

***Internet Activity: Muscle Contractions***

You will be visiting various websites today that discuss the causes of muscle contractions.

**Part I: The Neuromuscular Junction & Contraction Stimulus**

Go to the website: [http://www.wisc-online.com/objects/index\\_tj.asp?objID=AP2804](http://www.wisc-online.com/objects/index_tj.asp?objID=AP2804)

*Read through the slides on the neuromuscular junction and how a contraction is started. Then answer the following questions.*

1. What is the neurotransmitter that is released at the myoneural junction? \_\_\_\_\_
2. Where is the neurotransmitter stored on a motor neuron? \_\_\_\_\_
3. Using the image to the right, identify the **direction of action potential, calcium ions, synaptic vesicles, and where ACh is released.**



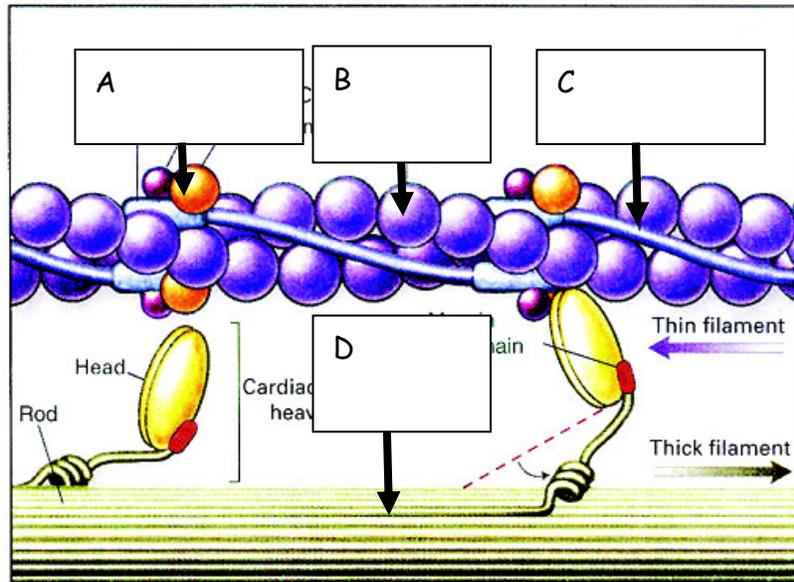
4. What is the motor plate highly folded? \_\_\_\_\_
5. Describe how the action potential is generated.
6. a. Identify the enzyme that degrades the ACh. \_\_\_\_\_  
 b. Why do you think the ACh needs to be degraded?
7. What is the final outcome of this process? \_\_\_\_\_

**Part II: Muscle Contractions**

Go to the website: <http://www.wisc-online.com/Objects/ViewObject.aspx?ID=AP2904>

1. An action potential reaches the inside of a muscle cell via \_\_\_\_\_.
2. a. What ion is released from the sarcolemma? \_\_\_\_\_  
 b. What does this ion attach to? \_\_\_\_\_  
 c. What change does this cause (hint: next slide)? \_\_\_\_\_
3. What makes up the cross bridges?

4. a. What needs to be released in order to have the power stroke occur the sarcomere?  
 b. What causes the muscle to contract?
5. Where do the calcium ions return to once the contraction has occurred? \_\_\_\_\_
6. Describe what causes the muscle cell to relax.
7. In the picture below, identify the following parts of a myofibril: **actin**, **myosin**, **troponin**, **tropomyosin**. (You may need to flip back through the slides)

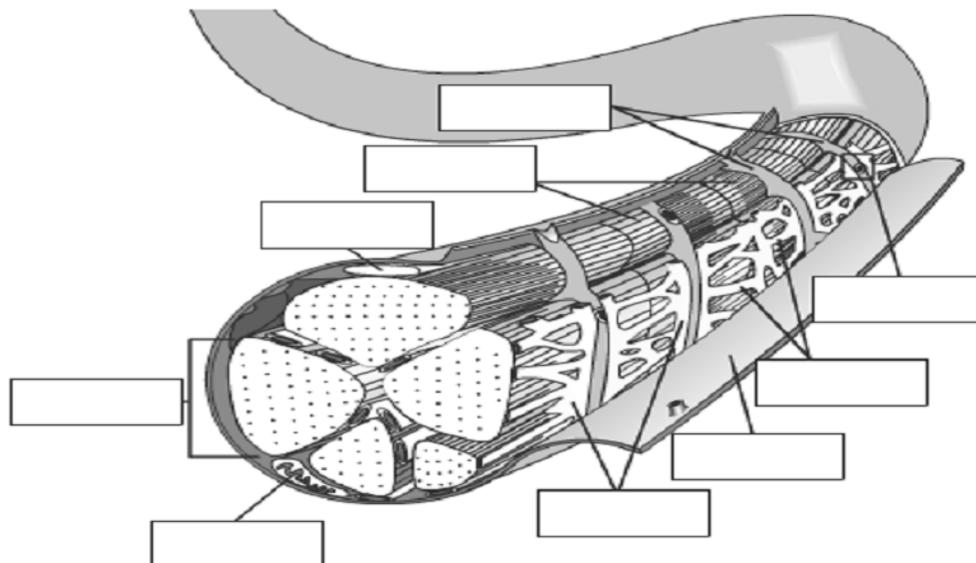


**Part III: Overall Muscle Contraction**

Go to the following website:

