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**The major cation inside the cell is :**

- a. Na**
- b. Ca**
- c. K**
- d. PO<sub>4</sub>**

**The major cation outside the cell is :**

- a. Na**
- b. K**
- c. Ca**
- d. ATP**

**what is the difference between graded potential and action potential :**

- a. Graded potential allow communication over short distances while action potential over long distances**
- b. Graded potential arise mainly at trigger zone**
- c. Action potential is slower than graded potential**
- d. Action potential allow summation**

**Which of the following can strongly activate the Na /K pumps :**

- a. High Cl outside the cell**
- b. Low proteins inside the cell**
- c. High phosphate outside the cell**
- d. High Na inside the cell**

**Local anesthetics are drugs that block pain and other somatic sensation by :**

- a. Block the opening of K voltage gated channel**
- b. Accelerate the opening of Na voltage gated channel**
- c. Block the opening of Na voltage gated channel**
- d. Accelerate the opening of Ca voltage gated channel**

**All of the following are the difference between graded and action potential except:**

- a. Action potential is decremental**
- b. Action potential has a refractory period while graded potential not**
- c. Summation can occur in graded potential**
- d. Mechanical and ligand gated channels are present in graded potential**

**All of the following contribute to the resting state of action potential except:**

- a. High concentration of Na outside the cell**
- b. More Na channel in plasma membrane than K channel**
- c. The selective permeability of plasma membrane doesn't allow for protein and ATP to leave the cell**
- d. Electrogenic nature of the Na / K ATPases**

**What is the neurotransmitter in the NMJ :**

- a. Acetyl choline**
- b. Dopamine**
- c. Adrenaline**
- d. Noradrenaline**

**Why we need a lot of mitochondria in the terminal part of the neuron :**

- a. Synthesis of excitatory neurotransmitters (Ach)**
- b. Need for electrogenic Na / K pumps**
- c. Requires for exocytosis of the Ach vesicles**
- d. All of the above**

**Which channel in the presynaptic membrane opens when the action potential reach the terminal part of the axon:**

- a. Na voltage gated channel**
- b. K voltage gated channel**
- c. Cl voltage gated channel**
- d. Ca voltage gated channel**

**Which of the following facilitate exocytosis of the Ach vesicles :**

- a. flow of the Na ions inside the cell**
- b. flow of the Ca ions inside the cell**
- c. flow of the K ions outside the cell**
- d. flow of the Ca ions outside the cell**

**which of the following sentence is wrong about receptor in the post synaptic membrane in the NMJ :**

- a. it's a ligand gated channels**
- b. composed of 5 subunits**
- c. required 2 Ach molecules to open**
- d. in adults, the gamma subunit substitutes for an epsilon subunit in this receptor complex**

one of the following is true regarding botulinum toxin :

- a. block the acetylcholine gated channels
- b. block the synthesis of acetylcholine
- c. block the release of the acetylcholine from the presynaptic neuron
- d. block the Ca voltage gated channel

regarding myasthenia gravis :

- a. is an untreatable disease and we use drug to minimize the symptoms
- b. caused by excessive release of acetylcholine
- c. there is an increase of the AchRs and Ca voltage gated channels
- d. it's an autoimmune disease that affect the neuromuscular junction

which sentence is wrong about muscle structure :

- a. composed of repeated sarcomere
- b. 98% of fiber is innervated by multiple nerve ending
- c. The major structure is actin and myosin protein
- d. The sarcoplasmic reticulum storage high amount of Ca

The action potential reaches all muscles fiber due to presence of :

- a. Z line
- b. M line
- c. T tubules
- d. Titin

Which of the following receptor sense the action potential when it reached the T tubules :

- a. Ryanodine receptor
- b. Ca release channels
- c. Dihydropyridine receptor

Regarding troponin which one is true :

- a. Composed of four subunit
- b. Troponin I has strong affinity to actin
- c. Troponin T has strong affinity to titin
- d. Troponin C has strong affinity to chloride ions

Following the structure of the actin filament which one is wrong :

- a. Composed of actin, tropomyosin and troponin
- b. Actin backbone composed of triple stranded F-actin helix
- c. In resting state, the tropomyosin wrap on the top of active site of actin
- d. The strand of F-actin helix composed of polymerized G-actin molecules

Following the contraction cycle which one is wrong:

- a. The contraction of muscle requires Ca
- b. The myosin head need ATP to detachment from the actin
- c. The myosin head tilt the actin filament away from the arm of the cross bridge
- d. Before contraction ATP attach to the myosin head to become oriented and energized

