Assignment - 2

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Q1. Place the following events in chronological order from 1-8:

___3___ Na^+ enters the cell, and depolarization occurs to approximately +30 mV.

___1___ The voltage across the cell membrane is -70 mV, the resting membrane potential.

___4___ Upon reaching the peak of the action potential, the VG Na^+ channels are inactivated by the closing of their inactivation gate and the activation gate of each VG K^+ channel opens.

___8___ VG K^+ channels close by the closing of their activation gate, and the resting membrane potential is gradually restored.

___2___ An excitatory postsynaptic potential depolarizes the membrane to threshold and the activation gate of VG Na^+ channels open.

___6___ Upon returning to the resting membrane potential, VG Na^+ channels are reset by opening of the inactivation gate and the closing of the activation gate.

___7___ VG K^+ channels are slow to close, resulting in an excess of K^+ efflux and hyperpolarization.

___5___ Depolarization occurs as K^+ flows out of the cell.

Ans. Order will be : 3, 1, 4, 8, 2, 6, 7, 5.

Q2. Determine whether the statement is true or false. If the statement is false, give reason for the same.
Before a second action potential can be generated, the concentration of sodium and potassium on either side of the cell membrane must be fully restored.

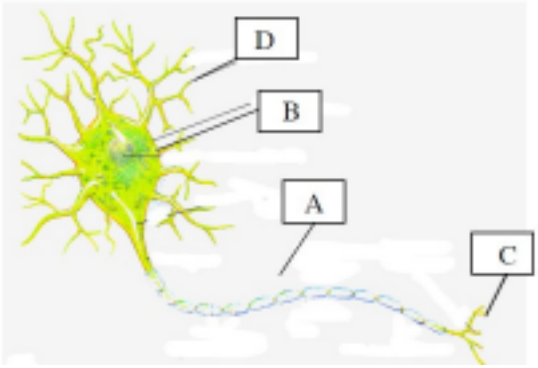
Ans. False. Only a relatively small amount of sodium and potassium ions move down their electrochemical gradient per any given action potential.

Q3. Determine whether the statement is true or false. If the statement is false, give reason for the same.
The strength of an action potential is represented by the amplitude of the wave. A stronger stimulus will generate an action potential with a higher peak than a weaker stimulus.

Ans. False. Upon reaching the threshold, an action potential will run its course irrespective of the strength of the initial stimulus so long as the stimulus is sufficient. It is the frequency of the action potentials which gives one the perception of strong or weak sensations.

Q4. Identify the major parts of the neuron shown here by putting the appropriate letter in each box for the structure connected to that box.

(A) Axon
(B) Cell body or Soma
(C) Synaptic Terminal
(D) Dendrites



Q5. Action potential:

(A) is a graded potential.
(B) is produced by subthreshold stimulus.
(C) starts with repolarization caused by outward movement of Cl^-.
(D) is conducted slower in thin nerve fibers.

Ans. (D)

Q6. Myelin sheath:

(A) Present in the myelinated and unmyelinated nerve fibers.
(B) Formed of lipoprotein complex and acts as an electric insulator.
(C) It is formed of successive wrappings of the membrane of Schwann cells.
(D) It is the cause of decreased conduction of nerve impulse.

Ans. (B)

Q7. As regard conduction of action potential in a nerve:

(A) in thick myelinated nerve fibers can reach up to 120 meter / second.
(B) can be increased by increasing calcium.
(C) can be increased by cooling.
(D) is conducted with decrement.

Ans. (A)

Q8. During depolarization:

(A) voltage activated Na+ channels open.
(B) the membrane becomes impermeable to Na+.
(C) when membrane potential reaches -55 m.v Na+& K+ fluxes occur at the same time.
(D) K+ ions diffuse outside.

Ans. (A)

Q9. Repolarization:

(A) Occurs at first gradually then becomes fast.

(B) Results from closure of sodium gates and opening of potassium gates.
(C) is represented by the ascending limb of the spike.
(D) is followed by the appearance of response.

Ans. (B)

Q10. Continuous conduction:

(A) occurs in myelinated nerve fibers.
(B) occurs by jumping of charges from one node of Ranvier to another.
(C) is relatively slow 0.5-2.0 meter / second.
(D) occurs in the neuro-muscular junction.

Ans. (C)

Q11. Match the columns:

Column I	Column II
(1) Includes both phagocytosis and pinocytosis	(i) Endocytosis
(2) Secretory vesicles fuse with the cell membrane, and the contents of the vesicle are eliminated from the cell.	(ii) Exocytosis

Ans. **(1) - (i), (2) - (ii)**

Q12. In monophasic action potential:

(A) One electrode is put inside and the other is put outside the same nerve fiber.
(B) The spike is a large wave of short duration.
(C) The spike is followed by positive after potential then negative after potential.
(D) The ascending limb of the spike is due to K+ efflux.

