MUSCULAR SYSTEM



Complete Anatomy Unit

15 day unit

Includes print and digital

biology roots

Features in a Nutshell:

Answer keys included

Editable items included

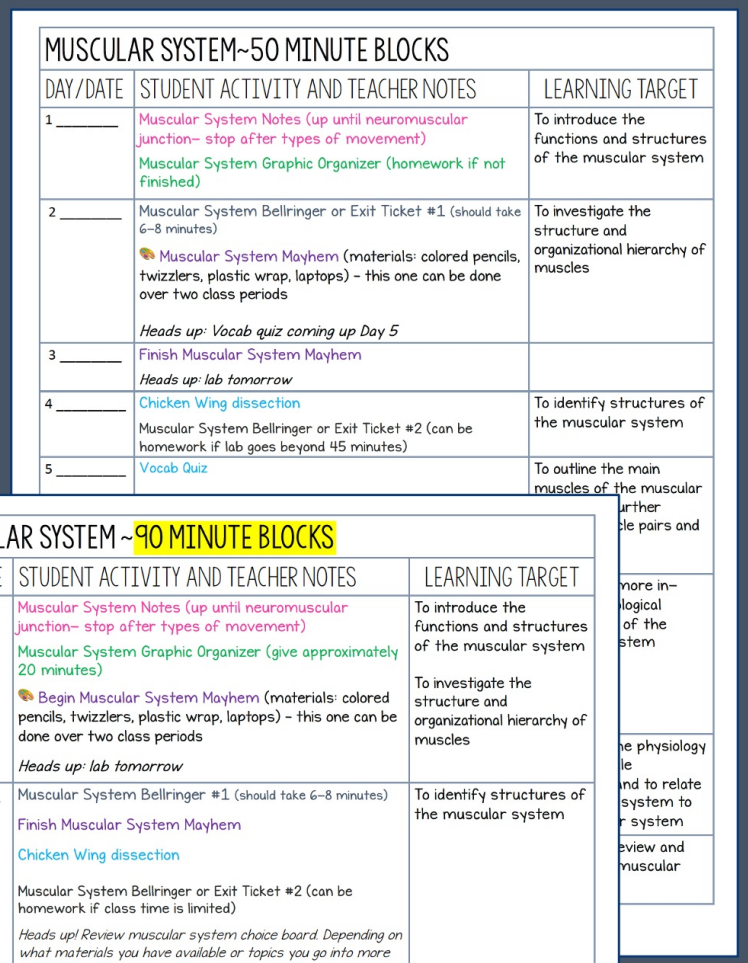
Differentiated
(advanced/honors version)

Pacing Guides
(50 and 90 minute)

Print and Digital
(Google Slides)

Hands-on labs

15 days of lessons, ready to teach



MUSCULAR SYSTEM~50 MINUTE BLOCKS

DAY/DATE	STUDENT ACTIVITY AND TEACHER NOTES	LEARNING TARGET
1 _____	Muscular System Notes (up until neuromuscular junction– stop after types of movement) Muscular System Graphic Organizer (homework if not finished)	To introduce the functions and structures of the muscular system
2 _____	Muscular System Bellringer or Exit Ticket #1 (should take 6–8 minutes) Muscular System Mayhem (materials: colored pencils, twizzlers, plastic wrap, laptops) – this one can be done over two class periods *Heads up: Vocab quiz coming up Day 5*	To investigate the structure and organizational hierarchy of muscles
3 _____	Finish Muscular System Mayhem *Heads up: lab tomorrow*	
4 _____	Chicken Wing dissection Muscular System Bellringer or Exit Ticket #2 (can be homework if lab goes beyond 45 minutes)	To identify structures of the muscular system
5 _____	Vocab Quiz	To outline the main muscles of the muscular … urther … cle pairs and … more in– … ological … of the … stem … he physiology … le … nd to relate … system to … r system … eview and … nuscular

MUSCULAR SYSTEM ~90 MINUTE BLOCKS

DAY/DATE	STUDENT ACTIVITY AND TEACHER NOTES	LEARNING TARGET
1 _____	Muscular System Notes (up until neuromuscular junction– stop after types of movement) Muscular System Graphic Organizer (give approximately 20 minutes) Begin Muscular System Mayhem (materials: colored pencils, twizzlers, plastic wrap, laptops) – this one can be done over two class periods *Heads up: lab tomorrow*	To introduce the functions and structures of the muscular system To investigate the structure and organizational hierarchy of muscles
2 _____	Muscular System Bellringer #1 (should take 6–8 minutes) Finish Muscular System Mayhem Chicken Wing dissection Muscular System Bellringer or Exit Ticket #2 (can be homework if class time is limited) *Heads up! Review muscular system choice board. Depending on what materials you have available or topics you go into more depth with, you may want to add more choices. You can edit it so that students need to choose two options instead of one*	To identify structures of the muscular system
3 _____	Vocab Quiz Muscle Labeling and Movement Muscular System Bingo (see notes in Folder or teacher print) Hand out/share choice board so students can start thinking about which project/option they choose. Finish muscular System Notes Open Note "Quiz" (optional if you think your students needed extra practice) – students can finish for homework if needed *Heads up: Exhibition Stations next class (protective sheets ensure you only need to print once!) Please review materials needed so you are prepared.*	To outline the main muscles of the muscular system, to further explore muscle pairs and movement Introduces more in–depth physiological components of the muscular system
4 _____	Neuromuscular Junction Reading and Coloring (should take about 40–50 minutes) Muscular System Exhibition Stations (materials: clothespins, microscope slide if you have one)	To explore the physiology behind muscle contraction and to relate the nervous system to the muscular system …view and …uscular

Pacing guides to outline the unit

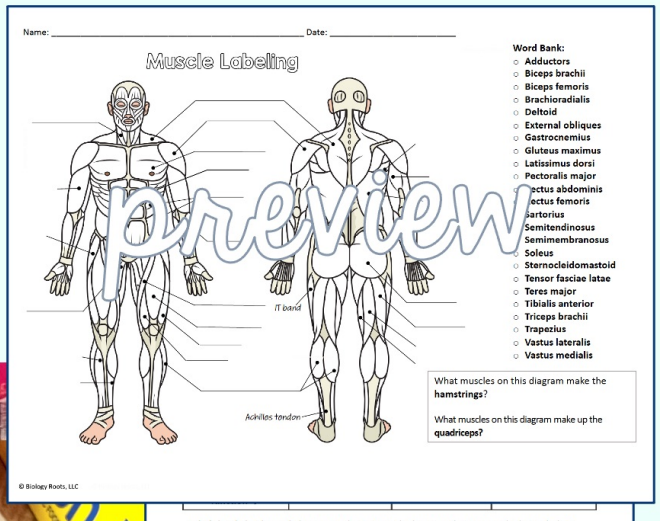


Muscular System

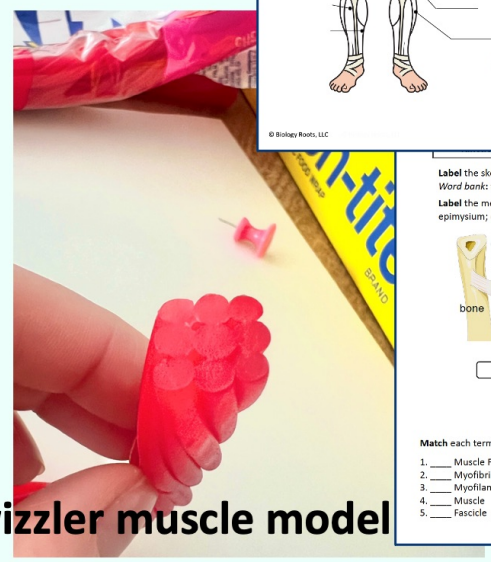
Types of resources included:

