

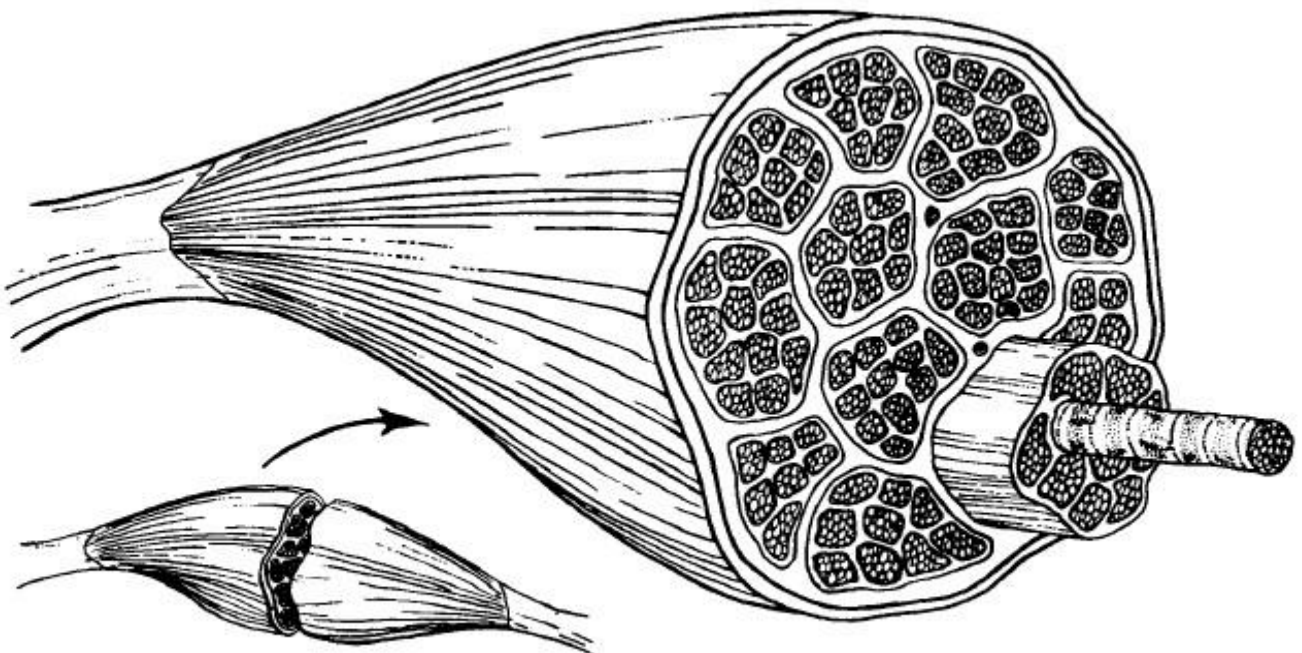
Name: \_\_\_\_\_

Period: \_\_\_\_\_

# Muscles

Write name of the structure below the definition. Then color that structure on the diagram below according to the color stated. If there is no color stated, do not color that item.

1. The connective tissue that surrounds a muscle (yellow)
2. Connective tissue that encloses a bundle of muscle fibers (green)
3. Bundle of muscle fibers
4. Connective tissue wrapped around each muscle fiber (blue)
5. Strong cord of fibrous connective tissue; extends from the muscle to the bone (orange)
6. Muscle cell (pink)
7. Smaller fibers that are found in a muscle fiber; consist of thick and thin myofilaments



Color the **muscle fiber** structures according to the colors listed below.