[http://www.brookscole.com/chemistry\\_d/templates/student\\_resources/shared\\_resources/animations/muscles/muscles.html](http://www.brookscole.com/chemistry_d/templates/student_resources/shared_resources/animations/muscles/muscles.html)

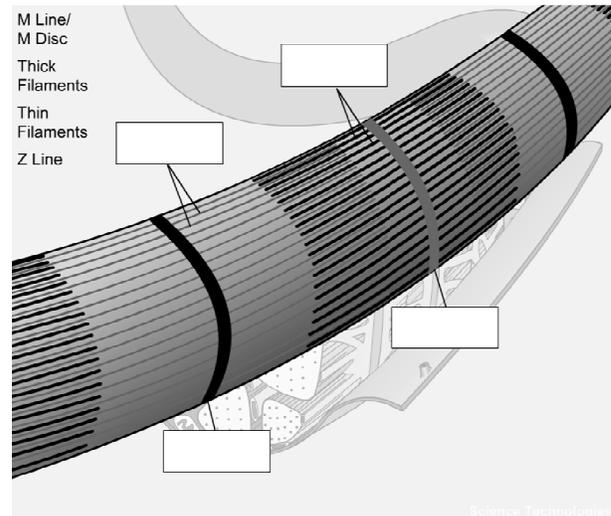
1. Click through the first part of the activity to review the muscle structure. Label the diagram below and continue on.



2. Match the descriptions with the correct muscle fiber structure. Use the words above, and put the term on the line next to the matching description. (Not all words will be used)

- \_\_\_\_\_ i. Composed of a T-tubule, the terminal cisternae, and gaps.
- \_\_\_\_\_ ii. Cylindrical structures that carry out contraction
- \_\_\_\_\_ iii. Extensions of the sarcolemma that separate the sarcomeres
- \_\_\_\_\_ iv. Specialized plasma membrane of the skeletal muscle cell; forms membrane connections between each of the sarcomeres.
- \_\_\_\_\_ v. The specialized endoplasmic reticulum of the skeletal muscle cell
- \_\_\_\_\_ vi. Units of the myofibrils

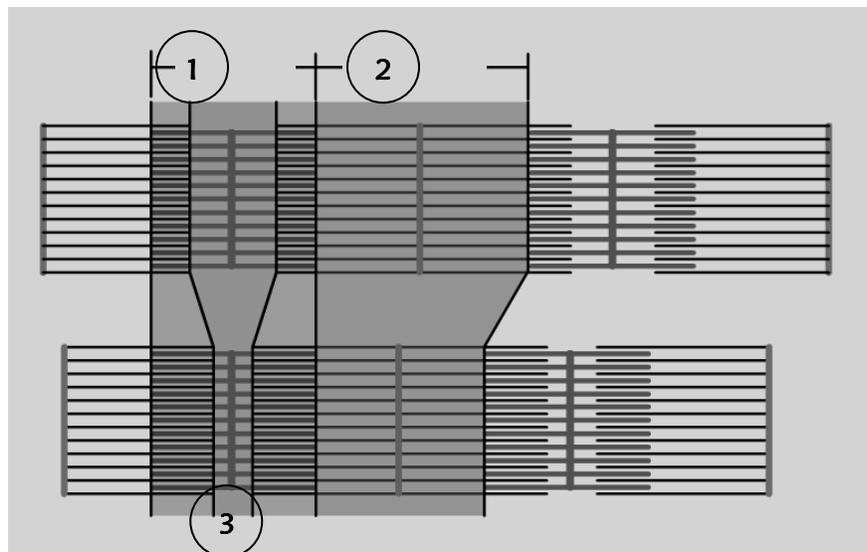
3. In the picture to the right, identify the **M Line**, **Thick Filaments**, **Thin Filaments**, and **Z Line**



4. Watch the movement of the molecules during the contraction and describe the motion below.

- 5. The distance between the ends of the thin filaments was known as \_\_\_\_\_.
- 6. The distance between the thick filaments of one sarcomere and the thick filaments of an adjacent sarcomere was known as the \_\_\_\_\_.
- 7. The length of the thick filaments was known as the \_\_\_\_\_.
- 8. Identify the areas in the following picture below

- a \_\_\_\_\_
- b \_\_\_\_\_
- c \_\_\_\_\_



9. The \_\_\_\_\_ and \_\_\_\_\_ shortens, but the \_\_\_\_\_ does not shorten during muscle contraction.
10. Chemically, muscle contraction is driven by \_\_\_\_\_ and triggered by the release of \_\_\_\_\_ from the **sarcoplasmic reticulum**.
11.  $\text{Ca}^{2+}$  binds to \_\_\_\_\_ in the thin filaments, exposing the myosin binding sites on actin.
12. The movement where the myosin head pulls the thin filaments inward is called the \_\_\_\_\_.
13. Place the following events in order by placing a number (1-6):
- \_\_\_\_\_ Power stroke (ADP and P dissociate from myosin).
  - \_\_\_\_\_ Thin filament returns to relaxed state
  - \_\_\_\_\_  $\text{Ca}^{2+}$  binds troponin causing a conformational change of the thin filament
  - \_\_\_\_\_ Myosin heads bind to actin
  - \_\_\_\_\_ Electrochemical signal causes release of  $\text{Ca}^{2+}$  from sarcoplasmic reticulum
  - \_\_\_\_\_ ATP binds myosin head