- ✅ Editable PowerPoint with 2 types of student notes
- ✅ Exploration: ATP and Muscle Fatigue; Hypertrophy
- ✅ Group work to explore muscle physiology
- ✅ Differentiated student packets
- ✅ Modeling Skeletal Muscle Using Twizzlers
- ✅ Neuromuscular Junction Coloring
- ✅ Muscle BINGO!
- ✅ Graphic Organizer
- ✅ Bellringers
- ✅ Case Study
- ✅ Chicken Wing Dissection
- ✅ Exhibition Stations

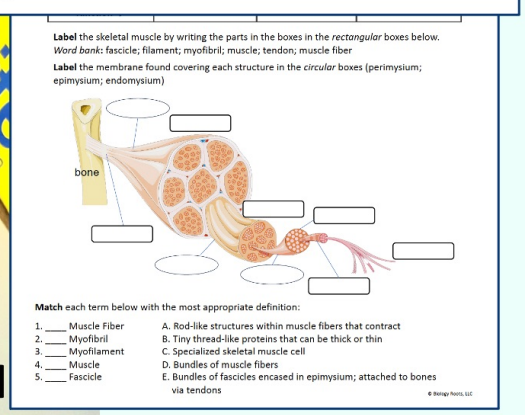
... plus more!



Preview



Twizzler muscle model



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Muscular System

Topics include:

✅ Types of muscle (smooth; cardiac; skeletal)

✅ Skeletal muscle structure

✅ The Neuromuscular Junction & Cycling of Proteins

✅ Skeletal Muscle Labeling

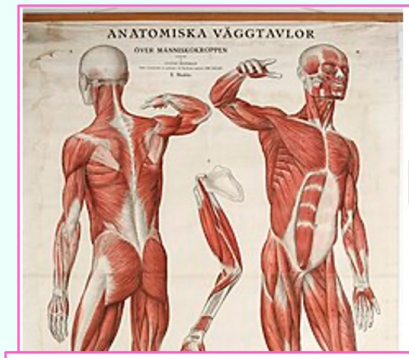
✅ Types of Movement: Flexion, Extension, etc.

✅ Origin and Insertion

✅ Physiology: DOMS; Fatigue; Muscle Soreness; Rigor Mortis

biology roots

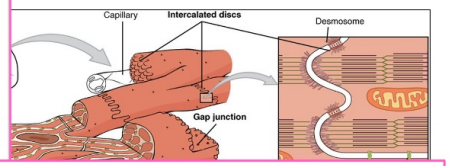
Muscular System



THE MUSCULAR SYSTEM

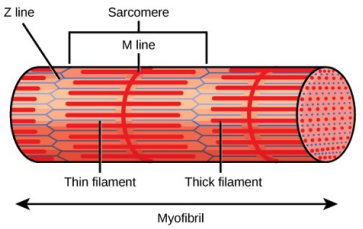
Muscle (cardiac myocytes)

cle cells must work in unison to form a
hey are branched to form an electrical network
nnected web.

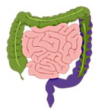


Sarcomeres

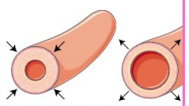
re is the smallest
yofibril that can
is a combination
d myosin
nts measured
to Z-line
where actin is
d:



Smooth Mus



Smooth muscle pushes food and waste through the intestines



Blood vessels can dilate constrict to move blood

What are skeletal mu

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fibers.
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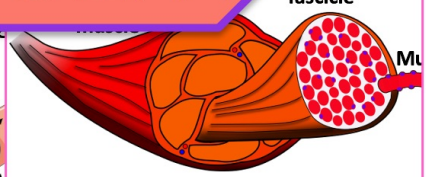
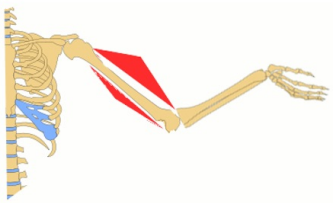


contract during childbirth

Skeletal muscles work in antagonistic pairs



- **Agonist** = muscle that contracts to produce the primary desired movement (prime mover)
- **Antagonist** = muscle that relaxes to lengthen

One contracts, one relaxes - they switch roles between opposite movements.

Example

- Elbow flexion (bending the arm) - biceps contract (agonist), triceps relax (antagonist)
- Elbow extension (straighten the arm)- triceps contract (agonist), biceps relax (antagonist)

ential

e muscles move?)

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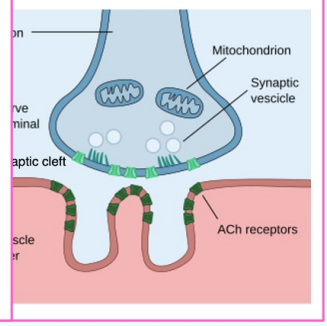
notor neuron and the



EDITABLE POWERPOINT

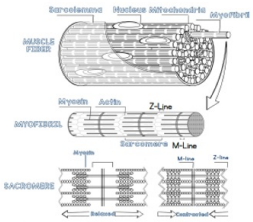
MODELS & LABS



Name: _____ Date: _____

Exploration: ATP, Muscle Fatigue, DOMS & Hypertrophy

Have you ever wondered why your muscles can feel sore after workouts?



I. Muscle fibers are made of smaller structures called myofilaments, which are organized into repeating chains of sarcomeres: contractile units made of actin and myosin. Actin and myosin slide over each other to create a pull, or contraction, resulting in movement.

Muscle fibers contain many mitochondria: the organelle that produces ATP (cellular energy) using glucose and oxygen.

Muscles need ATP in order to contract. More muscle contraction = higher ATP demands.

1. What is a sarcomere and how does it relate to muscle contraction?

2. Which organelle is found in high numbers within muscle fibers, and why?

3. Muscles at work need (circle one) [ATP | actin] to meet energy demands.

II. Exploring Muscle Fatigue

Choose ONE exercise: wall sits or push-ups. For push-ups, your partner will count how many you can do within a 40 second interval. For wall sits, your partner will record how long you were able to do the wall sit with good form within 40 seconds. Good form means back against the wall, legs at a 90 degree angle without moving feet!

The goal is to do as many push-ups as you can in 40 seconds, or to do a wall-sit in good form for as long as you can within 40 seconds over three rounds. ***You only have 15 seconds of rest between rounds, then right back to it for a repeat!***

For push-ups, record a number, for wall sits, record the time in seconds. Record your data as well as your partner's in the space below.

Your chosen exercise: _____ Your partner's chosen exercise: _____

QUANTITATIVE DATA

Round 1 =
Round 2=
Round 3=

QUANTITATIVE DATA

Round 1 =
Round 2=
Round 3=

QUALITATIVE DATA – describe how you felt each round:



