BIOPHYSICS : Open Book Test

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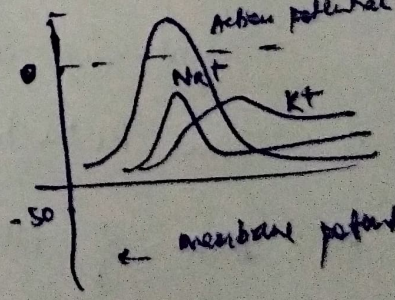
Ans 1. Modelling and simulation is use of a physical and logical representation of a given system to generate data and help determine decisions or make predictions about the system.

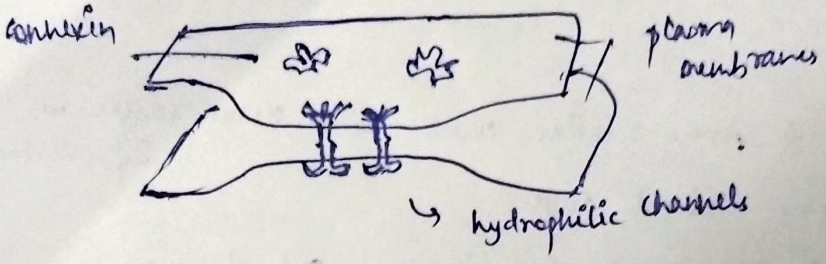
Applications :

- Simulating the effect of severe weather events like storm surges on infrastructure to guide design of more resilient system
- Creating a program to model a social situation and observing the behaviour of individuals in the simulations when it runs.
- Simulating physical how a physical change to a system will affect its performance.

Ans 2. The Hodgkin-Huxley (HH) model describes the phenomenon of action potential generation in neurons. The model was applied to the squid Giant Axon and later generalized to other neurons. This mathematical model was developed by Sir Alan Hodkin and Sir Andrew Huxley. The squid Giant axon is notable for its extraordinarily large diameter. They systematically demonstrated how the macroscopic ionic currents in squid axon could be understood in terms of charging Na^+, K^+ conductance in axon membrane.



Ans 3. Gap junctions are aggregates of intercellular channels that permit direct cell-cell transfer of ions and small molecules. Initially described as low-resistance ion pathways joining excitable cells, gap junctions are found joining virtually all cells in solid tissues.



Functions:

↳ Embryonic, organ and tissue development
- embryos with areas of blocked gap junctions was unclear but it was undertaken to elucidate the mechanism.

↳ Cell Death - when cells are compromised due to disease or injury and start to die messages are transmitted to neighbouring cells connected by gap junctions.

↳ Tissue Restructuring

↳ Areas of electrical coupling → Heart and Neurons.

Ans 4. Forward and Backward Euler method are adjoint to one another.

Forward euler gives an explicit update equation, so it is easier to implement in practice. On the other hand, backward euler requires solving an implicit equation making it more expensive and have greater stability.

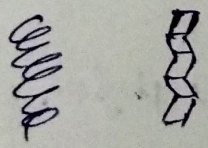
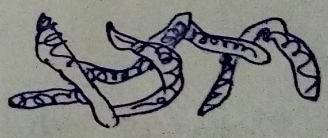
For a general linear equation both forward and backward Euler methods are of first order accuracy so each will have the same error reduction properties.

Ans.5 Whole cells computational models aims to predict cellular phenotypes from the genotype and the environment by representing the function of each gene, gene product, and metabolite.