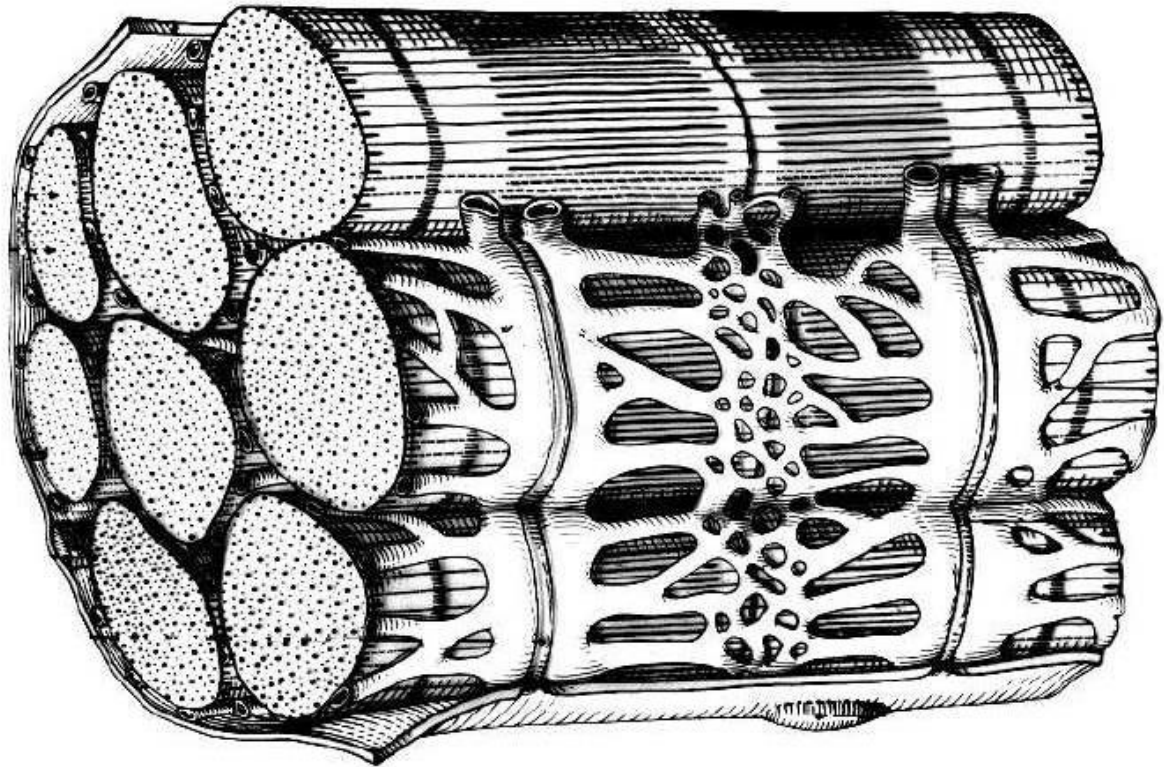
**Sarcoplasmic reticulum** - yellow

**T-tubules** - orange

**Myofibrils** - red

**Sarcolemma** - green

**Nuclei** - purple



Label & color the following on the picture below. You may have to draw in some structures.