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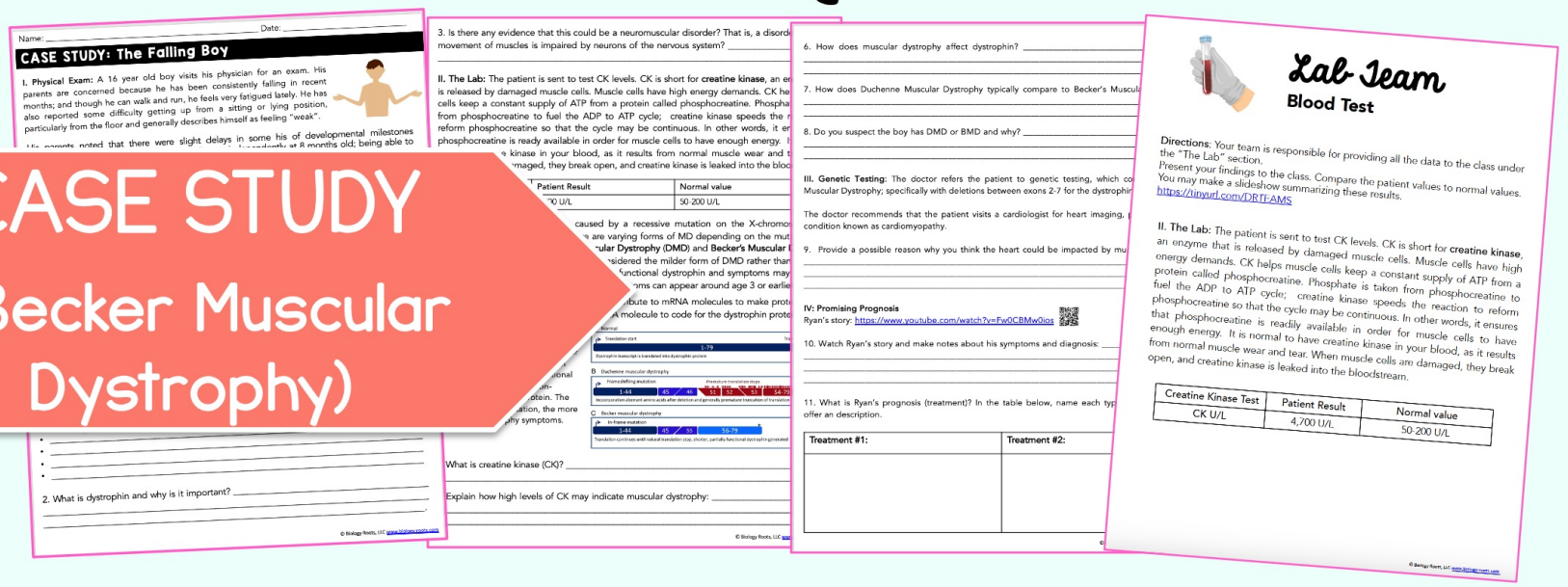
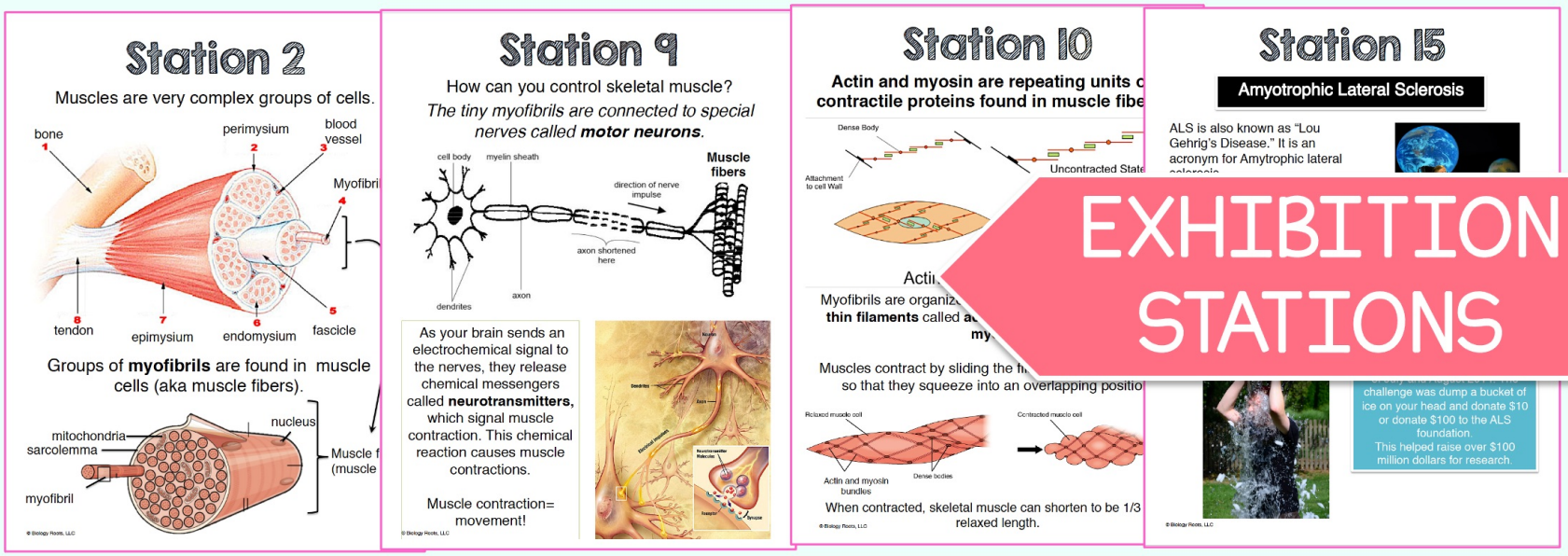
Muscular System

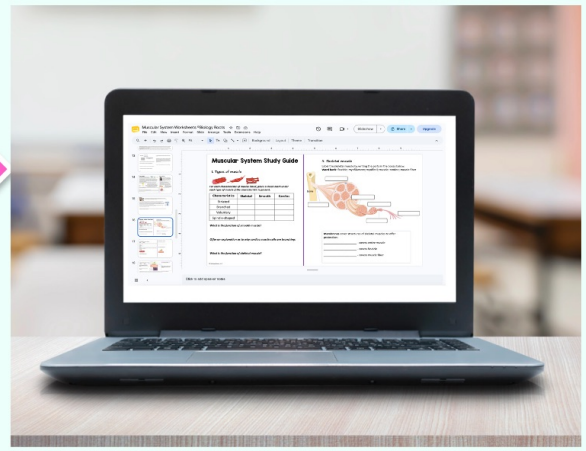
CASE STUDY (Becker Muscular Dystrophy)



