USMLE Uworld questions collection

I) A calcium isotope is taken up by resting skeletal muscle and stored in the sarcoplasmic reticulum. During contraction, the isotope will bind to which of the following?

A. Actin

B. Myosin

C. Tropomyosin

D. Troponin

E. Protein kinase A

II) Verapamil (calcium channels blocker) can be used in patients with arterial hypertension due to its vasodilatory properties. It also affects cardiac contractility but has no effect on skeletal muscles. Which of the following properties of of skeletal muscle is responsible for its resistance to the effect of verapamil?

A. No internal automaticity

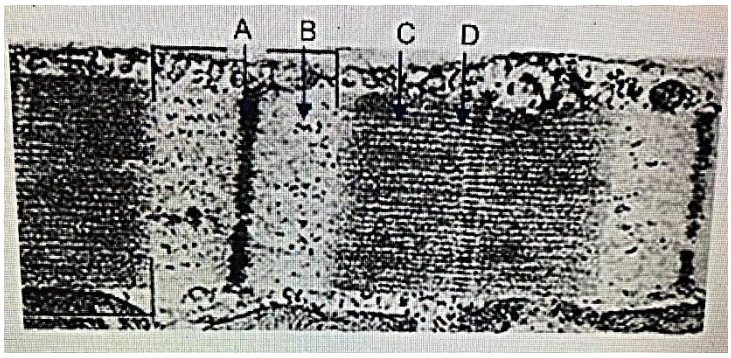
B. Calmodulin-independent excitation-contraction coupling

C. Troponin C affinity to intracellular calcium

D. Dependence on intracellular calcium pool

E. Elaborate T-tubular system

III) Which of the following regions indicated by arrows contains only thick filaments and no thin filaments?



A. A

B. B

C. C

D. D

E. E

IV) A 23 year old male presents to the emergency room following sudden onset of heart palpitations. His heart rate is 160/min and regular, and his blood pressure is 110/70 mmHg. Gentle neck massage just below the angle of the right mandible produces immediate improvement of his condition. His heart rate is now 75/min and his blood pressure is 120/80 mmHg. This maneuver improved the patient's symptoms by:

A. Decreasing the baroreceptor firing rate

B. Increasing sympathetic output to the SA node

C. Prolonging the AV node refractory period

D. Prolonging the ventricular myocardium refractory period

E. Increasing systemic vascular resistance

V) A 43-year old male presents to your office with exertional dyspnea that has been progressing over the last three weeks. Pitting pedal edema and distended jugular veins are evident on physical examination. Which of the following substances has been increasingly produced by the pulmonary endothelium in this patient?

A. Renin

B. Aldosterone

C. Angiotensin-converting enzyme

D. Arginine vasopressin

E. Prostaglandin E1

F. Angiotensinase

VI) As part of an experiment, radio-labeled ATP is injected into skeletal muscle. During muscle contraction, the labeled ATP is observed to attach to the sarcomere. This attachment causes immediate:

A. Calcium binding to troponin C

B. Tropomyosin displacement from the groove on the actin molecule

C. Myosin head detachment from the actin filament

D. Cross-bridge formation

E. Myosin light chain phosphorylation by a specific enzyme

VII) A 43 year old man is rushed to the emergency room following repeated episodes of coffee ground-appearing emesis. He has a blood pressure of 70/40 mmHg, a heart rate of 130/min, and his extremities are cool to the touch.

A. Total peripheral resistance

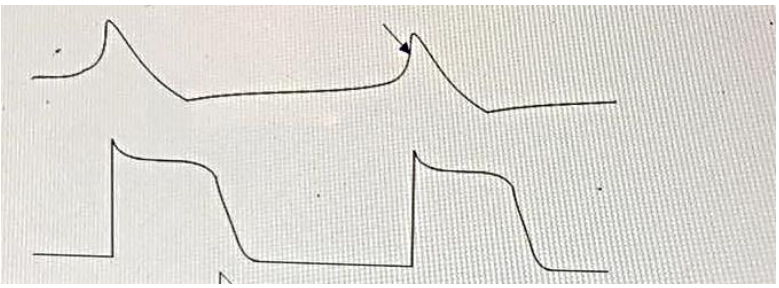
B. Ventricular muscle contraction velocity

C. End diastolic sarcomere length

D. Heart rate

E. Diastolic ventricular compliance

VIII) Special electrodes are used to record the membrane potential changes of different cardiac muscle cells (see below). Movement of which of the following ions or combinations of ions creates the deflection indicated by the arrow?



A. Sodium

B. Potassium

C. Calcium

D. Chloride

E. Sodium and potassium

F. Sodium and calcium

IX) A 44 year old man with non-ischemic cardiomyopathy experiences fatigue and exertional dyspnea. He has no symptoms at rest, but his daily activities are significantly limited by dyspnea. Physical examination shows no signs of fluid overload. A medication that selectively decreases the heart rate but has no effect on myocardial contractility or relaxation is added to this patient's regimen. Which of the following ion transporters does this medication most likely inhibit?

A. Funny sodium channels during phase 4

B. L-type calcium channels during phase 2

C. Rapid sodium channels during phase 0

D. Slow delayed rectifier potassium channels during phase 3

E. Sodium potassium pump

X) Physiologists conducting research on the electrical properties of the heart measure action potential conduction velocity at four different points within normal cardiac tissue. The results, expressed in terms of spread of conduction (meters per second), are as follow:

Point 1: 0.05 m/sec

Point2: 0.3 m/sec

Point3: 1.1 m/sec

Point4: 2.2 m/sec

From the following list of locations, which most likely corresponds to the order of points 1-2-3-4?

A. Atrial muscle, ventricular muscle, Purkinje system, AV node

B. AV node, Purkinje system, ventricular muscle, atrial muscle

C. AV node, ventricular muscle, atrial muscle, Purkinje system

D. Purkinje system, AV node, ventricular muscle, atrial muscle

E. Ventricular muscle, AV node, Purkinje system, atrial muscle

Good luck

Ed3oli