Human Anatomy  
Unit 5– Chapter 7 – The Muscular System

Name ____________________________  P.__  Date__________

Turn your stamp sheet in by day of test or one day after for chance at full credit. After that, max points = half credit. GET ANY INCOMPLETE WORK COMPLETED!!! Late work = 2pts if complete.

<table>
<thead>
<tr>
<th>ASSIGNMENT</th>
<th>DATE TO BE COMPLETED</th>
<th>POINTS EARNED</th>
</tr>
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<tbody>
<tr>
<td>1) Muscle Nomenclature</td>
<td></td>
<td>4 2 0</td>
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<tr>
<td>2) PPT notes on muscle movement</td>
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<td>4 2 0</td>
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<tr>
<td>3) Mary, Mary</td>
<td></td>
<td>2 1 0</td>
</tr>
<tr>
<td>4) Worksheet 4-5 naming muscle movement (3 pages) (teacher gives)</td>
<td></td>
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<tr>
<td>5) Anterior and Posterior Body Muscles label</td>
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<tr>
<td>6) Arm and Leg Muscles label</td>
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<tr>
<td>7) Worksheets 4-3 and 4-4 Muscles labels and crossword (teacher gives)</td>
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<tr>
<td>8) Worksheet 4-6 tendons (teacher gives)</td>
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<td>4 2 0</td>
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<tr>
<td>9) “Don’t Get Muscled” worksheet</td>
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<td>4 2 0</td>
</tr>
<tr>
<td>10) The Anatomy of a Muscle diagram + book notes worksheet</td>
<td></td>
<td>4 2 0</td>
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<tr>
<td>11) Worksheet 38 – muscle contraction (goes w/a video)</td>
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<tr>
<td>12) Muscle response reading and question</td>
<td></td>
<td>4 2 0</td>
</tr>
<tr>
<td>13) Review/study guide</td>
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<td>4 2 0</td>
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Muscle Nomenclature

Read the information below and use it to classify the muscles that follow.

The names of muscles basically come from six different sources

- **Size:** Used to compare two muscles in the same area, but of different sizes. Example: *gluteus maximus*.

- **Shape:** The name is based on what shape they look like. Example: *deltoid* is shaped like the Greek letter delta (Δ)

- **Direction that the muscle fibers run.** Example: *rectus abdominus* runs vertically in the abdomen.

- **Location.** Example: *biceps brachii* is found in the arm and brachii = branch/arm

- **Number of attachments the muscle has.** Example: *biceps brachii* has two points of attachment at the origin.

- **The action the muscle performs.** Example: The *extensor digitorum* extends the fingers or digits.

Classify the following muscles according to how they are named using the following categories: **Size, shape fiber direction, location, # of attachments, or action.** (use pages 124-134 in the book to help)

<table>
<thead>
<tr>
<th>MUSCLE</th>
<th>HOW NAMED</th>
<th>MUSCLE</th>
<th>HOW NAMED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trapezius p. 127</td>
<td></td>
<td>Sternocleidomastoid p. 127</td>
<td></td>
</tr>
<tr>
<td>Temporalis p. 126</td>
<td></td>
<td>Masseter p. 126</td>
<td></td>
</tr>
<tr>
<td>Pectoralis major p. 130</td>
<td></td>
<td>Tibialis anterior p. 134</td>
<td></td>
</tr>
<tr>
<td>Rectus Abdominus p. 129</td>
<td></td>
<td>Orbicularis oris p. 126</td>
<td></td>
</tr>
<tr>
<td>External oblique p129</td>
<td></td>
<td>Latissimus dorsi p. 130</td>
<td></td>
</tr>
<tr>
<td>Gluteus medius p. 132</td>
<td></td>
<td>Biceps femoris p. 133</td>
<td></td>
</tr>
</tbody>
</table>

