

## Homework Assignment #5 (V2)

### Chapter 11 Skeletal Muscle

#### Muscle Contraction (1.25 min)

1. How is a skeletal muscle activated (voluntary)? Pathway?
2. What is the union of the nerve and muscle fiber called?
3. What molecule is released by the terminal synaptic vesicle? Into where?
4. What type of channel will the molecule bind to?
5. What type of ion moves through the channel?

#### The Myofilament (1.25 min)

1. What two molecules make the myofilaments?
2. What protrudes from the myosin filament?
3. When will contraction begin? What happens?
4. What happens to the myosin head after it binds to actin?

#### Neuromuscular Junction (1.25 min)

1. What happens when the action potential reaches the end of the nerve's axon? What type of channel?
2. What type of channel is opened after acetylcholine enters the synaptic cleft? Binds to what type of channel?
3. What occurs to the post synaptic membrane after sodium enters the muscle cell?
4. What occurs if "threshold is reached?"
5. What enzyme breaks down the neurotransmitter in the synaptic cleft?

#### Sliding Filament Theory (1.25 min)

1. What molecule on actin binds calcium?
2. What molecule on actin moves after calcium binds? Exposes what?
3. What molecule must bind to the myosin head to break the myosin cross bridge?
4. What happens to the myosin head after the cross bridge is broken?

#### Myosin Heads Interacting with Actin (40 sec)

1. Are all the myosin heads bound to actin at the same time?
2. What term was used to describe the movement of the myosin head? Work starts with an "R"!

#### Myosin Heads and Actin Filament (2.25 min)

1. What happens to the myofilaments when calcium is present?
2. What happens to the myosin head after ATP binds? Does it form or break the cross bridge?
3. What is ATP converted to after it binds to the myosin head?
4. What must happen for muscle relaxation?
5. During relaxation, are is the status of the myosin heads?

#### Sliding Filament Theory (7 min)

1. What is the neuromuscular junction?
2. What is a motor unit?
3. What is the motor end plate? Location?
4. What neurotransmitter stimulates the motor end plate?
5. What occurs during excitation contraction coupling?
6. What type of gate is opened by the action potential as it flows down the T-tubules? What is released?
7. When was the sliding filament theory proposed?
8. What happens to the distance between the Z-lines? Why?

9. What causes the myosin head to be “cocked”? When will the cocked energy be released?
10. How and when will the cross bridge be broken?
11. What is the function of acetylcholinesterase? What downstream events occur?
12. Where does the energy to power the interaction between actin and myosin come from?
13. How long does ATP last?
14. What are the three pathways of ATP regeneration?
15. How long may creatine phosphate power muscle contraction?
16. What causes muscle fatigue?
17. What is oxygen debt?
18. How much of the energy from ATP in a muscle contraction is lost as heat? How do we use this lost heat?

#### Stretch Reflex (9 min)

1. What fiber type generate the contraction force?
2. What structure is formed by a second type of muscle fiber called the intrafusal fibers? What is the purpose of these structures?
3. What type of information is transmitted to the spinal cord?
4. As a muscle contracts the tension within a muscle spindle must be adjusted. What nerve fiber may adjust the tension inside the muscle spindle?
5. What do the primary sensory nerve fibers measure (respond to)? Where will this information be sent?
6. What is the main role of the muscle spindle?
7. What is the circuit of the stretch reflex? How many synapses are in this reflex? Significance?
8. What is reciprocal innervation? If a flexor muscle is stretched, then what type of muscle is “relaxed”?