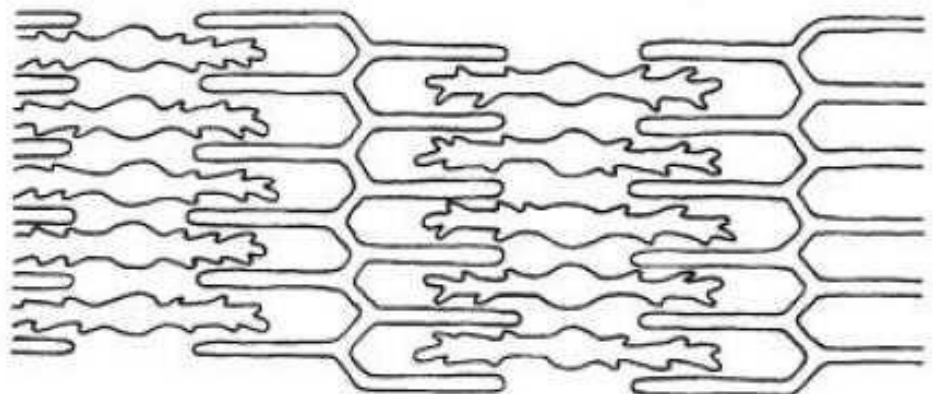
**A band** - purple

**Z disc** - dark blue

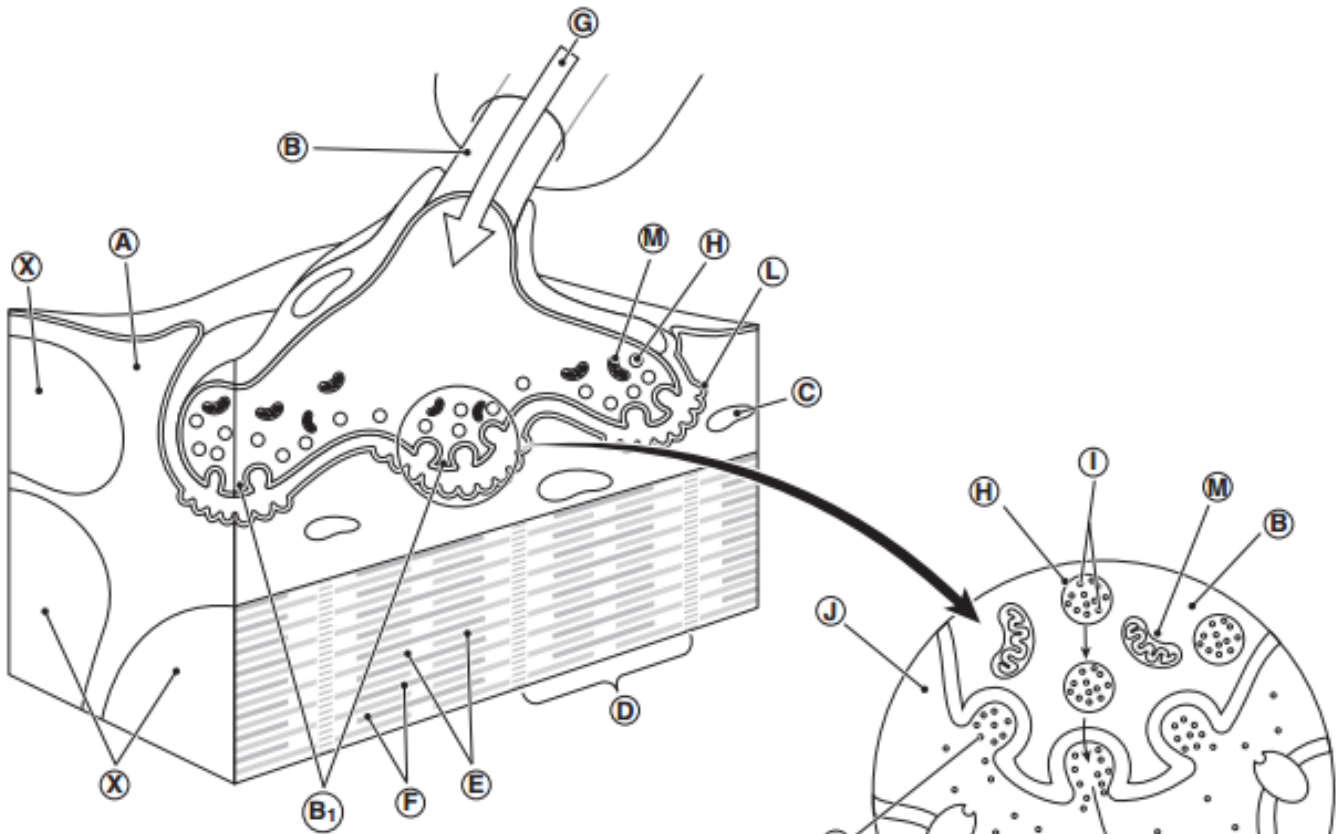
**I band** - light blue

**H zone** - red

**M - Line** - black



# Neuromuscular Junction



- |                                |                     |
|--------------------------------|---------------------|
| A. muscle cell                 | G. action potential |
| B. motor neuron                | H. synaptic vesicle |
| B <sub>1</sub> . axon branches | I. acetylcholine    |
| C. nucleus                     | J. synaptic cleft   |
| D. sarcomere                   | K. receptor         |
| E. actin                       | L. motor end plate  |
| F. myosin                      | M. mitochondria     |

X. myofibrils    Color only on the left side,  
 color the same color as A.

## Where do Muscles Obtain ATP?

### **Creatine phosphate** (B)

- Very rapid **ATP** (A) production; no oxygen or glucose required
- Muscles contain small store of creatine phosphate
- Creatine phosphate loses phosphate group, creating **creatine** (C)
- **ADP** (D) accepts phosphate group, resulting in **ATP** (A)
- Creatine phosphate stores increased by exercise, dietary supplementation

### **Anaerobic metabolism** (E)

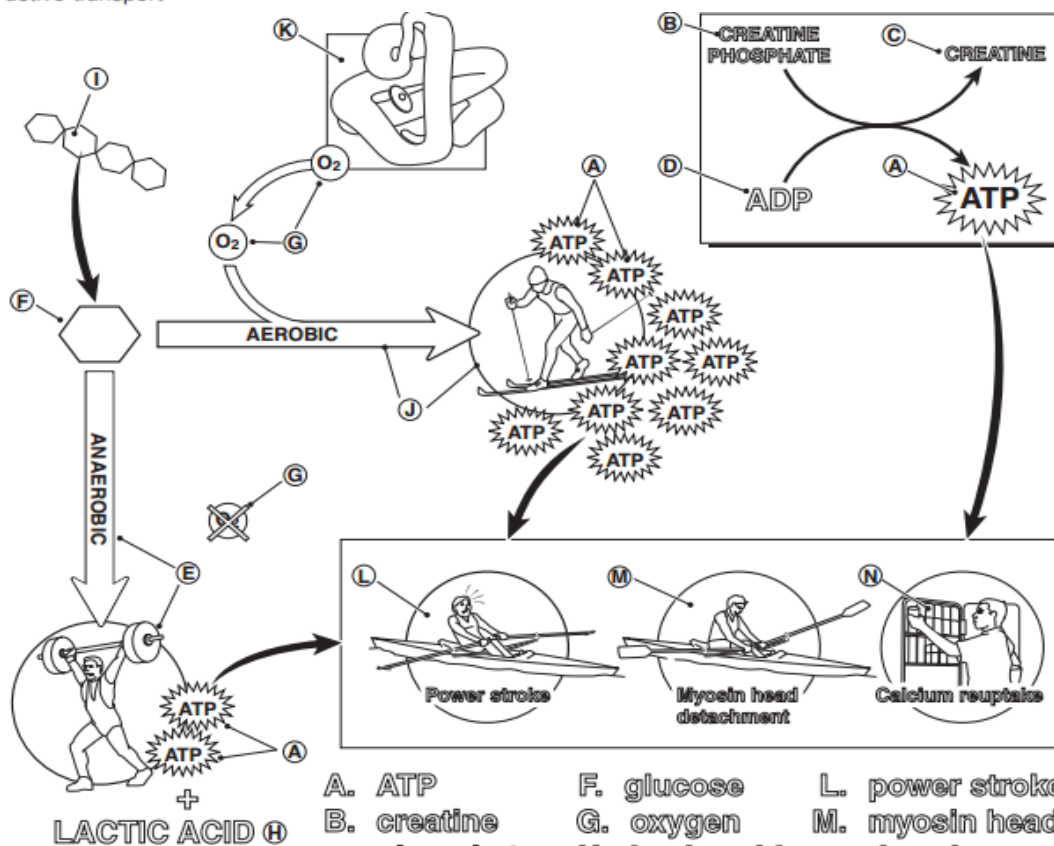
- **Glucose** (F) rapidly converted into small amount of **ATP** (A) (2–3 molecules); no **oxygen** (G) required
- **Lactic acid** (H) produced as byproduct
- Glucose can come from blood or (more frequently) from **glycogen** (I) breakdown