1. Are there some muscles above that fit into more than one category? Which categories often overlap?

2. Which category did most of the muscles fit into?

3. What is the **origin** of the muscle? (pg 124) ______________________________________________________

4. What is the **insertion** of the muscle? (pg 124) ______________________________________________________

5. What is the **prime mover?** (pg 124) ________________________________________________________________

6. What are **synergists** (p. 124) and give an example.

7. What are **antagonists** (p. 124) and give an example.

8. How many skeletal muscle does your body have? (p 124)? ___________________ --
Muscle Movement and Connections – PowerPoint Notes

Basics of Muscle Contraction

- Muscles move your body by ________ on bones.
- Muscles pull by ________.
- Muscles ________ push
- Muscles can only pull in the direction that their ______ run.
- Muscles are attached to bones with ________.
- The origin is the bone the muscle is ____________ that doesn’t move when the muscle contracts.
- The insertion is the bone the muscle is attached to that ____________
- Muscles often work in groups
  - The muscle doing most of the movement is the ________________
  - The other muscles that help are the ________________
  - An ________________ is a muscle that does the opposite movement of a muscle.
    - The triceps straightens the arm whereas the biceps ________________ the arm. They are antagonists.

Types of Movement

- Flexion (flex) __________________ – usually bending the part towards the body.
- Extension (extend) _______________ – usually straightening the body part. (draw in example for both)

- Adduction – moves body part toward the ________ brings them closer to the body
- Abduction – moves body part laterally ________ from the midline – moves them away from the body (draw in example for both)

- Tone: The ________________ contraction of part of the muscle
- Hypertrophy: The ______________ in muscular size due to sustained exercise
- Atrophy: The ______________ of muscular size due to sustained inactivity
Mary, Mary, Quite Contrary, How does your Body Move?

By now you have lived long enough to know that your muscles move your bones, thereby moving your body. Muscles move by contracting and then pulling on bones. The type of movement they produce is described on page 106 in your book.

Read the description and decide the type of movement described. Write the type of movement in the blank next to the description. Also, while reading, try to move the way it is described in your book.

_______________________1) A body part is moved around its own axis
_______________________2) Reduces the joint angle, like bending of the knee
_______________________3) To move away from the midline
_______________________4) When you lift your shoulder while shrugging
_______________________5) To move toward the midline
_______________________6) Increases the joint angle, like when straightening arm
ANTERIOR VIEW OF SKELETAL MUSCLES

Use page 125 in the book to label AND color code all of these muscles. Use the word bank to get correct labels.

<table>
<thead>
<tr>
<th>adductors group</th>
<th>deltoid</th>
<th>biceps brachii</th>
</tr>
</thead>
<tbody>
<tr>
<td>external oblique</td>
<td>frontalis</td>
<td>gracilis</td>
</tr>
<tr>
<td>internal oblique</td>
<td>masseter</td>
<td>orbicularis oculi</td>
</tr>
<tr>
<td>orbicularis oris</td>
<td>pectoralis major</td>
<td>rectus abdominus</td>
</tr>
<tr>
<td>rectus femoris</td>
<td>sartorius</td>
<td>peroneus longus</td>
</tr>
<tr>
<td>sternocleidomastoid</td>
<td>temporalis</td>
<td>tibialis anterior</td>
</tr>
<tr>
<td>vastus lateralis</td>
<td>vastus medialis</td>
<td>zygomaticus</td>
</tr>
</tbody>
</table>
POSTERIOR VIEW OF SKELETAL MUSCLES
Use page 125 in the book to label AND color code all of these muscles. Use the word bank to get correct labels.

<table>
<thead>
<tr>
<th>Trapezius</th>
<th>Deltoid</th>
<th>Triceps brachii</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latissimus dorsi</td>
<td>External oblique</td>
<td>Gluteus medius</td>
</tr>
<tr>
<td>Gluteus maximus</td>
<td>Soleus</td>
<td>Gastrocnemius</td>
</tr>
<tr>
<td>Hamstrings</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Muscles of the arm and forearm

COLOR AND LABEL!

