

## **Advance Preparation—ATP Muscle Kit**

1. Order the ATP muscle kits (Carolina) to be delivered no more than seven days before the lab. One kit provides generously for eight students. Extra vials of the chemical solutions can be ordered separately (Carolina) and will reduce waiting time. Just before the lab begins, cut the muscle bundles into 2-centimeter lengths and place in a petri dish in the accompanying glycerol.

# Microscopic Anatomy and Organization of Skeletal Muscle

## Skeletal Muscle Cells and Their Packaging into Muscles

1. From the inside out, name the three types of connective tissue wrappings of a skeletal muscle.

a. endomysium b. perimysium c. epimysium

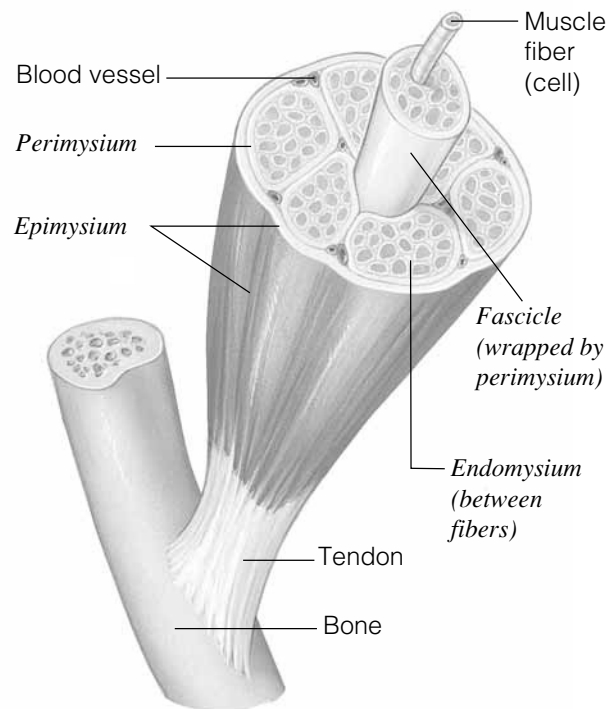
Why are the connective tissue wrappings of skeletal muscle important? (Give at least three reasons.)

They support and bind muscle fibers, strengthen the muscle as a whole, and provide a route for the entry and exit of  
nerves and blood vessels that serve the muscle fibers.

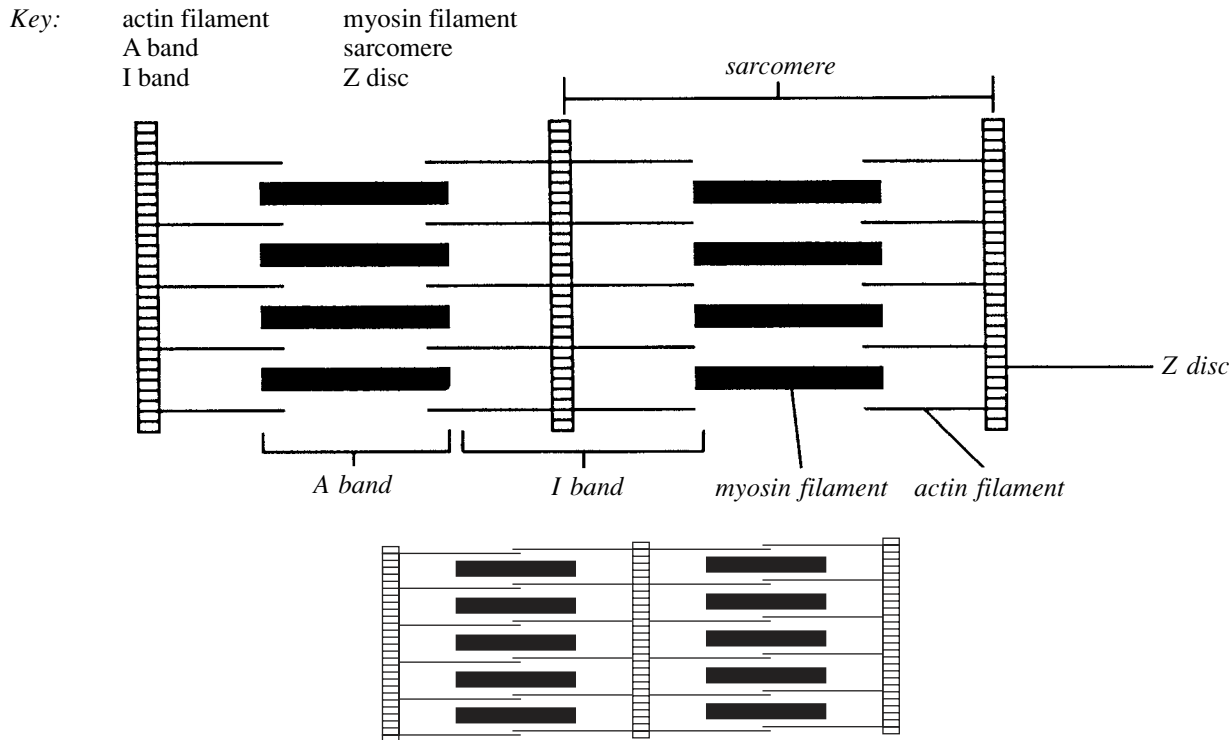
2. Why are there more indirect—that is, tendinous—muscle attachments than direct muscle attachments? (Your text may help you answer this.)