### **Aerobic metabolism** (J)

- Glucose slowly converted into large amount of ATP (over 30 molecules); oxygen required
- Oxygen is stored within muscle cells attached to **myoglobin** (K)
- Other energy sources (amino acids, fatty acids) can also be used

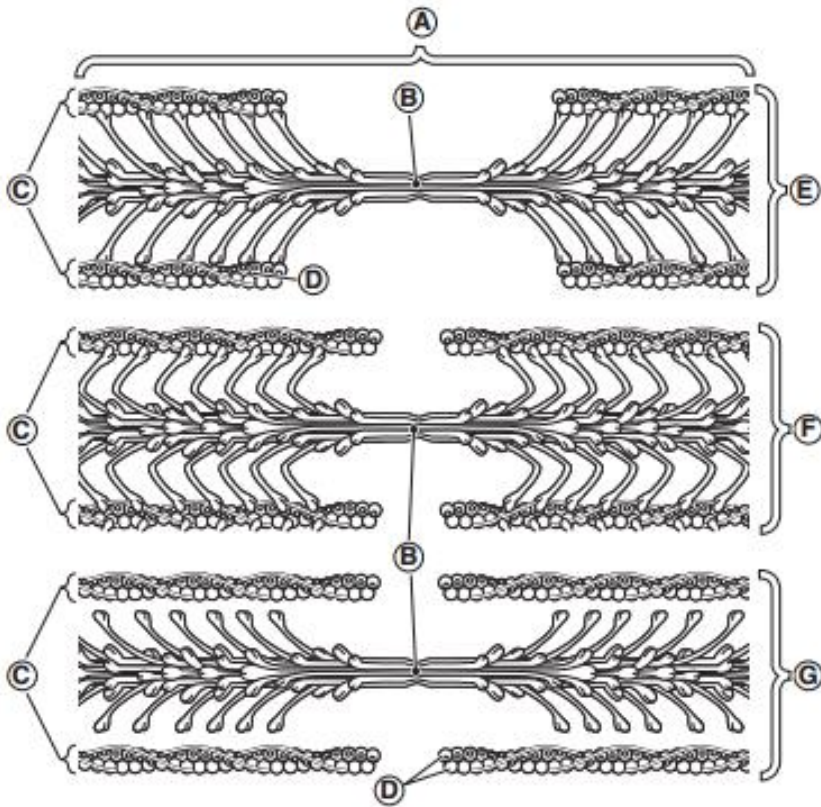
## Why do Muscles Need ATP?

- **Power stroke** (L): movement of the myosin head that brings actin filaments closer together
- **Myosin head detachment** (M): no ATP results in rigor mortis: myosin heads stay attached, muscle cannot relax
- **Calcium reuptake** (N)
  - Calcium reuptake into endoplasmic reticulum necessary for muscle relaxation
  - Occurs by active transport