<table>
<thead>
<tr>
<th>Muscle Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>DELTOID</td>
</tr>
<tr>
<td>TRICEPS BRACHII</td>
</tr>
<tr>
<td>BICEPS BRACHII</td>
</tr>
<tr>
<td>EXTENSOR CARPI RADIALIS</td>
</tr>
<tr>
<td>BRACHIORADIALIS</td>
</tr>
<tr>
<td>FLEXOR CARPI ULNARIS</td>
</tr>
<tr>
<td>EXTENSOR DIGITORUM</td>
</tr>
</tbody>
</table>
LEG MUSCLES
Use page 133 in the book to label AND color code all of these muscles. Use the word bank to get correct labels.

<table>
<thead>
<tr>
<th>Semimembranosus</th>
<th>Rectus femoris</th>
<th>Tibialis anterior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps femoris</td>
<td>Vastus medialis</td>
<td>Gluteus medius</td>
</tr>
<tr>
<td>Gluteus maximus</td>
<td>Soleus</td>
<td>Gastrocnemius</td>
</tr>
<tr>
<td>Sartorius</td>
<td>Vastus lateralis</td>
<td>Fibularis</td>
</tr>
<tr>
<td>Semitendinosus</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Don’t Get Muscled Out of This!

Use the pictures below, the handout and pages 115-117 in your text to answer the questions below.

<table>
<thead>
<tr>
<th>Letter</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
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<tr>
<td>E</td>
<td></td>
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<tr>
<td>G</td>
<td></td>
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<td>I</td>
<td></td>
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<td>K</td>
<td></td>
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<td>B</td>
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<td>D</td>
<td></td>
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<td>F</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td></td>
</tr>
</tbody>
</table>

1. What is the advantage of having muscle divided into such small segments?

2. Find a source that describes what actin and myosin look like. Explain how their shape might help with their function. (pg 119)

3. What accounts for the striated appearance of skeletal muscle?

4. Explain why tendons connect muscle to bones at the end. Why wouldn’t it be as effective if it was connected in the middle or at many points along the bone? Use the back if you need more space.
The Anatomy of a Muscle

Use the diagrams to fill in the missing information

All skeletal muscles have the same basic anatomy.

- ________ connect the muscles to the bones

- Muscle is coated with a thin sheath made of protein called the ________

- Each bundle of muscle is also covered with a sheath called the ________

- Within each bundle are individual fibers. Each of these is essentially one cell.

- Each fiber is made of many ________ which are themselves made of two proteins: ________ and ________.

- These fibers are broken into individual segments called ________. Each one can be identified because it exists between two dark, thin lines in the muscle called ______-lines.

When muscles contract, the actin and myosin together and grip. Similar to Velcro™.

Muscle cells have a ________ reticulum instead of an endoplasmic reticulum. Main function of this is calcium storage, release reabsorption. Calcium ions (Ca^{2+}) are necessary for muscular contractions and release.
Skeletal muscle tissue has alternating ________- and ________- bands, giving it a striated appearance.

I. Muscle Fiber
In a muscle cell (aka muscle ________) the plasma membrane is called the ____________, the cytoplasm is called the ____________, and the endoplasmic reticulum is called the ________________ ________________.

T-tubules dip down into the muscle fiber. ___________ ions, which are needed for muscle ________________, are stored in the T-tubules.

Muscle fibers are made of ____ fibrils.

A. A sarcomere is a portion of a _________________________ (from one ___ line to another)

B. Myofibrils are made of 2 types of protein ________________. The thick filament is made of the protein ____________, and the thin filament is made of the protein ________________.

C. The darker region of the A band in the sarcomere is produced by overlapping ___________ and ____________ filaments.

D. The thick filaments are made of ____________ molecules which are shaped like a ______ _________.

E. The thin filaments are made of 2 intertwining strands of ____________ molecules.

F. A muscle contracts when the ____________ filaments begin to slide toward each other.

G. ______ provides the energy for muscle contraction.
Worksheet 38

Muscle Contraction

PART A Using the diagram below, match each letter with the correct term by writing a letter in each space provided. Some letters will be used more than once.

1. ______ actin
2. ______ myofibril
3. ______ muscle fiber
4. ______ thick filament
5. ______ thin filament
6. ______ muscle bundle
7. ______ myosin
8. ______ individual muscle cell

PART B Answer the following.