EXHIBITION STATIONS



DIGITAL VERSIONS



Hosted on Google Slides

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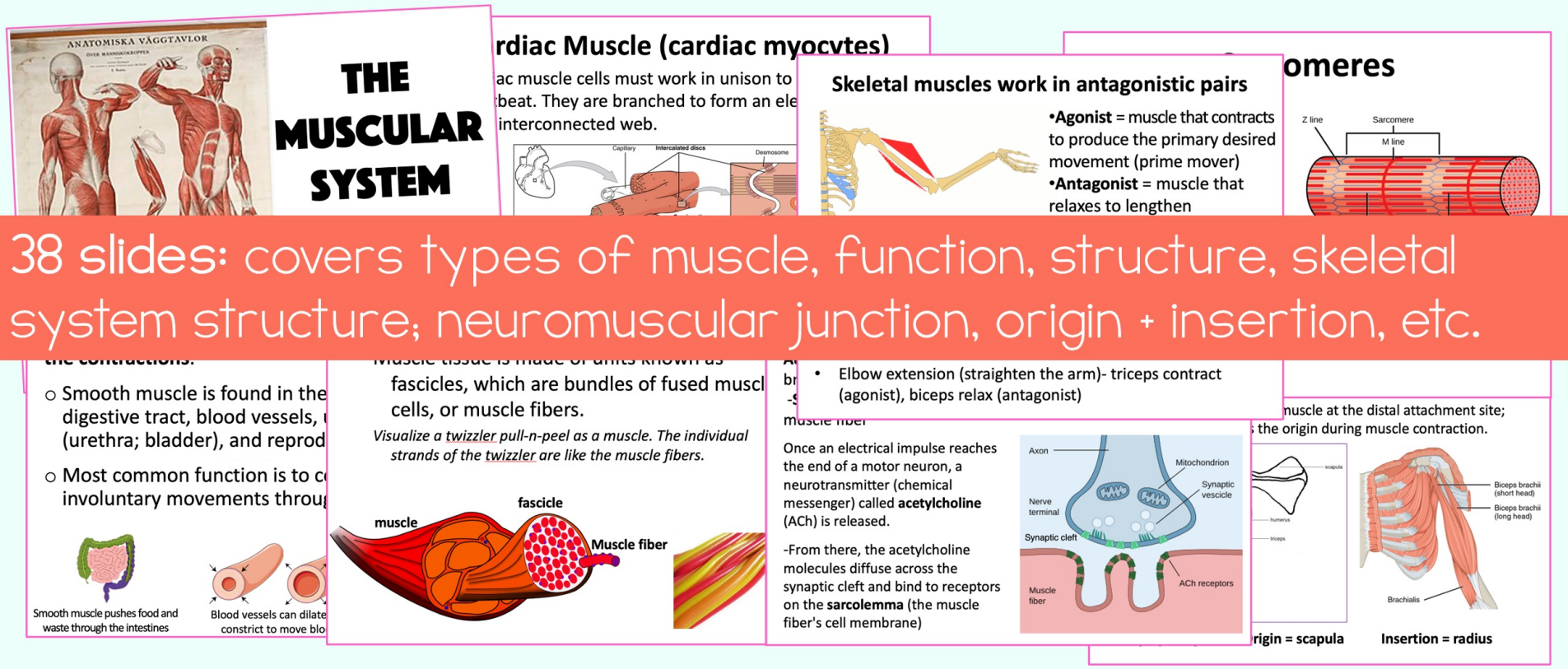
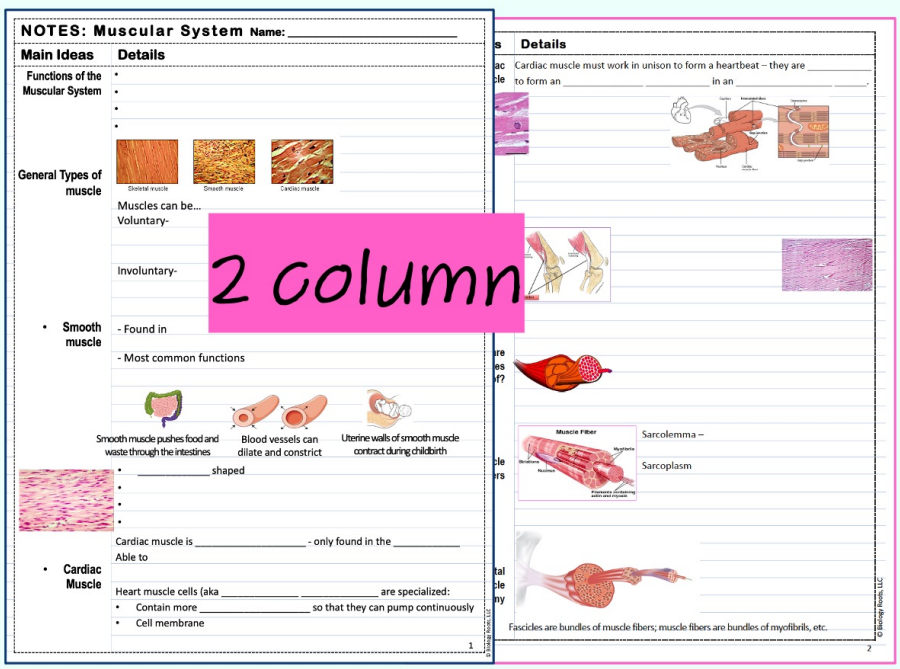
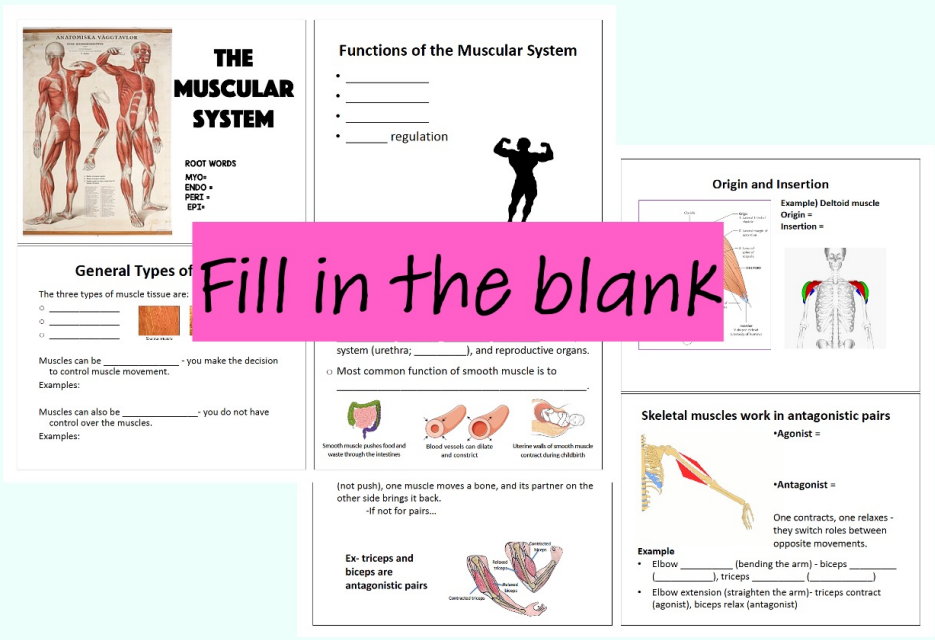
Editable PowerPoint Presentation (+ open note quiz)



38 slides: covers types of muscle, function, structure, skeletal system structure; neuromuscular junction, origin + insertion, etc.

2 types of student notes to choose from:
2 column OR fill-in-the-blank (editable)





Muscular System Classwork

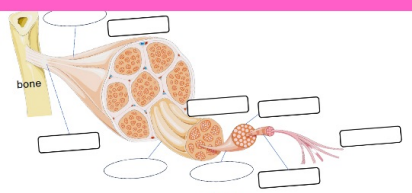
Bellringers • Exit Tickets

Name: _____ Date: _____

Muscular System Bellringer or Exit Ticket #1

For each characteristic of muscle listed, **place a check mark** under each type of muscle if the characteristic is present. In the the bottom row, **describe its function.**

Characteristics	Skeletal	Smooth	Cardiac
Striated			
Branched			
Voluntary			
Involuntary			



Match each term below with the most appropriate definition:

1. ___ Muscle Fiber
2. ___ Myofibril
3. ___ Myofilament
4. ___ Muscle
5. ___ Fascicle

A. Rod-like structures within muscle fibers that contract
B. Tiny thread-like proteins that can be thick or thin
C. Specialized skeletal muscle cell
D. Bundles of muscle fibers
E. Bundles of fascicles encased in epimysium; attached to bones via tendons

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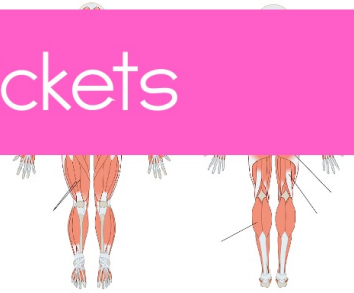
Name: _____ Date: _____

Muscular System Exit Ticket or Bellringer #2
Label the major muscles

❑ Deltoid	❑ Gastrocnemius	❑ Gluteus maximus	❑ Rectus femoris
❑ Pectoralis major	❑ External obliques	❑ Triceps brachii	❑ Biceps femoris
❑ Biceps brachii	❑ Rectus abdominis	❑ Latissimus dorsi	❑ Trapezius
		❑ Brachioradialis	



Name: _____ Date: _____

Muscular System Bellringer or Exit Ticket #3

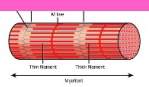
Muscle Fiber



Define the following components of the muscle fiber:

Sarcolemma:

Myofibril:



Thick filament= **Thin filament=**

How are sarcomeres related to myofilaments?