Tendons provide durability and conserve space. They are tough collagen fibers so they can cross rough, bony  
projections that would tear delicate muscle tissues. Because of their small size, more tendons can pass over a joint.

3. On the following figure, label endomysium, perimysium, epimysium, and fascicle.



4. The diagram illustrates a small portion of a muscle myofibril in a highly simplified way. Using terms from the key, correctly identify each structure indicated by a leader line or a bracket. Below the diagram make a sketch of how this segment of the myofibril would look if contracted.



## The Neuromuscular Junction

5. For skeletal muscle cells to contract, they must be excited by motor neurons. However, the electrical impulse cannot pass directly from a nerve cell to the skeletal muscle cells to excite them. Just what *does* pass from the neuron to the muscle cells, and what effect does it produce?

*A neurotransmitter chemical called acetylcholine diffuses from the axon into the synaptic cleft and combines with the receptors on the muscle cells. The permeability of the muscle cells change, allowing more sodium ions to diffuse into the muscle fiber, resulting in the generation of an action potential.*

6. Why is it that the electrical impulse cannot pass from neuron to muscle cell? *The neuron and muscle fiber membranes, close as they are, do not actually touch. They are separated by a small fluid-filled gap called the synaptic cleft.*

## Classification of Skeletal Muscles

7. Several criteria were given for the naming of muscles. Match the muscle names (column B) to the criteria (column A). Note that more than one muscle may fit the criterion in some cases.

	Column A	Column B
<u>flexor digitorum superficialis</u>	1. action of the muscle	pectoralis major
<u>deltoid</u>	2. shape of the muscle	flexor digitorum superficialis
<u>• biceps brachii</u> <u>• pectoralis major</u>	3. location of the origin and/or insertion of the muscle	biceps brachii
<u>biceps brachii</u>	4. number of origins	abdominis transversus
<u>• erector spinae • abdominis transversus • pectoralis major</u> <u>• external intercostals</u>	5. location of the muscle relative to a bone or body region	erector spinae
<u>• rectus abdominis</u> <u>• abdominis transversus</u>	6. direction in which the muscle fibers run relative to some imaginary line	deltoid
<u>pectoralis major</u>	7. relative size of the muscle	rectus abdominis
		external intercostals

8. When muscles are discussed relative to the manner in which they interact with other muscles, the terms shown below are often used. Define each term.

Antagonist: muscles that oppose or reverse a movement

Fixator: specialized synergists that immobilize the origin of a prime mover

Prime mover: muscles that are primarily responsible for producing a particular movement

Synergist: aid the action of agonists by reducing undesirable/unnecessary movement



## Gross Anatomy of the Muscular System



**Time Allotment:** 2–3 hours in lab plus time outside of lab.



**Multimedia Resources:** See Appendix A for a list of multimedia resource distributors.

*Anatomy of a Runner (Structure and Function of the Lower Limb)* (UL, 38 minutes, VHS)

*Abdomen and Pelvis* (UL, 16 minutes, VHS)

*Human Musculature Videotape* (BC, 23 minutes, VHS)

*Lower Extremity* (UL, WNS, 28 minutes, VHS)

*Major Skeletal Muscles and their Actions* (UL, 19 minutes, VHS)

*Muscles* (FHS, 20 minutes, VHS, DVD)

*The New Living Body: Muscles* (FHS, 20 minutes, VHS, DVD)

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### Advance Preparation

1. Set out models of the human torso and upper and lower limbs. It helps to have the muscles labeled on some of the models. Have model keys available.
2. Set out anatomical charts of human musculature.
3. Set out tubes of body (or face) paint and 1-inch wide brushes.



