

Name: _____

Period: _____

Date: _____

Muscle Contraction – An Interactive Tutorial

The Neuromuscular Junction

Go to: <http://www.getbodysmart.com/ap/muscleissue/menu/menu.html> As you make your way through the tutorial, be sure to click on the blue, bolded terms to see and animation of what is going on.

Click “Nerve Supply to Muscle Fibers”

Click “Motor Units”

Motor Units in Skeletal Muscle

1. What is the neuromuscular junction? _____

2. What is a motor unit? _____

3. How many fibers in the motor unit contract when a motor neuron fires? _____
4. Explain how the size of a motor unit relates to the amount of control or power it has. _____

Click on “Next” above the right side of the tutorial box.

Neuromuscular Junction Structure

5. What is the part of the sarcolemma where the motor neuron communicates with the muscle fiber called? _____

6. What neurotransmitter chemical is found in the synaptic terminals? _____
7. What is the synaptic cleft? _____

8. After the ACh is released from the terminals, where does it go? _____

Click on “Next” above the right side of the tutorial box.

Release of Neurotransmitters From Motor Neurons

9. What triggers the process to release acetylcholine? _____

10. What ion is responsible for causing the ACh vesicles to fuse with the membrane, releasing ACh into the synaptic cleft? _____
11. What happens to the ACh when it is released from the synaptic terminal? _____

Click on "Next" above the right side of the tutorial box.

Acetylcholine Receptors in Muscle Fiber (Cells)

12. What causes the receptors on the motor end plate to open? _____

13. What happens when these receptors open? _____

Click on "Next" above the right side of the tutorial box.

Depolarization of the Sarcolemma at the Synapse

14. What is the resting membrane potential of muscle cells? _____

15. What is the threshold value of muscle cells? _____

Click on "Next" above the right side of the tutorial box.

Repolarization of the Sarcolemma at the Synapse

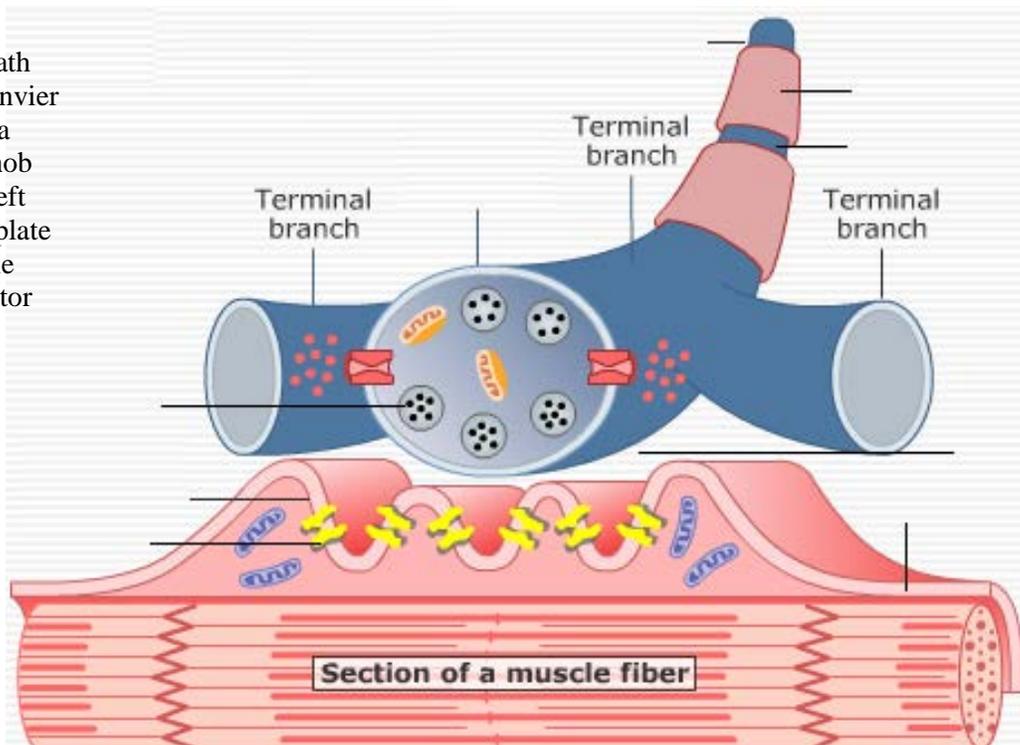
16. After the motor neuron stops sending signals to the muscle, the ACh must be removed from the cleft. What substance removes the ACh? _____

17. What happens when the ACh has been broken down? _____

18. We previously say Na^+ rushing into the cell and K^+ rushing out. How are these ion returned to the proper side of the membrane after the channels close? _____

19. Label the following structures on the neuromuscular junction diagram below:

- Neuron
- Myelin sheath
- Node of Ranvier
- Sarcolemma
- Synaptic knob
- Synaptic cleft
- Motor end plate
- ACh Vesicle
- ACh Receptor



Click on "Next" above the right side of the tutorial box.

Introduction to Excitation-Contraction Coupling

- 20. What triggers the excitation process? _____

- 21. What does the ACh generate? _____

- 22. What happens when the action potential enters the muscle fiber? _____

Click on "Next" above the right side of the tutorial box.

A Closer Look at Excitation-Contraction Coupling

- 23. _____ channels open when a muscle is stimulated.
- 24. Where do the molecules move? _____
- 25. What is the part of the muscle fiber that interacts with the motor neuron called? _____
- 26. This influx of Na⁺ ions causes an action potential to be generated in the sarcolemma, just as they did in a neuron.
How do these action potentials get to the center of the muscle fiber? _____

- 27. What happens when the action potential reaches the sarcoplasmic reticulum? _____

Click on "Next" above the right side of the tutorial box 3 times.

Contraction Cycle in Skeletal Muscle Fibers

- 28. Explain the role of the Ca⁺⁺ that is released from the sarcoplasmic reticulum. _____

- 29. Place the following steps to the contraction cycle in order, after the active sites on the actin have been exposed.
 - ADP and P leave the myosin head
 - ATP attaches to myosin head
 - Myosin detaches from actin
 - Myosin attaches to actin to form a cross bridge
 - ATP is turned into ADP and P
 - Myosin heads pivot towards the M-line
 - Myosin head resets_____

Click on "Next" above the right side of the tutorial box 2 times.

Relaxation of Skeletal Muscle Fibers

30. Summarize what must happen for a muscle fiber to return to its resting (relaxed) state.

31. Briefly summarize what is happening in each of the steps on the diagram below.