- Explain the sliding filament theory:

-What neurotransmitter from the nervous system is required to begin the process of muscle contraction?

-What role do calcium ions (Ca^{2+}) play in muscle contraction?

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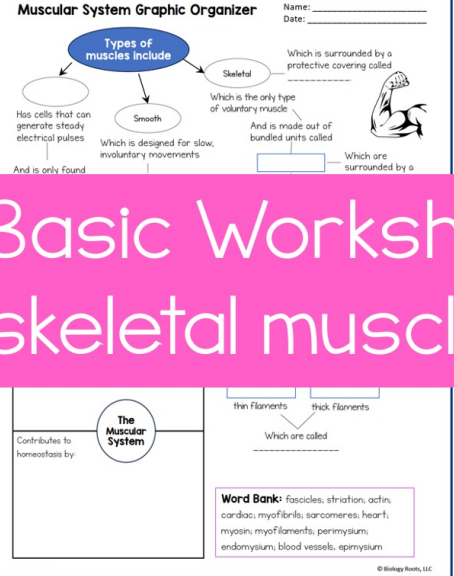
Basic Worksheets: Graphic organizer, labeling, skeletal muscle model, & coloring:

Muscular System Graphic Organizer

Name: _____
Date: _____



Word Bank: fascicles, striation, actin, cardiac, myofibrils, sarcomeres, heart, myosin, myofilaments, perimysium, endomysium, blood vessels, epimysium

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Part III: Twizzler Skeletal Muscle Model



Materials:
1 twizzler pull-and-peel *per person*
Plastic wrap

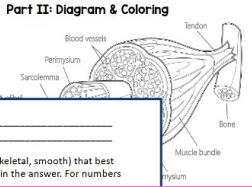
1.Pull apart a Twizzler into strands — each strand represents a **muscle fiber (cell).**

17. What type of muscle is this? How do you know? _____

18. How many fascicles can you spot in the illustration? _____

19. Epimysium, perimysium, and

Part II: Diagram & Coloring



MUSCULAR MAYHEM

Name: _____
Date: _____

Part I: In the table below, determine the type of muscle (cardiac, skeletal, smooth) that best matches the description. More than one type of muscle can be listed in the answer. For numbers



9. _____ 10. _____ 11. _____

Read the summary about the **structure of skeletal muscle** and answer the questions.

Skeletal muscle is designed for movement.

- **The smallest structures are the myofilaments (actin and myosin)- structures that slide** to cause contraction (actin=thin; myosin=thick)
- **Sarcomere= organized units of myo-filaments** where contraction happens; runs from **one Z-line to the next.**
- **Myofibril = long chain of sarcomeres within a muscle fiber**
- **Muscle fiber = specialized muscle cell that contains many myofibrils; encased in endomysium**
- **Fascicle = bundle of muscle fibers wrapped in perimysium**
- **Muscle= multiple bundled fascicles, nerves, and blood vessels wrapped in epimysium.**

12. What are myofilaments?

13. What are sarcomeres?

14. Why do you think it's important that actin and myosin are organized into a specific pattern?

15. How is a sarcomere different from a myofibril?

16. What is the relationship between fascicles and muscles?

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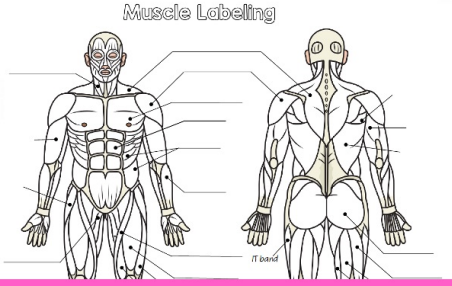
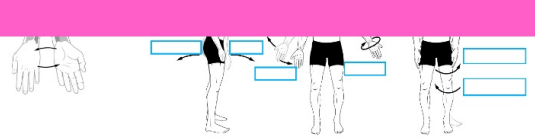
Name: _____ Date: _____

Muscle Labeling



Word Bank:
- Adductors
- Biceps brachii
- Biceps femoris
- Brachioradialis
- Deltoid
- External obliques
- Gastrocnemius
- Gluteus maximus
- Latissimus dorsi
- Pectoralis major
- Rectus abdominis
- Rectus femoris
- Sartorius
- Semitendinosus
- Semimembranosus
- Soleus
- Sternocleidomastoid
- Tensor fasciae latae
- Teres major
- Tibialis anterior
- Triceps brachii



1. Briefly summarize antagonistic muscle pairs (including why muscles work in pairs): _____

2. Complete the table below. For each joint listed, determine the movements and antagonist/agonist muscle pairs.

Joint	Movement Term	Movement description	Agonist	Antagonist
Elbow	flexion	Flexion of elbow/bend arm		triceps
	extension			
knee			hamstrings	
		Extension of knee/ straighten leg		
Shoulder	abduction			Latissimus dorsi
		Move arms towards body		deltoid

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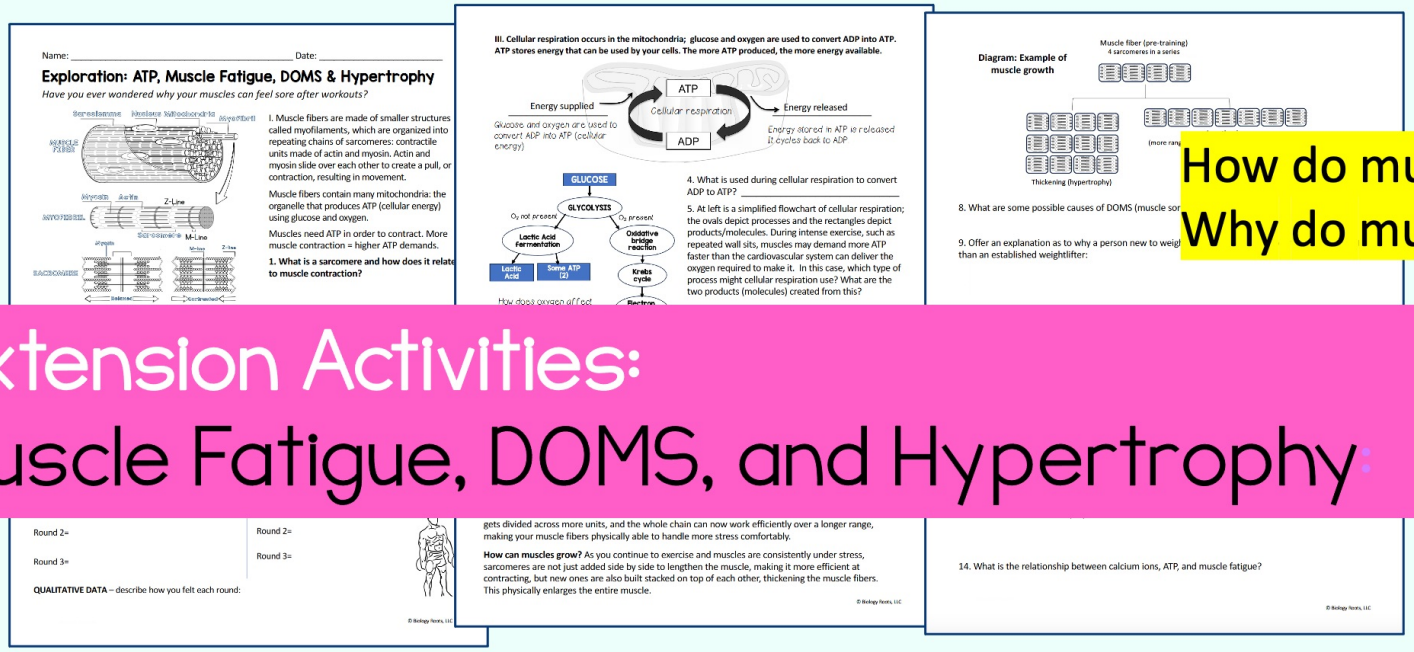
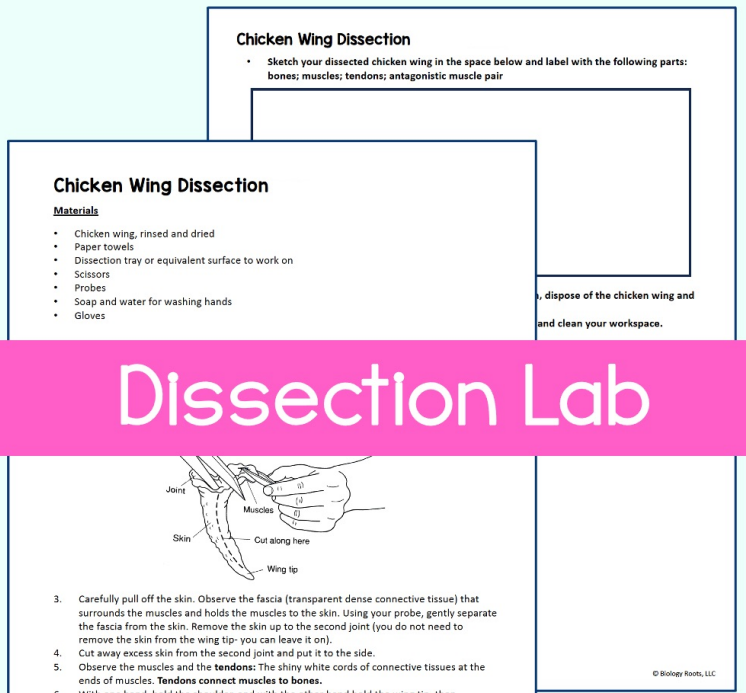
Muscular System Classwork