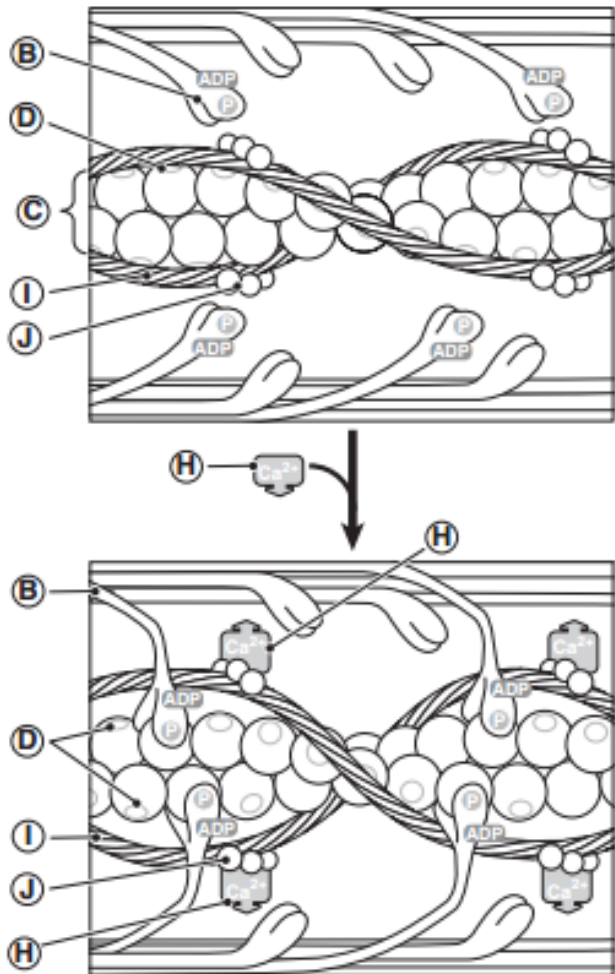


- |                         |                       |                           |
|-------------------------|-----------------------|---------------------------|
| A. ATP                  | F. glucose            | L. power stroke           |
| B. creatine phosphate   | G. oxygen             | M. myosin head detachment |
| C. creatine             | H. lactic acid        | N. calcium reuptake       |
| D. ADP                  | I. glycogen           |                           |
| E. anaerobic metabolism | J. aerobic metabolism |                           |
|                         | K. myoglobin          |                           |