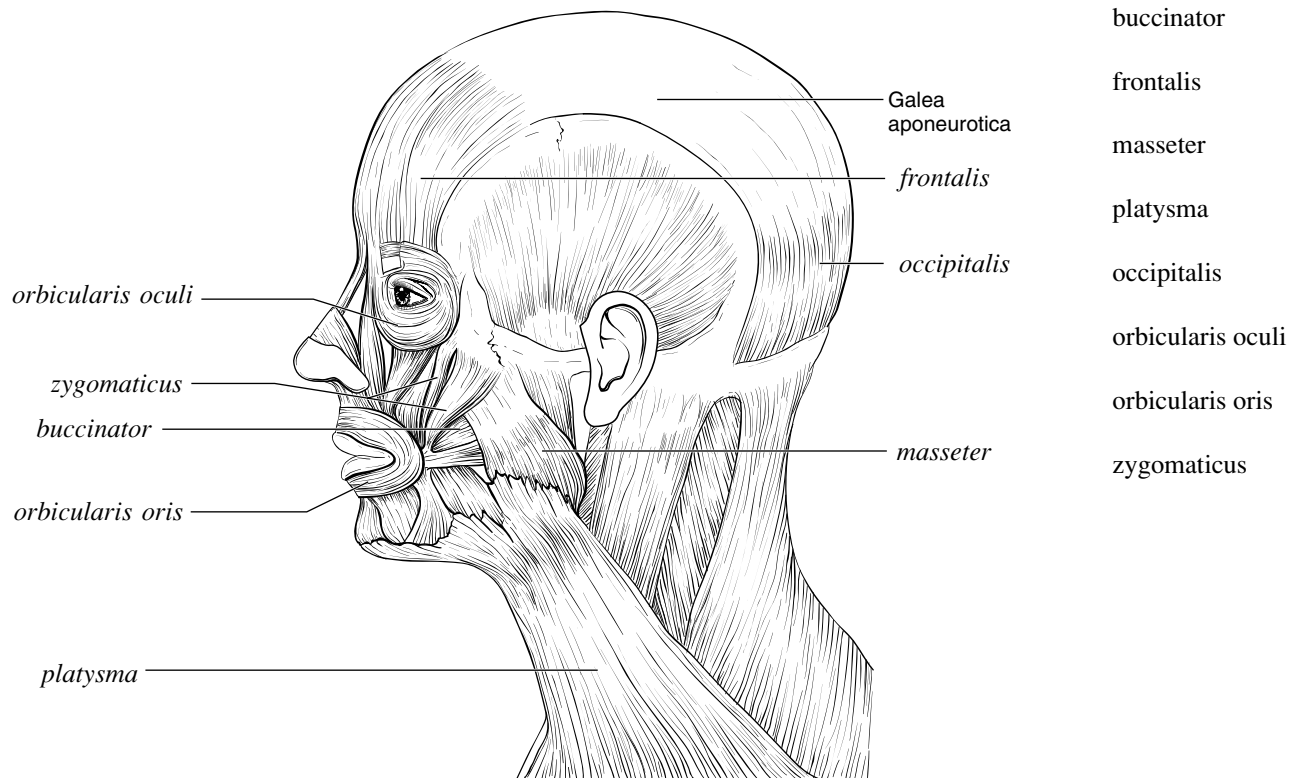
NAME \_\_\_\_\_

LAB TIME/DATE \_\_\_\_\_

## Gross Anatomy of the Muscular System

### Muscles of the Head and Neck

1. Using choices from the list at the right, correctly identify the muscles provided with leader lines on the diagram.



2. Using the terms provided above, identify the muscles described next.

- zygomaticus 1. used to grin
- buccinator 2. important muscle to a saxophone player
- orbicularis oculi 3. used in blinking and squinting
- platysma 4. used to pout (pulls the corners of the mouth downward)
- frontalis 5. raises your eyebrows for a questioning expression
- orbicularis oris 6. your "kisser"
- masseter 7. allows you to "bite" that carrot stick
- platysma 8. tenses skin of the neck during shaving



