

PhysioQuiz 4 - Concept Review and Applications

1. Neuromuscular Transmission:

AP Ca^{2+} influx ACh release Na^{+} influx in muscle muscle AP T-tubule depolarization ACh breakdown by acetylcholinesterase.

Application: Used in treating myasthenia gravis.

2. Frank-Starling Law:

Increased stretch increased contractile force (within physiological range).

Application: Cardiac output regulation with preload.

3. Fast-Twitch Fibers:

Fast-twitch = less myoglobin and mitochondria, high power, fatigue faster.

4. Bone Properties:

High Young's modulus, anisotropic, stronger along long axis.

5. Cartilage:

Smooth, protects joints, avascular poor healing.

6. Sliding Filament Theory:

AP Ca^{2+} from SR binds troponin shifts tropomyosin myosin-actin power stroke using ATP Ca^{2+} reuptake via SERCA.

7. Muscle Contraction Types:

Isotonic = movement (25 lb curl); Isometric = no movement (100 lb attempt).

8. Smooth Muscle Channels:

Uses Ca^{2+} -dependent APs; Na^{+} is not primary ion.

9. Smooth Muscle Control:

Controlled by ANS, endocrine, and paracrine systems (not somatic PNS).

10. Muscle Endurance:

Slow-twitch fibers = high endurance (mitochondria, myoglobin).

11. Lactic Acid Buildup:

Anaerobic glycolysis incomplete glucose oxidation pH impaired contraction.

12. Tetanus:

Sustained Ca^{2+} release = continuous contraction.

13. ATP in Muscle:

ATP powers myosin detachment, SERCA pumps, and $\text{Na}^{+}/\text{K}^{+}$ ATPase.

14. Smooth vs Striated Muscle:

Smooth = energy-efficient, autonomous, can maintain tone (latch state).

15. Bone Adaptation:

Follows Wolffs Law, resists rapid loading better than slow, follows Hookes law.

16. ATP Use in Muscle:

Used by myosin heads, SERCA pump, Na⁺/K⁺ pump.

17. Exercise Energy Systems:

0-10s: ATP-PCr; 10s-2min: Anaerobic glycolysis; long-term: aerobic metabolism.

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