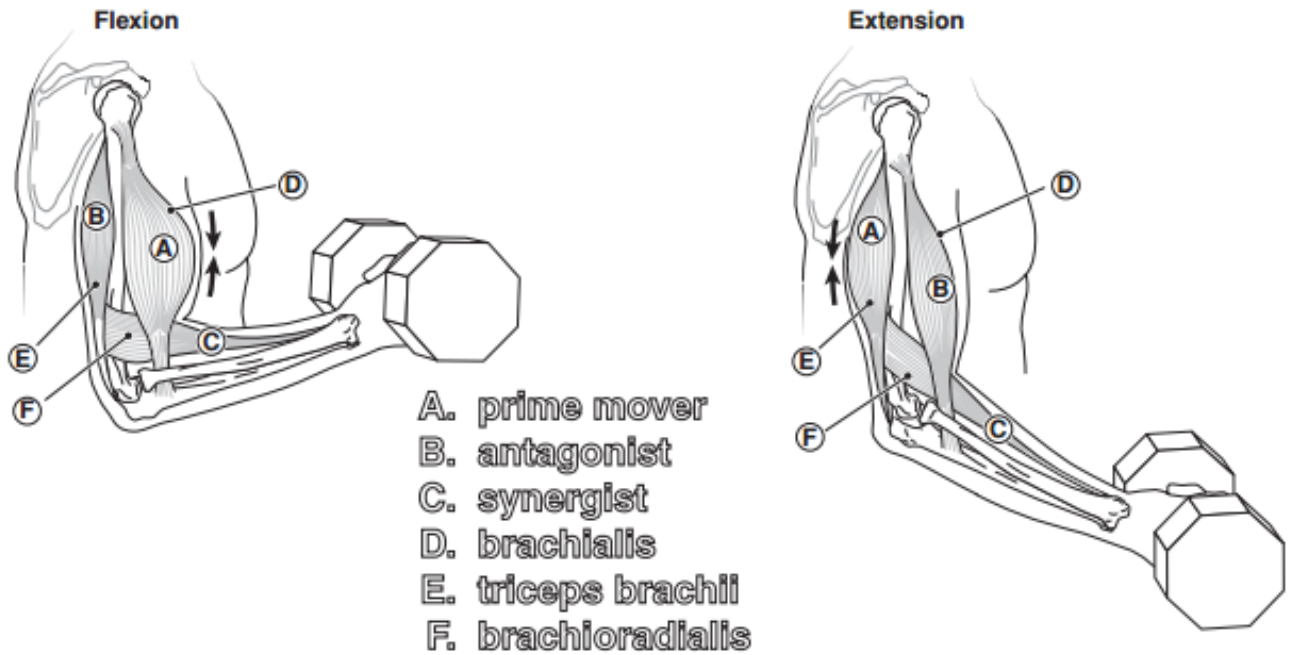
**Muscle Contraction**



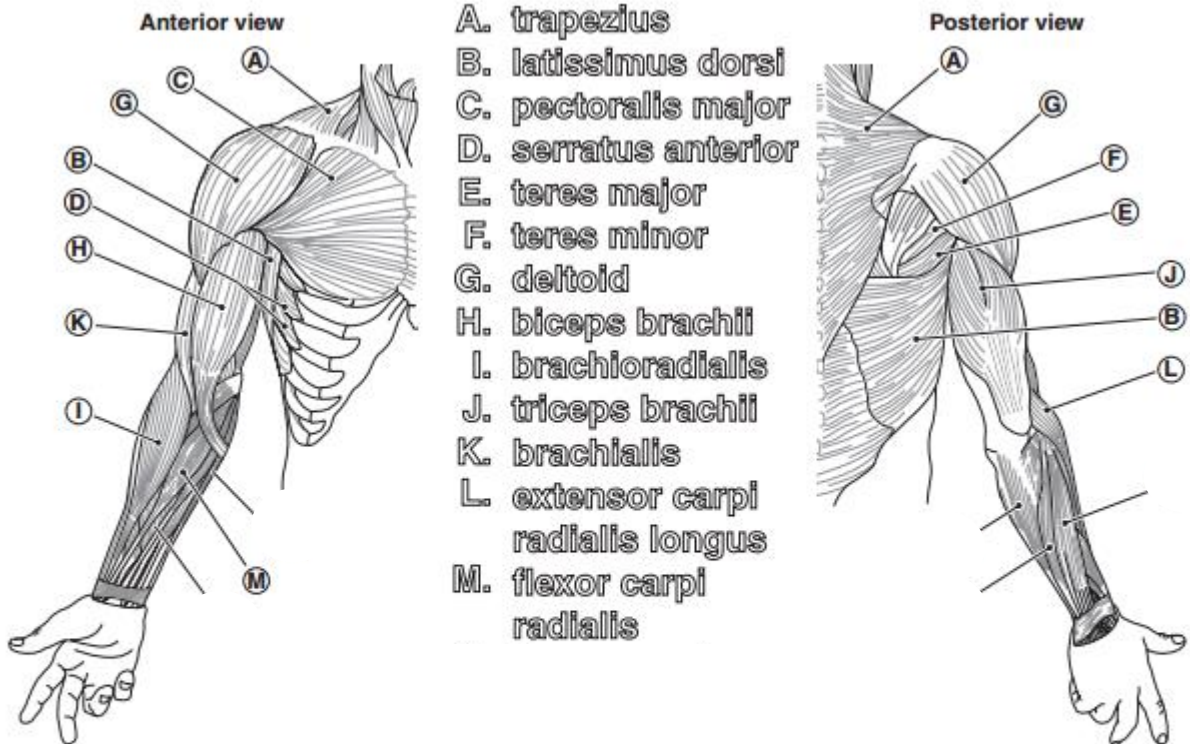
- A. sarcomere
- B. myosin
- C. actin
- D. binding site
- E. attachment
- F. power stroke
- G. release/reattachment
- H. calcium
- I. tropomyosin
- J. troponin complex