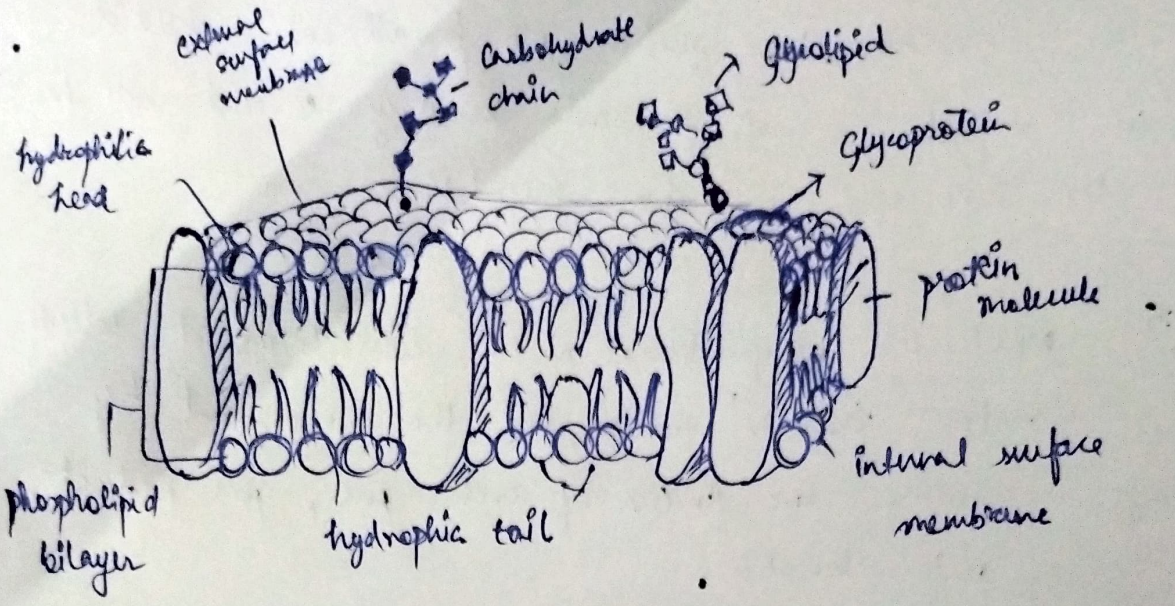
Principles and methods required by WC:

- Measurement methods
- prediction tools
- emerging methods and data repositories
- scalable model design
- calibration and verification.

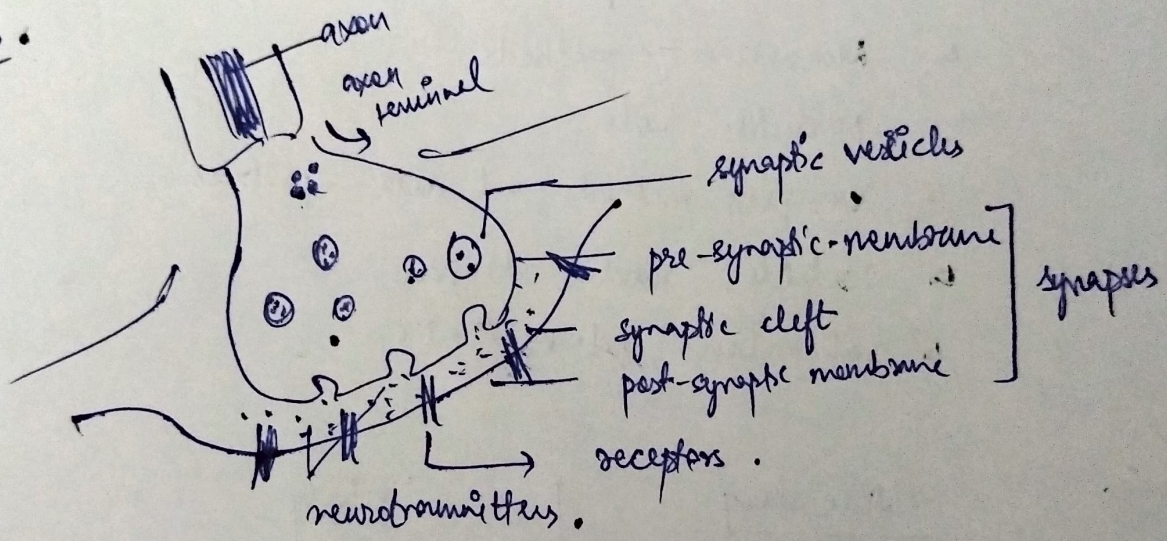
Ans.6.

Secondary	Tertiary
	
→ folding of a pptide chain.	→ three-dimensional structure.
→ either α-helix or β-sheets.	→ globular proteins.
→ encompasses hydrogen bonds	→ encompasses disulphide bonds, salt bridges, H-bonds.
→ involved in forming structures such as ligaments, skins, etc.	→ involved in metabolic functn of the body.
→ forms collagen, elastin, elatin.	→ includes enzymes, haemoglobin.

Ans 7.



Ans 8.



Ans 9. Biophysicist study the chemical and physical principles of living thing and of biological process, such as cell development, growth, heredity and diseases. An important contribution of biophysict to biology is the perspective that biological process can be understood from the interactions between and within the constituent molecules. Therefore, behavious of biological system can be predicted from physical principle.

Ans. 10

Electrocardiogram