One of the following process require energy in the muscle fiber:

- a. Release of the Ca ions from the sarcoplasmic reticulum
- b. Pulling the actin filament toward the M line by myosin head
- c. Require for entering of Na to the cell
- d. Uncovering the myosin binding site in the actin filament

The first source of energy that reconstitute the ATP is :

- a. Oxidative phosphorylation
- b. Aerobic glycolysis
- c. Anaerobic glycolysis
- d. Phosphocreatine

What is the importance of glycolysis:

- a. The rate of ATP formation 2.5 times rapid than classic ATP formation
- b. Can't occur in the absence of oxygen
- c. Lasting for long duration around 1 hour
- d. Happen in the mitochondria

All of the following are features of slow fibers except:

- a. Slow fiber is smaller than fast fiber
- b. Contain numerous numbers of mitochondria
- c. Have an extensive sarcoplasmic reticulum than fast fibers
- d. Posses high number of myoglobin, an iron-containing protein,

which of the following is characteristics of fast fibers:

- a. contain less blood supply compared with slow fibers
- b. depending on the oxidative phosphorylation as source of energy
- c. have low rate of ATP hydrolysis
- d. have high resistant to fatigue

what is the difference between red and white fibers:

- a. red fibers have slow contraction velocity than white fibers
- b. white fibers have an extensive sarcoplasmic reticulum compared with red fibers
- c. red fibers have less glycogen store than white fibers
- d. all of the above

regarding type 1 and type 2 fibers which one is wrong:

- a. type 1 fibers contain larger amount of iron-containing proteins than type 2 fibers
- b. type 2 fibers depend on glycolysis as source of energy
- c. type 2 fibers contain large amount of glycolytic enzyme
- d. All of the following are true



**The followings are events during excitation contraction coupling:**

1. generation of end-plate potentials
2. activation of chemical gated  $\text{Na}^+$
3. activation of voltage gated  $\text{Na}^+$  channels.
4. release of  $\text{Ca}^{++}$  from sarcoplasmic reticulum

**Slow muscles are depending MOST for their energetics during their**

- A) oxidative phosphorylation.
- B) creatine phosphate reserves.
- C) glycolysis.
- D) ATP reserves.
- E) adenylate cyclase.

**The absolute refractory period of an action potential:**

- A) a.is during the after hyperpolarization wave.
- B) b. refers to the membrane potential at resting state.
- C) c. coincides with the firing stage of an action potential.
- D) d. coincides (at the same time) with the lowest activity of  $\text{K}^+$  channels.
- E) e.is mostly when  $\text{Na}^+$  channels are closed and not capable for opening.

**Which of the followings is NOT involved in smooth muscle cells contractile mechanisms ?**

- A) activation of voltage gated  $\text{Ca}^{++}$  channels at the sarcolemma.
- B) release of  $\text{Ca}^{++}$  from intracellular stores.
- C) activation of phospholipase C.
- D) interaction of actin and myosin.
- E) phosphorylation of calmodulin.

**Which of the following pairs of events are NOT related to each other in skeletal muscle contractile mechanisms:**

- A) replacement of ADP with an ATP:
- B) rigor mortis: decreased ATP in the sarcoplasm.
- C) T tubules: transmission of action potentials.
- D) fatigue: increased Ach concentration in cleft.
- E) tetanization: frequency summation

**Which of the following events does NOT occur at all in skeletal muscle during excitation-contraction coupling:**

- A) activation of voltage gated  $\text{K}^+$  channels at the sarcolemma.
- B) depolarization of the sarcoplasmic reticulum.
- C) activation of voltage gated  $\text{Na}^+$  channels at the sarcolemma.
- D) action potential at T tubules.
- E) binding of  $\text{Ca}^{++}$  to troponin C.

**Decreased generation of motor end plate potentials can be a result of all the following conditions EXCEPT:**

- A) depletion of chemical gated  $\text{Na}^+$  channels at the motor end plate.
- B) decreased generation of action potential by motor neurons.
- C) inhibition of chemical gate  $\text{Na}^+$  channels at motor end plate.
- D) blocking of acetyl-choline esterase at motor end plate.
- E) inhibition of nicotinic receptors at motor end plate.

\* «اللهم أصلح قلوبنا، وأزل عيوبنا، وتولنا بالحسنى، وزينا بالتقوى،  
 واجمع لنا خير الآخرة والأولى، وارزقنا طاعتك ما أبقيتنا».