## Muscles in Action



## Muscles that move the upper limb



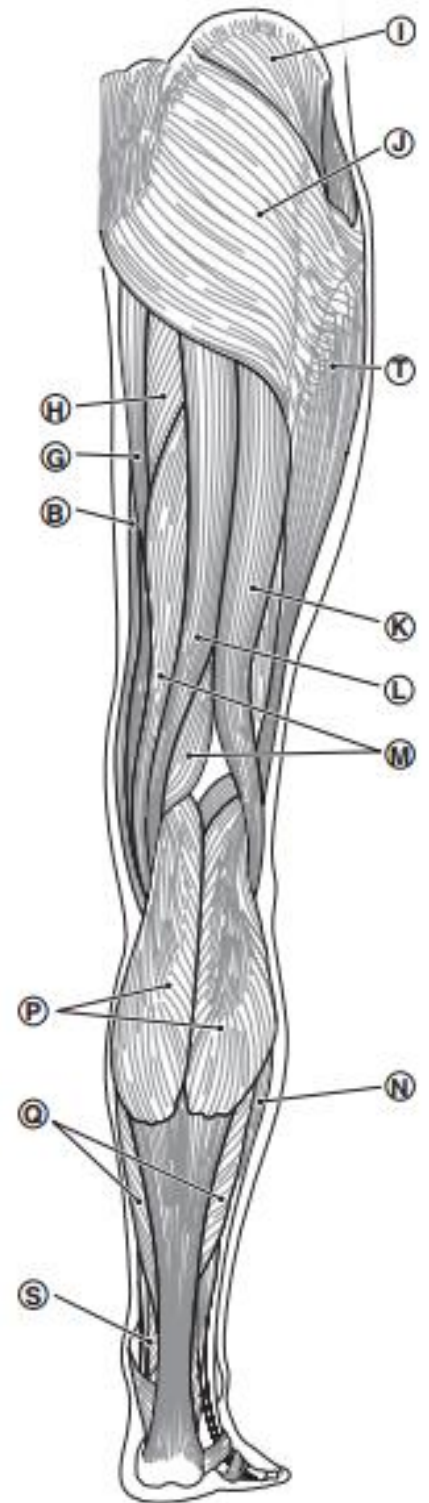
**Muscles that move the lower limb**

**Anterior view**

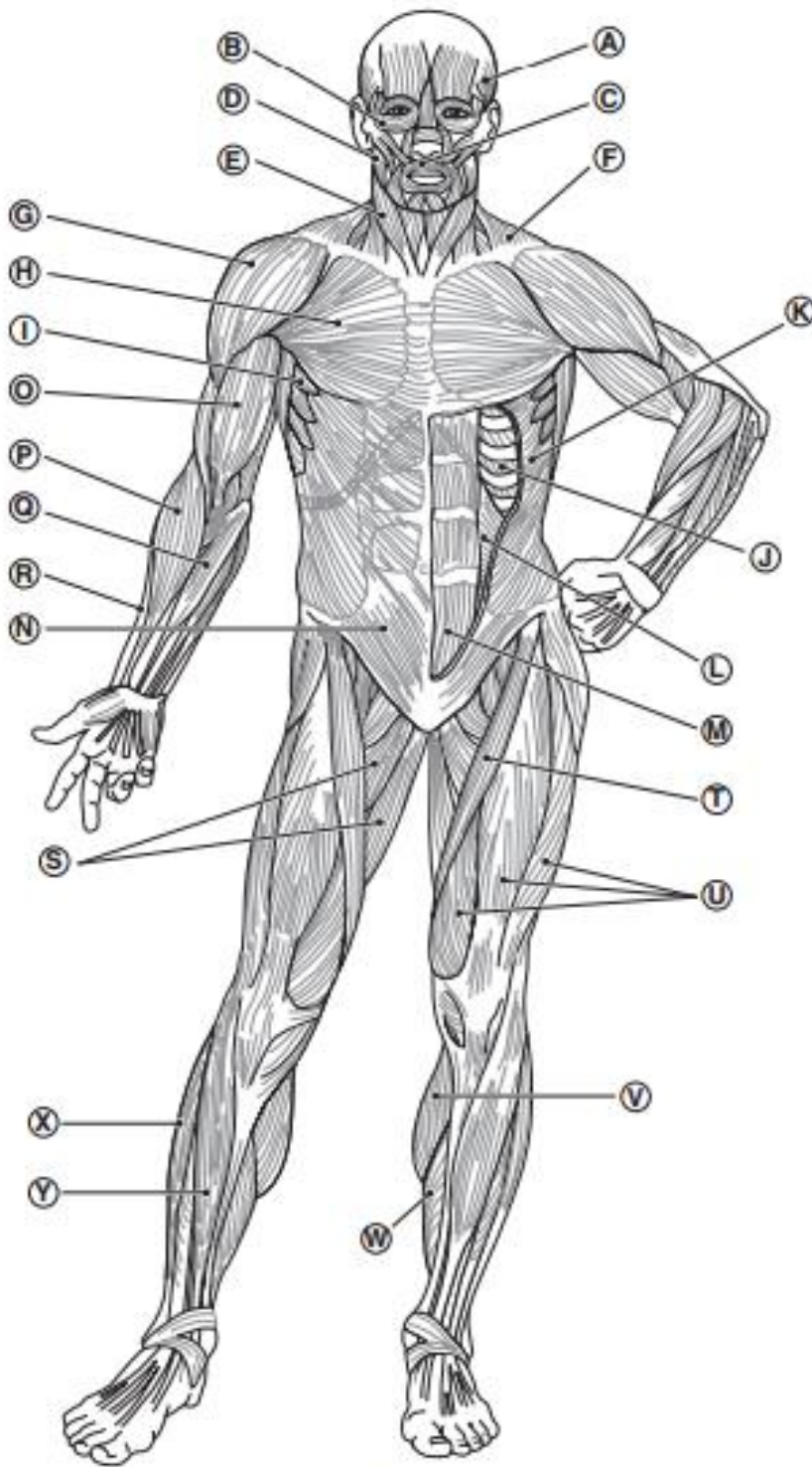


- A. iliopsoas
- B. sartorius
- C. rectus femoris
- D. vastus lateralis
- E. vastus medialis
- F. adductor longus
- G. gracilis
- H. adductor magnus
- I. gluteus medius
- J. gluteus maximus
- K. biceps femoris
- L. semitendinosus
- M. semimembranosus
- N. peroneus longus
- O. tibialis anterior
- P. gastrocnemius
- Q. soleus
- R. extensor digitorum longus
- S. flexor digitorum longus
- T. iliotibial tract