<table>
<thead>
<tr>
<th></th>
<th>DURING MUSCLE CONTRACTION</th>
<th>DURING MUSCLE RELAXATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>How does sarcomere shape change?</td>
<td>a.</td>
<td>c.</td>
</tr>
<tr>
<td>How does the distance between Z lines change?</td>
<td>b.</td>
<td>d.</td>
</tr>
</tbody>
</table>

1. Complete the table.

2. Explain why the accepted theory of how skeletal muscles move is called the “sliding filament” theory.

3. Describe the role of ATP in muscle contraction.

4. What is the role of Calcium ions in muscle contractions?

   When a muscle fiber receives a nerve impulse from the m_____ neuron, c_____ ion channels open and allow calcium ions to flow into the s__________. The presence of the calcium is needed for the c_________________ to from between the actin and the myosin filaments.
An important characteristic of skeletal muscle is its ability to contract to varying degrees. Although each fiber either contracts fully or doesn’t, known as the all-or-none law, a muscle, like the biceps, contracts with varying degrees of force depending on the circumstance (this is also referred to as a graded response). Muscles do this by a process called summation, specifically by motor unit summation and wave summation.

**Motor Unit Summation** - the degree of contraction of a skeletal muscle is influenced by the number of motor units being stimulated (with a motor unit being a motor neuron plus all of the muscle fibers it innervates; see diagram below). Skeletal muscles consist of numerous motor units and, therefore, stimulating more motor units creates a stronger contraction.

**Wave Summation** - an increase in the frequency with which a muscle is stimulated increases the strength of contraction. This is illustrated in (b). With rapid stimulation (so rapid that a muscle does not completely relax between successive stimulations), a muscle fiber is re-stimulated while there is still some contractile activity. As a result, there is a 'summation' of the contractile force. In addition, with rapid stimulation there isn’t enough time between successive stimulations to remove all the calcium from the sarcoplasm. So, with several stimulations in rapid succession, calcium levels in the sarcoplasm increase. More calcium means more active cross-bridges and, therefore, a stronger contraction.

If a muscle fiber is stimulated so rapidly that it does not relax at all between stimuli, a smooth, sustained contraction called **tetanus** occurs (illustrated by the straight line in c above & in the diagram below).

So, under most circumstances, calcium is the "switch" that turns muscle "on and off" (contracting and relaxing).

When a muscle is used for an extended period, ATP supplies can diminish. As ATP concentration in a muscle declines, the MYOSIN HEADS remain bound to actin and can no longer swivel. This decline in ATP levels in a muscle causes MUSCLE FATIGUE. Even though calcium is still present (and a nervous impulse is being transmitted to the muscle), contraction (or at least a strong contraction) is not possible.

Even when some muscles appear to be at rest, they exhibit **tone**, when some of their fibers are still contracting slightly. Tone allows us to keep our posture. If all of our muscles were to completely relax, we would collapse – like when a person becomes unconscious.

If muscles are not used they **atrophy**, or become weaker and shorter. When muscles are used forcefully for extended amounts of time the **hypertrophy**, or become stronger why increasing the number of myofibrils within the muscle fiber.

There are 2 types of muscle fibers, slow-twitch and fast-twitch. Slow twitch muscles tend to use aerobic respiration to metabolize sugars thereby giving them more energy. They have more mitochondria and appear darker due to more
myoglobin. These muscles are used during endurance type exercising like marathon running. They do not respond as quickly as the fast-twitch fibers so they fatigue slower.

Fast-twitch muscles tend to be anaerobic, so they can get energy from sugars quickly, but they don’t get a lot of energy so they fatigue quickly too. Fast-twitch muscles are lighter in color and have less mitochondria. They are used during explosive type exercising like weight-lifting or sprint running.

**QUESTIONS**

1. Although individual muscle fibers either contract fully or not at all (“the all or none principle”), a muscle has the ability to contract to ____________ degrees.

