Chapter Eleven Study Guide
Skeletal Muscle Structure and Function (W2025)

C11.1

1. How is skeletal muscle different than cardiac and smooth muscle? Why is a skeletal muscle cell called a muscle fiber?

2. What is the prefix used to rename some cell organelles in a skeletal fiber? Give three examples.

3. What is the sliding filament theory? Significance? General concept?

4. What is the difference between myofibrils and myofilaments?

5. What is a triad?

6. What is stored inside muscle fibers' sarcoplasm to help initiate the metabolism of contraction?

7. What is stored inside the sarcoplasmic reticulum? What do you know if this substance is "concentrated" inside the sarcoplasmic reticulum? What do you know if you want to release this stored concentrated substance?

8. What phase of the cell cycle are skeletal muscles "locked into"? What happens if you destroy a muscle fiber? What is this process called?

9. What is the functional unit of a muscle fiber? Between what two structures is this functional unit? Draw and label a "simple" picture of this unit.

10. What are the contractile proteins in skeletal fibers called? How do we describe these proteins?

11. What are the regulatory proteins in skeletal fibers called? Functions of each protein?

12. What are the purpose of the structural proteins in the muscle fiber? What do they connect? Which structural protein will call a terrible disease?

13. What happens to the Z disc when a muscle fiber contracts? What happens to the length of the thick and thin protein myofilaments?

14. What is the subunit used to construct the thick myofilament? What sport metaphor maybe used to describe this protein? How are they arranged along the myofilament?

15. How may you describe the structure of a thin myofilament? What regulatory protein rest in the thin myofilament "groove"? What is the regulatory protein "hiding"?

16. What binds to a small regulatory protein to make a larger regulatory protein expose a binding site? Use appropriate terms to answer this question!

17. What is the function of titin?

C11.2

18. What is the skeletal muscle voluntary motor pathway? From where to where? Name of two neurons in the pathway?

19. What is a synapse? What are the three components of a synapse? What is the name of the synapse between a nerve and muscle fiber called? Draw a simple picture and label.

20. What is the significance of acetylcholine at the skeletal muscle's synapse? Where is it made? Where is it stored? When released, what will acetylcholine bind to?

21. What are the four phases of a skeletal muscle contraction cycle? What occurs at each phase?

22. What is the difference between a local potential and an action potential? Where do these events occur at the neuromuscular junction?

23. What are the steps between acetylcholine being released from the presynaptic knob to the calcium binding to troponin?

24. What occurs during excitation contraction coupling?

25. What occurs during contraction? What happens to the "cocked" myosin head when it binds to the actin binding site? What is this union called? What must happen before this union is broken? What phrase describes this event?

26. What must occur before a muscle fiber may relax?

27. What is a motor unit? How are motor units used? Do eye or leg muscles have smaller motor units? Why?

C11.3

28. What happens to the length of a muscle fiber during an isometric muscle contraction? What happens to the length of a muscle fiber during a isotonic muscle contraction? Describe the phase difference when you try to lift a heavy object.

29. Why should you use your legs and not your back to lift a heavy object off the floor? Explain using the sliding filament theory. What is this principle called?

30. What two muscle fiber types may determine if a child prefers to run sprints or cross country races? What enzymes and metabolic pathways underlie this choice?

31. How will a skeletal muscle fiber change between endurance training, resistance training, and disuse?

C11.4

32. What are the two metabolic pathways used by a muscle fiber to make ATP? What is the fast and slow pathway?

33. How do muscle fibers provide ATP rapidly, even before the fast pathway makes ATP? When is this method initiated?

34. Why to muscle fibers have glycogen and myoglobin in the sarcoplasm? Explain this in terms of the respiratory and cardiovascular system functions.

35. What is the phosphogen system (creatine phosphate mechanism)? Significance.

36. Assume you are running a long distance race. You will need ATP throughout the race.
>What is the two sources of ATP in the first two seconds of the race?
>What is the source of ATP during the next eight seconds of the race?
>What is the source of ATP between eight seconds and 40 seconds?
>What is metabolized and from where using what metabolic pathway during the next 90 minutes?
>If you continue to run then where will the fuel come from to support what metabolic pathway?
>After you stop running, you continue to breath heavily, why? What is this called?

C11.5

37. Do all smooth muscles need a nerve signal to contract?

38. What nervous system may cause some smooth muscles to contract?

39. Are smooth muscle able to regenerate?

40. What is the difference between multiunit smooth muscle and single unit smooth muscle? Which form have gap junctions? Give examples where you find each type of smooth muscle.