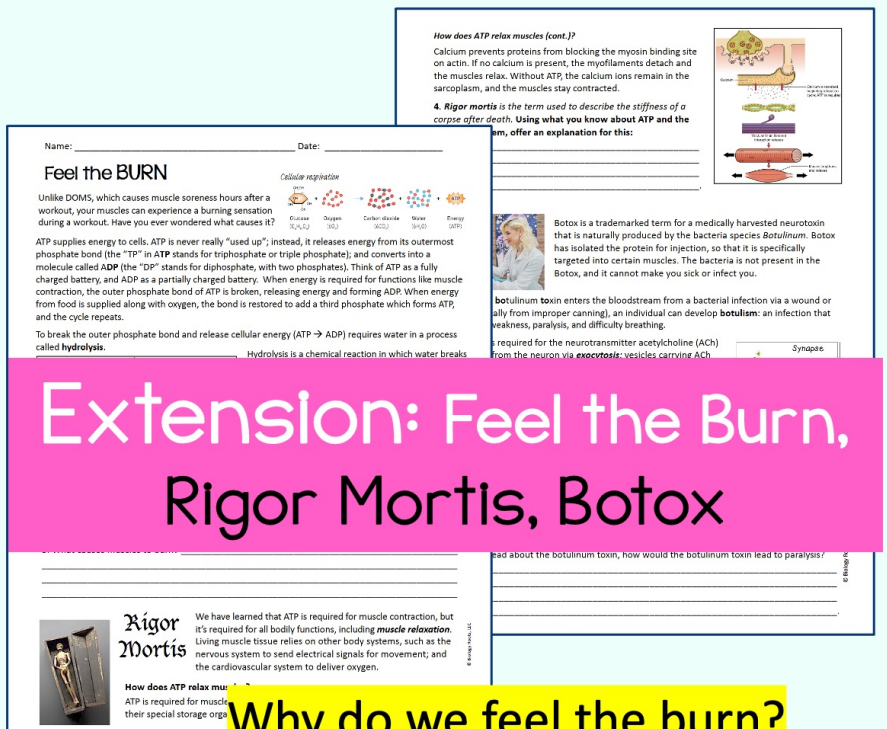
How do muscles grow?
Why do muscles get sore?

Extension Activities: Muscle Fatigue, DOMS, and Hypertrophy:



Dissection Lab

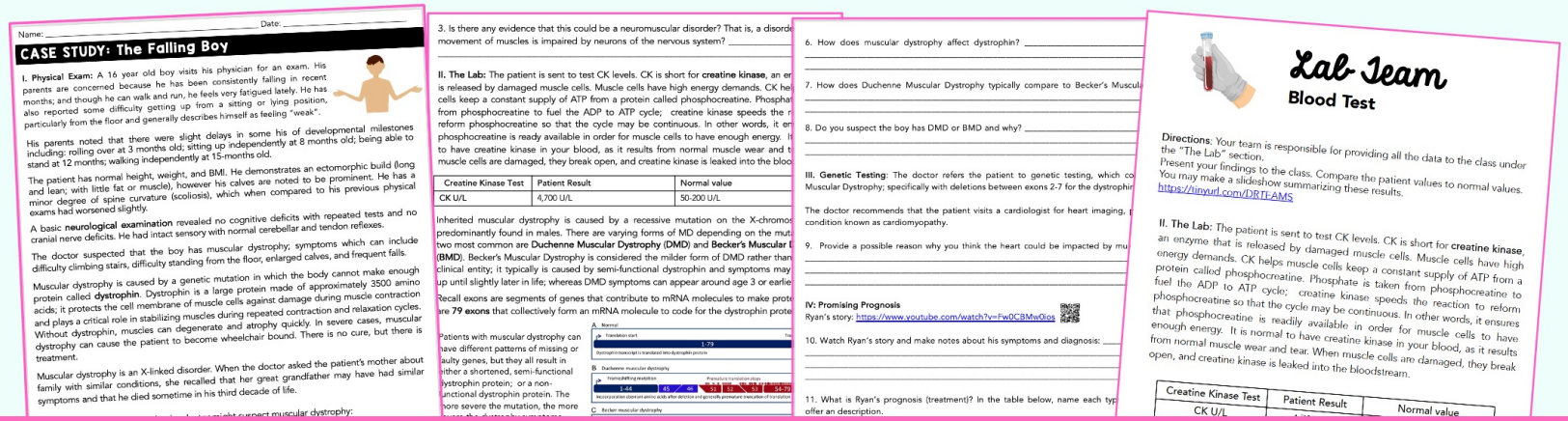
What do muscles look like?