## Muscles of the Trunk and Upper Limb

3. Using choices from the key, identify the major muscles described next:

- |  |  |
|--|--|
| <u>rectus abdominis</u>                                | 1. a major spine flexor  |
| <u>latissimus dorsi</u>                                | 2. prime mover for pulling the arm posteriorly                       |
| <u>triceps brachii</u>                                 | 3. elbow extender  |
| <u>rectus abdominis</u> , <u>external oblique</u>      | 4. help form the abdominal girdle (four pairs of muscles)            |
| <u>internal oblique</u> , <u>transversus abdominis</u> |  |
| <u>extensor carpi ulnaris</u>                          | 5. extends and adducts wrist   |
| <u>deltoid</u>   | 6. allows you to raise your arm laterally                            |
| <u>pectoralis major</u> , <u>latissimus dorsi</u>      | 7. shoulder adductors (two muscles)                                  |
| <u>biceps brachii</u>                                  | 8. flexes elbow; supinates the forearm                               |
| <u>external intercostals</u>                           | 9. small muscles between the ribs; elevate the ribs during breathing |
| <u>erector spinae</u>                                  | 10. extends the head   |
| <u>erector spinae</u>                                  | 11. extends the spine  |
| <u>extensor carpi radialis</u>                         | 12. extends and abducts the wrist                                    |

Key:

biceps brachii  
deltoid  
erector spinae  
extensor carpi radialis  
extensor carpi ulnaris  
extensor digitorum superficialis  
external intercostals  
external oblique  
flexor carpi radialis  
internal oblique  
latissimus dorsi  
pectoralis major  
rectus abdominis  
transversus abdominis  
trapezius  
triceps brachii

## Muscles of the Lower Limb

4. Use the key terms to respond to the descriptions below.

Key:

<u>fibularis longus</u>	1. lateral compartment muscle that plantar flexes and everts the ankle	adductor group
<u>gluteus maximus</u>	2. forms the buttock	biceps femoris
<u>gastrocnemius</u>	3. a prime mover of ankle plantar flexion	gastrocnemius
<u>tibialis anterior</u>	4. a prime mover of ankle dorsiflexion	gluteus maximus
<u>adductor group</u>	5. allow you to grip a horse's back with your thighs	fibularis longus
<u>vastus muscles</u> , <u>rectus femoris</u>	6. muscles that insert into the tibial tuberosity (two choices)	rectus femoris
<u>rectus femoris</u>	7. muscle that extends knee and flexes thigh	semimembranosus
		semitendinosus
		tibialis anterior
		tibialis posterior
		vastus muscles

## General Review: Muscle Descriptions

5. Identify the muscles described below by completing the statements:

- deltoid, vasti, and gluteus maximus and medius are commonly used for intramuscular injections (three muscles).
- The insertion tendon of the quadriceps group contains a large sesamoid bone, the patella.
- The triceps surae insert in common into the calcaneal tendon.
- The bulk of the tissue of a muscle tends to lie proximal to the part of the body it causes to move.
- The extrinsic muscles of the hand originate on the humerus, radius, and ulna.
- Most flexor muscles on the anterior aspect of the body; most extensors are located posteriorly. An exception to this generalization is the extensor-flexor musculature of the knee.

## General Review: Muscle Recognition

6. Identify the lettered muscles in the diagram of the human anterior superficial musculature by matching the letter with one of the following muscle names:

- t \_\_\_\_\_ 1. orbicularis oris  
v \_\_\_\_\_ 2. pectoralis major  
x \_\_\_\_\_ 3. external oblique  
u \_\_\_\_\_ 4. sternocleidomastoid  
g \_\_\_\_\_ 5. biceps brachii  
e \_\_\_\_\_ 6. deltoid  
l \_\_\_\_\_ 7. vastus lateralis  
q \_\_\_\_\_ 8. frontalis  
k \_\_\_\_\_ 9. rectus femoris  
w \_\_\_\_\_ 10. rectus abdominis  
aa \_\_\_\_\_ 11. sartorius  
c \_\_\_\_\_ 12. platysma  
i \_\_\_\_\_ 13. flexor carpi radialis  
r \_\_\_\_\_ 14. orbicularis oculi  
cc \_\_\_\_\_ 15. gastrocnemius  
b \_\_\_\_\_ 16. masseter  
d \_\_\_\_\_ 17. trapezius  
p \_\_\_\_\_ 18. tibialis anterior  
bb \_\_\_\_\_ 19. adductors  
m \_\_\_\_\_ 20. vastus medialis  
z \_\_\_\_\_ 21. transversus abdominis  
n \_\_\_\_\_ 22. fibularis longus  
j \_\_\_\_\_ 23. iliopsoas  
a \_\_\_\_\_ 24. temporalis  
s \_\_\_\_\_ 25. zygomaticus  
f \_\_\_\_\_ 26. triceps brachii

- h \_\_\_\_\_ 27. brachialis  
o \_\_\_\_\_ 28. extensor digitorum longus  
y \_\_\_\_\_ 29. internal oblique  
dd \_\_\_\_\_ 30. soleus