Ans. (B)

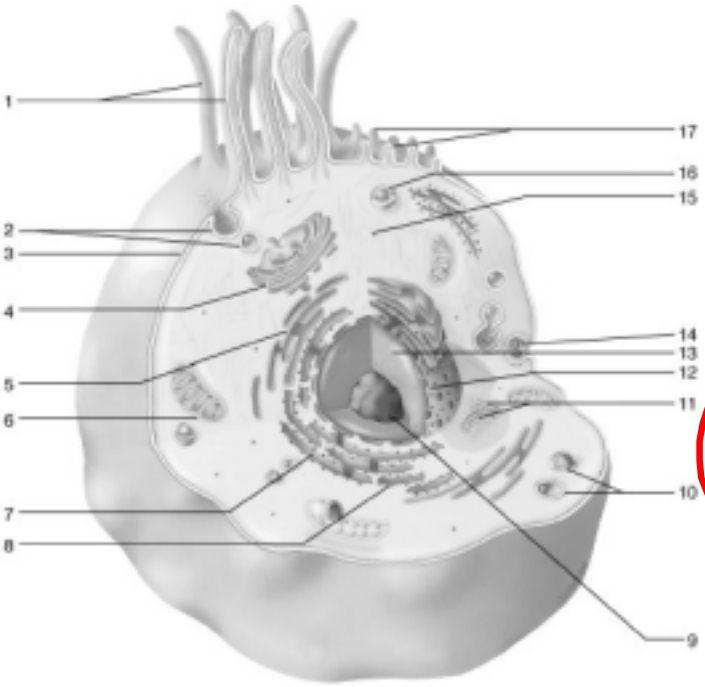
Q13. Match these terms with the correct statement or definition:

Axon	Dendrite	Collateral axon
Cell body	Myelin sheath	Nissl bodies

Cell body	Location of the nucleus and source of information for protein synthesis.
Nissl bodies	Areas of rough endoplasmic reticulum concentration in the cell body.
Dendrite	Usually receives information and transmits it to the cell body.
Axon	Long cell process from the cell body; conducts action potentials.
Collateral axon	Branch of an axon.
Myelin sheath	Insulating layer of cells around an axon.

Q14. Match the following:

Cell membrane
Centrioles
Cilia
Golgi apparatus
Lysosomes
Microvilli
Mitochondrion
Nuclear envelope
Nucleus
Nucleolus
Phagocytic vesicle
Cell membrane
Ribosome
Rough endoplasmic reticulum
Secretory vesicle
Smooth endoplasmic reticulum
Vesicles



1. Microvilli
2. Centriole
3. Cell Membrane
4. Golgi apparatus
5. Smooth Endoplasmic Reticulum
6. Mitochondrion
7. Rough Endoplasmic Reticulum
8. Vesicle
9. Nucleolus
10. Secretory Vesicle
11. Ribosome
12. Nuclear Envelope
13. Nucleus
14. Phagocytic Vesicle
15. Cytoplasm
16. Lysosomes
17. Cilia

Q15. Two proteins, myoglobin and hemoglobin, are compared.

1. Which characteristics are shared by these two proteins?

(A) They both are globular proteins containing the common amino acids, porphyrin, and iron.

(B) They both have closely related primary, secondary, tertiary, and quaternary structures.

(C) They both are composed of multiple subunits each of which contains a heme prosthetic group.

(D) They both have similar molecular weights and bind one oxygen molecule per protein molecule.

Ans. (A)

2. Which is a property of protein tertiary structure?

(A) Tertiary structures usually contain hydrocarbon R-groups in the interior of the protein where they can form hydrogen bonds.
(B) Tertiary structures usually contain hydroxyl R-groups on the exterior of the protein where they can favorably interact with water.
(C) A protein's tertiary structure can be predicted if the amino acid sequence is known by performing the Edman degradation.
(D) A protein's tertiary structure can be maintained by covalent salt bridges and non-covalent disulfide bridges.

Ans. (B)

3. Which is a characteristic of protein quaternary structure?

(A) A protein composed of identical subunits has quaternary structure but not tertiary structure.
(B) A protein composed of non-identical subunits contains two polypeptide chains with opposite charges.
(C) The quaternary structure of a multimeric protein always includes covalent crosslinks between the subunits.
(D) The quaternary structure of a multimeric protein always depends upon the primary structure of the subunits.

Ans. (D)

4. Which is a property of tertiary structure and quaternary structure?
(A) Both structures are stabilized by numerous covalent hydrophobic and hydrophilic interactions.
(B) Both structures have specific shapes that depend upon the amino acid sequence of the protein.
(C) Both structures form so that polar amino acid R-groups are found mainly in the interior of the protein.
(D) Both structures must contain multiple α-helices and β-pleated sheets connected by turns.

Ans. (B)

END