Extension: Feel the Burn, Rigor Mortis, Botox

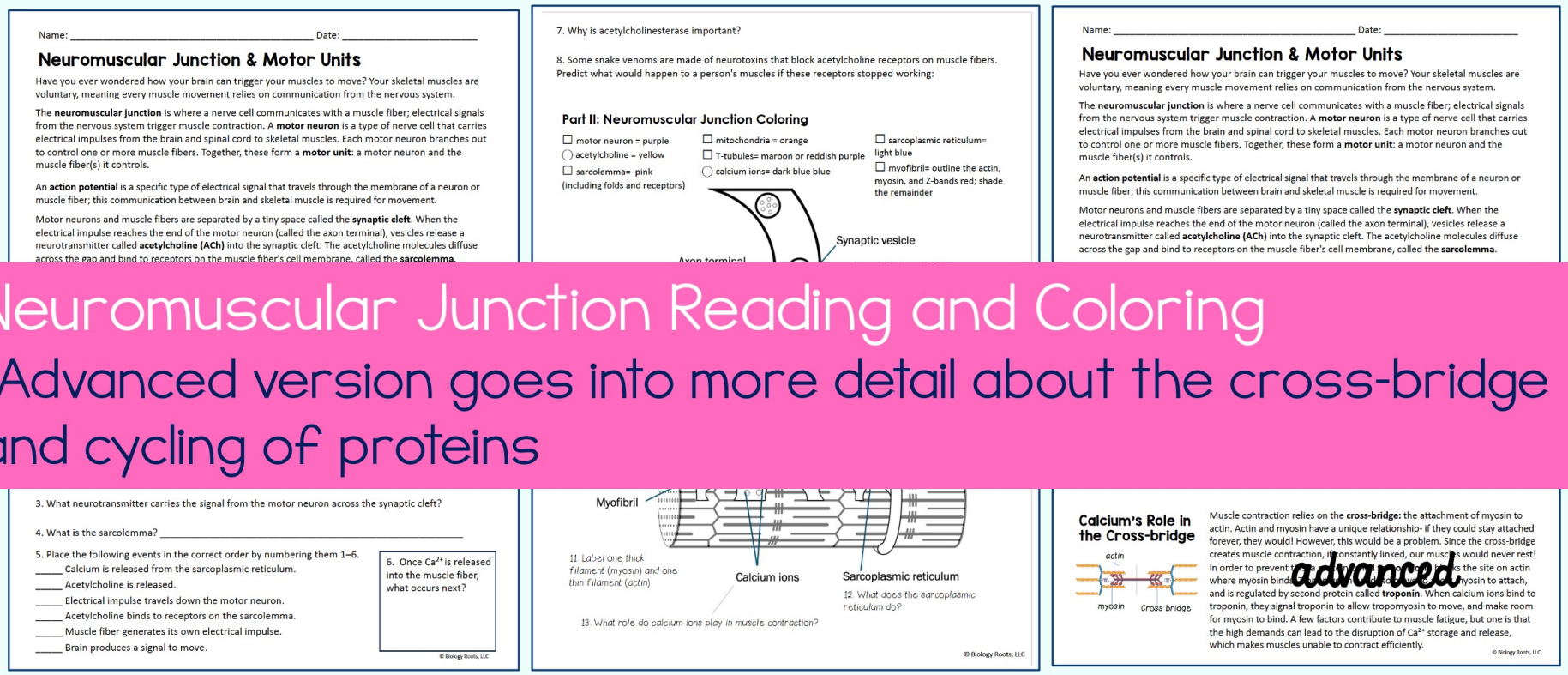
Why do we feel the burn?
What is rigor mortis?
How does Botox work?

Muscular System Classwork



Case Study: Becker Muscle Dystrophy: Explores the importance of dystrophin and reinforces that muscle cells are constantly breaking down and rebuilding

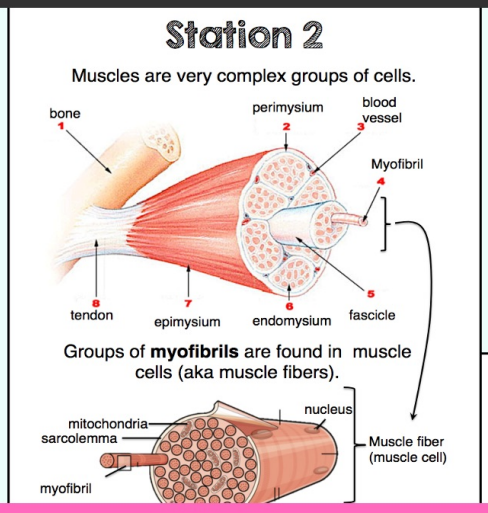
TEAMS version is a class effort, students work in groups as diagnosticians.

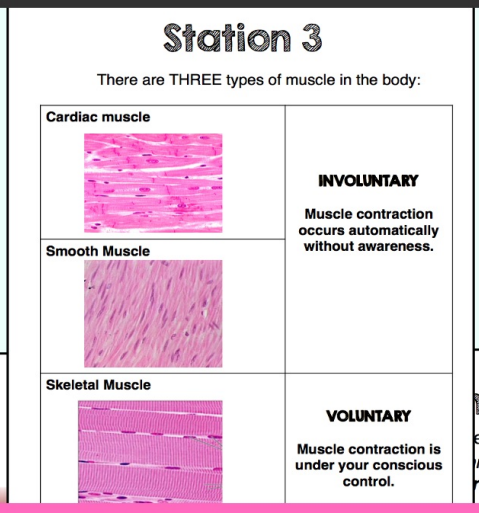


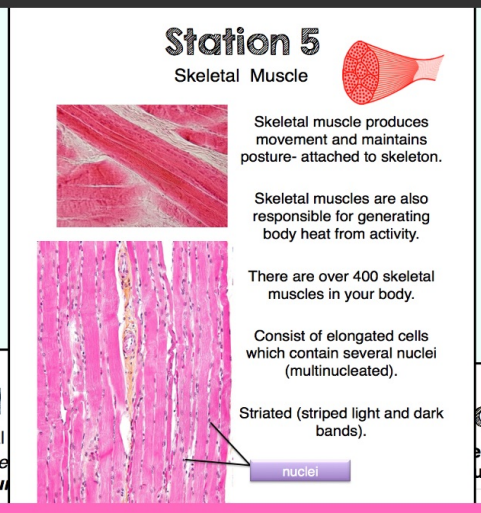
Neuromuscular Junction Reading and Coloring

*Advanced version goes into more detail about the cross-bridge and cycling of proteins