2. What is a motor unit made of? _____________________________________________________________

3. The muscles of the eye have a one motor neuron connected to 23 muscle fibers, whereas the gastrocnemius has one motor neuron connected to 1,000 muscle fibers. Why would there be such a difference in the ratio of neuron to fibers between these two muscles? ____________________________________________

4. In a strong contraction more __________ ____________ are stimulated than in a weaker contraction.

5. In a muscle a rapid succession of stimulations will result in a (stronger/weaker) contraction.

6. Explain why a rapid succession of stimulations results in an increase of calcium levels in the sarcoplasm. _________________________________________________________________

7. Calcium is involved with the formation of ____________ - ____________, which are involved in muscle contraction.

8. Explain what “tetanus” is and how it happens___________________________________________

9. Why do muscles fatigue after awhile even though calcium levels are high and the muscles are still getting the nerve impulse?

10. What is tone? _______________________________________________________________________

11. Why can slow-twitch muscles contract longer than fast-twitch muscles? ______________________

12. Think back to your Biology days – why do your muscles fatigue more quickly if you are not breathing while exercising?

13. Why can’t a fast sprinter run a marathon?______________________________________________
1) The 3 type of muscles are ____________, ______________ and ____________.

2) The bone that the muscle is attached to and pulls on is the ____________ point.

3) Cardiac muscle is found in the ____________. Cardiac muscle, like skeletal muscle is ____________, but unlike skeletal muscle, its fibers ____________, like a tree.

4) The bone that the muscle is attached to and anchored to is the ____________.

5) Two muscles are needed to move bones back and forth because muscles can only ________________.

6) The most numerous muscles in the body are ________________ muscles.

7) Smooth muscle is not striated and is found in the ________________ and other organs.

8) Smooth muscles are considered ________________ since they contract on their own, you don’t control it.

9) The muscles help maintain homeostasis of the body by pumping ____________, allowing for eyes to move, contracting the ____________ for breathing, and moving food through ____________ system.

10) Muscles move in response to messages from ____________.

11) The tissue that holds muscle to bone is called a ____________.

12) The root word __________ means “muscle”.

13) A continuous contraction due to a fusion of twitches is ________________.

14) The growth of muscles due to heavy use and the repair of small tears is ________________.

15) A type of tetanus in which only a small number of fibers contract affecting posture is ____________.

16) A muscle warm up phenomenon is which single twitches rapidly follow each other is ________________.

17) The deterioration of muscles due to lack of use is ________________.

18) The muscles in a group that relax during the action is the definition of a(n) ________________.

19) The ____________ ____________ is named this because it has 2 points of attachment.
20) The _________________ is named this because it has a triangular shape.

21) The _______________ _______________ is named this because it extends the digits.

22) The _______________ _______________ is named this because of its size.

23) The _______________ _______________ is named this because of the direction that its fibers run.

24) Muscles are made of muscle _______________, which are made of muscle fibers. Muscle fibers are made of _______________ which are made of myofilaments (_____________ or myosin).

25) When a muscle contracts in a spasm without relaxing, the result is ____________.

26) The chemical that blocks the inhibitor in a muscle contraction is ____________.

27) During a muscle contraction after the ATP is broken down, the actin slides towards each other in the ____________.

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**Be able to identify the following muscles on a diagram.**

Be able to identify the following muscles on a diagram.

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Muscle</th>
<th>Muscle</th>
<th>Muscle</th>
<th>Muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sternocleidomastoid</td>
<td>Deltoid</td>
<td>Masseter</td>
<td>Trapezius</td>
<td>Pectoralis major</td>
</tr>
<tr>
<td>Biceps brachii</td>
<td>Latissimus dorsi</td>
<td>Triceps brachii</td>
<td>Gluteus maximus</td>
<td></td>
</tr>
<tr>
<td>Rectus femoris</td>
<td>Biceps femoris</td>
<td>Gastrocnemius</td>
<td>Achilles tendon</td>
<td></td>
</tr>
</tbody>
</table>

**Answer Bank**

- A cramp
- Actin
- Bundles
- Ca++
- Deltoid
- Extensor digitorum
- Gluteus maximus
- Myofibrils
- Rectus abdominus
- Sarcomere