

   c. Discuss the "Energy Balance Equation". (5 marks)

   Good Luck

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EXAMINATION FOR **THIRD YEAR** STUDENTS OF BIOPHYSICS (SEMESTER 1)

COURSE TITLE:		ELECTRICAL CIRCUITS	COURSE CODE: PH3151
DATE: 27 DECEMBER, 2022	TERM: FIRST	TOTAL ASSESSMENT MARKS: 100	TIME ALLOWED: 2 HOURS

Answer The Following:

First Question (25 points):

1-(10 points) What is the difference between fuse and circuit breakers?

2-(5 points) complete and **give reason** for:

Ideal current sources have internal resistance value of……. Connected in ……………

3-(10 points) draw the waveform and phasor forms of the following equations and find their phase difference. V=20 sin(ωt+40) V. and I=10 cos(ωt-50) mA.

Second Question (25 points):

1-(15 points) complete and **give reason** for

  1) To convert between current source and voltage source there are three conditions……………

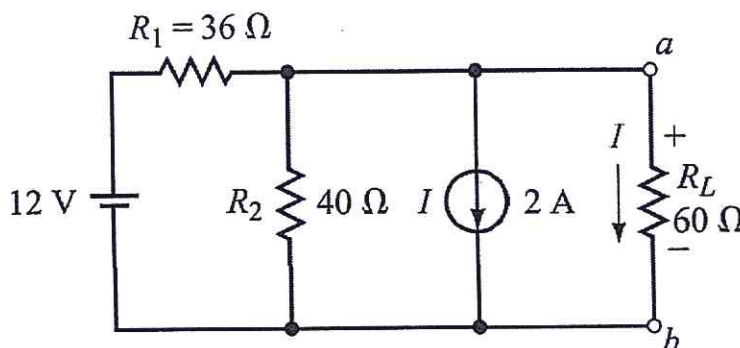 2) The law of conservation of energy in electrical circuits states that …………………

2-(10 points) using the mesh loop technique find the current in each loop of the following circuit when the load resistance is set to 5KΩ
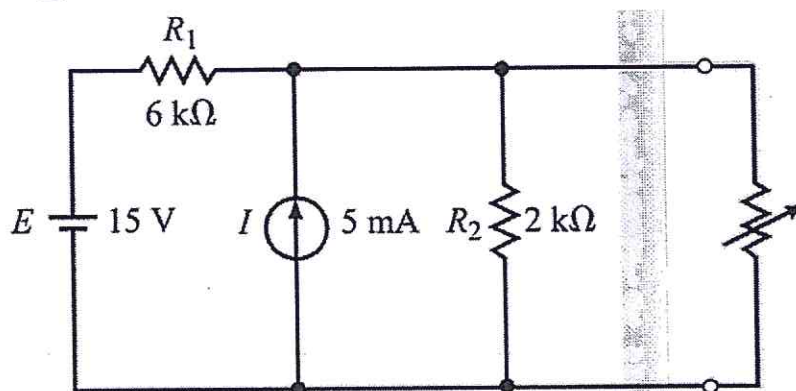
Third Question (25 points):

1- (5 points) Define: integrator circuit.

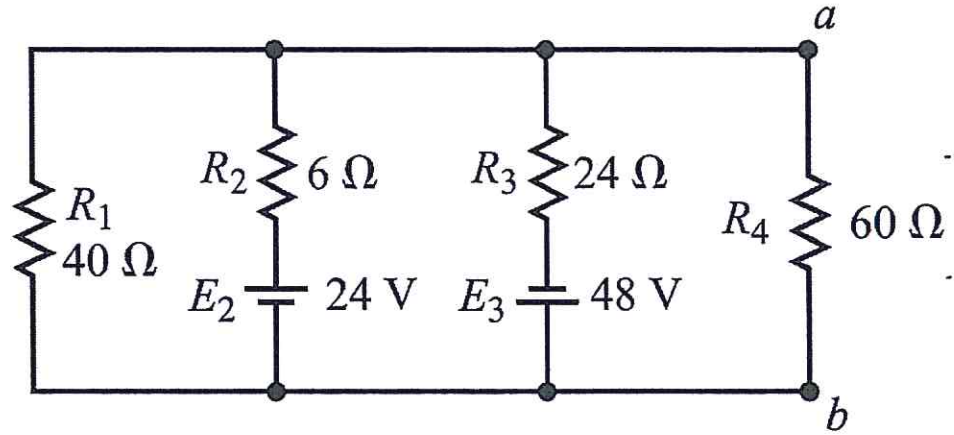2- (10 points) using the superposition theorem, find the voltage across the load resistance

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3- (10 points)
Find the Norton
equivalent
circuit between
points a and b.

Fourth Question (25 points):

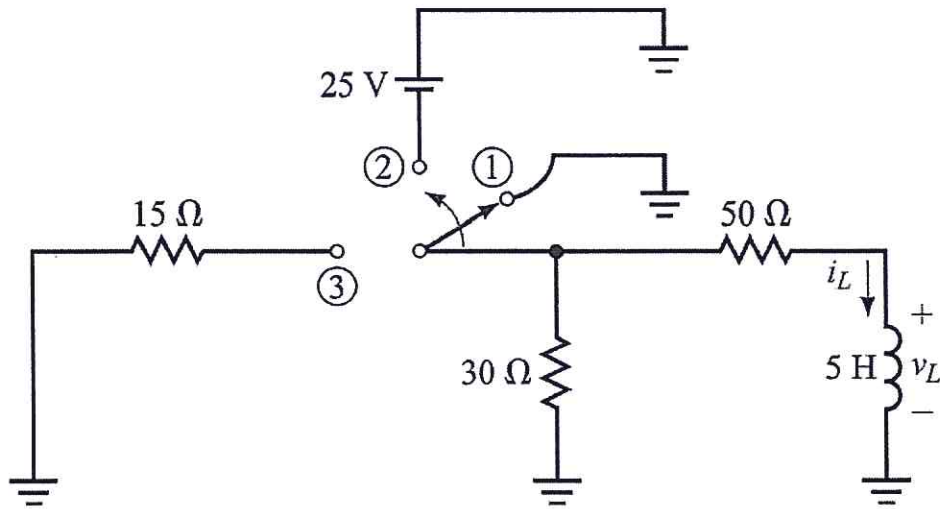1-(15 points) define:

Steady state

Kirchhoff's current law

Stray capacitance

2-(10 points) In the following circuit, when the switch is set to position 2 the circuit is energizing the inductor with energy. When the circuit reaches steady state find:

-The currents in all the branches.

-The voltage across the inductor VL.

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