**Posterior view**



Ventral Muscles

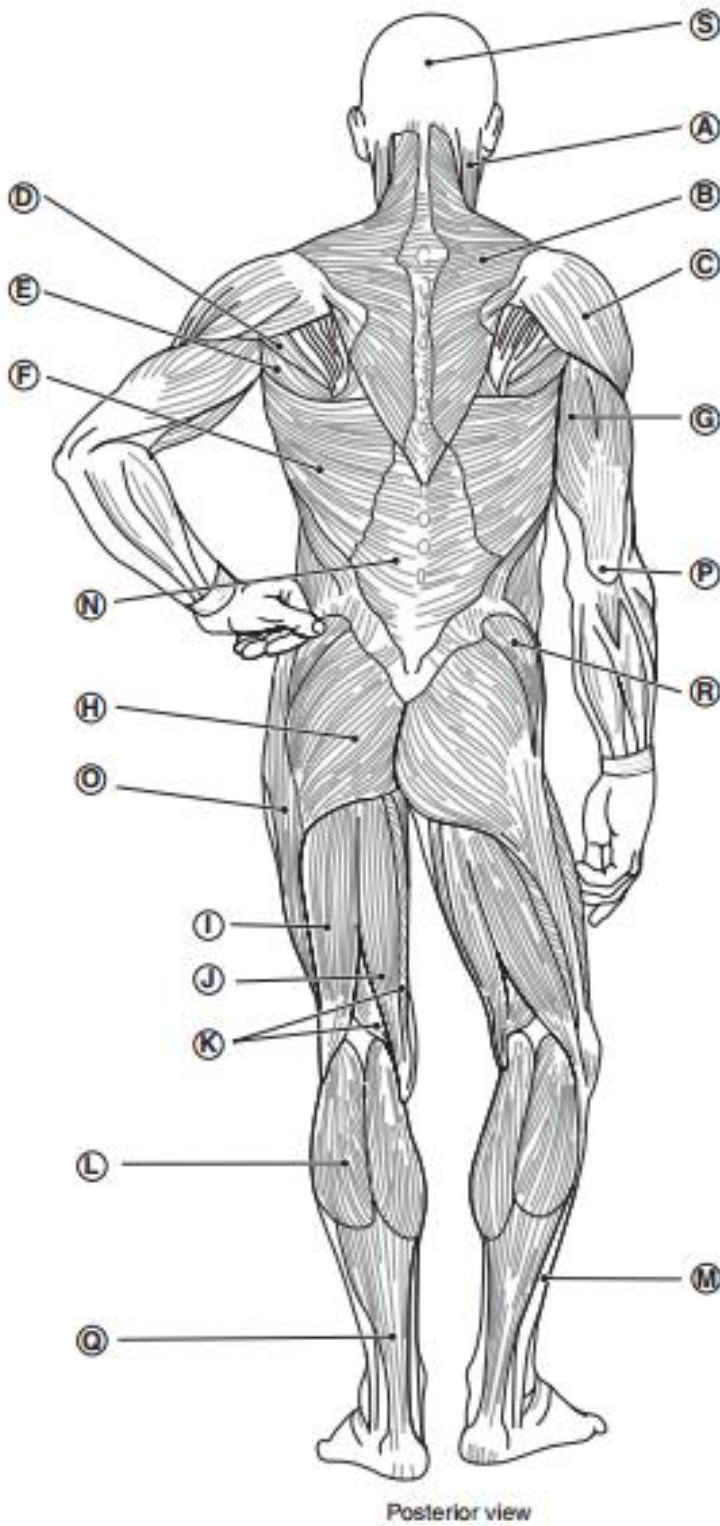


Anterior view

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_
- D. \_\_\_\_\_
- E. \_\_\_\_\_
- F. \_\_\_\_\_
- G. \_\_\_\_\_
- H. \_\_\_\_\_
- I. \_\_\_\_\_
- J. \_\_\_\_\_
- K. \_\_\_\_\_
- L. \_\_\_\_\_
- M. \_\_\_\_\_
- N. \_\_\_\_\_
- O. \_\_\_\_\_
- P. \_\_\_\_\_
- Q. \_\_\_\_\_
- R. \_\_\_\_\_
- S. \_\_\_\_\_
- T. \_\_\_\_\_
- U. \_\_\_\_\_
- V. \_\_\_\_\_
- W. \_\_\_\_\_
- X. \_\_\_\_\_
- Y. \_\_\_\_\_



Dorsal Muscles



- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_
- D. \_\_\_\_\_
- E. \_\_\_\_\_
- F. \_\_\_\_\_
- G. \_\_\_\_\_
- H. \_\_\_\_\_
- I. \_\_\_\_\_
- J. \_\_\_\_\_
- K. \_\_\_\_\_
- L. \_\_\_\_\_
- M. \_\_\_\_\_
- N. \_\_\_\_\_
- O. \_\_\_\_\_
- P. \_\_\_\_\_
- Q. \_\_\_\_\_
- R. \_\_\_\_\_
- S. \_\_\_\_\_