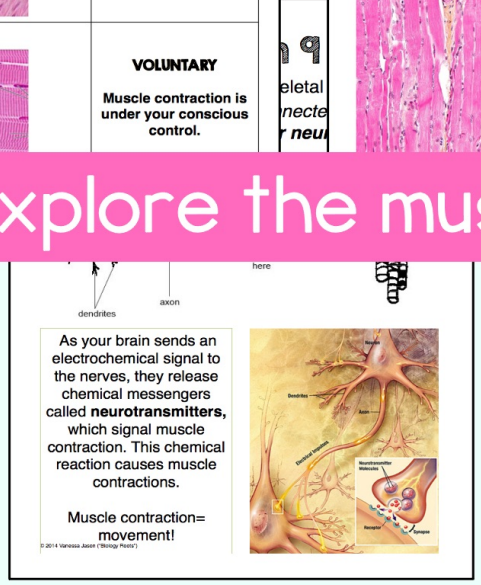
Muscular System Exhibition Stations

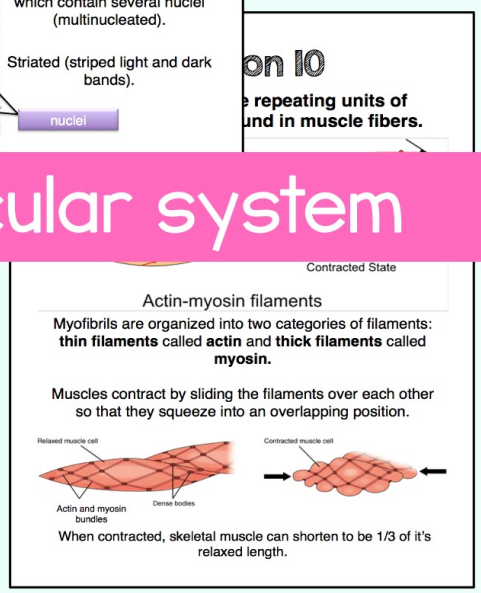




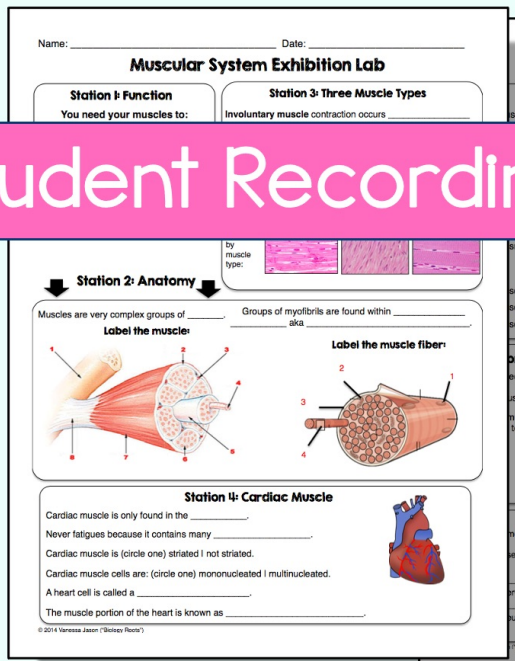


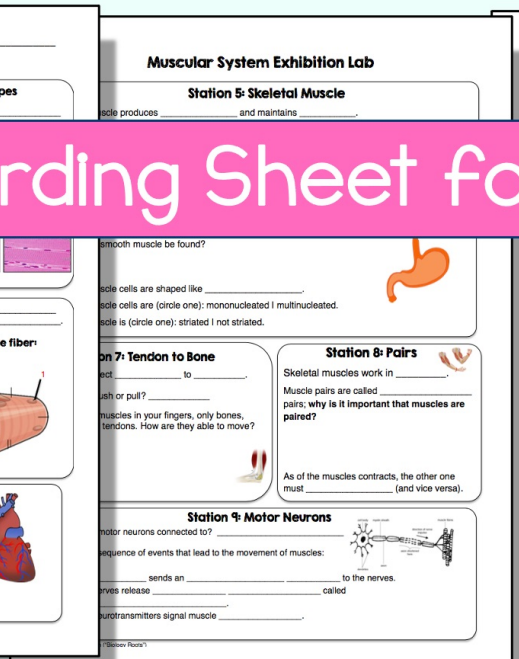


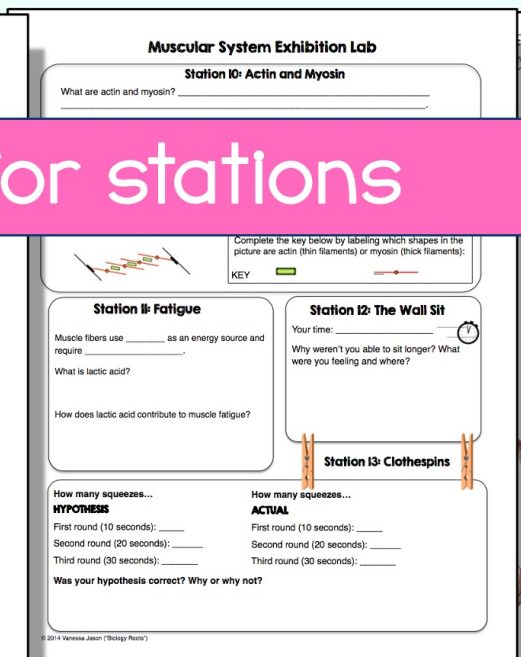


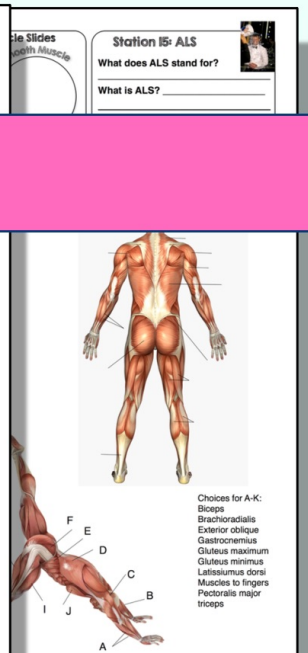


16 stations to further explore the muscular system



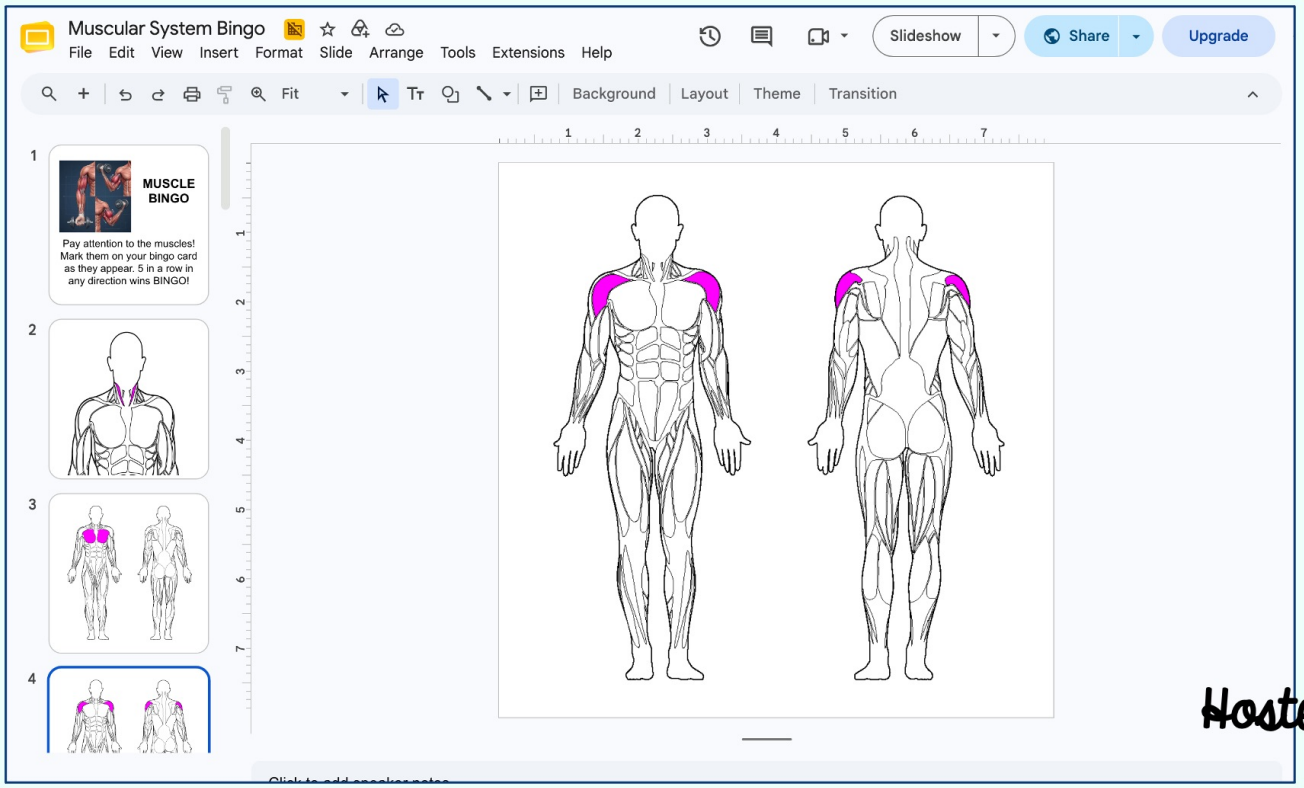


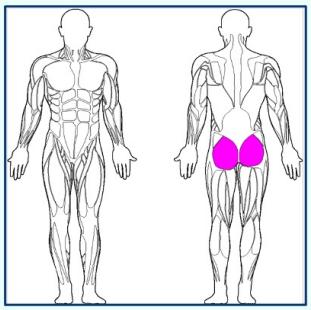


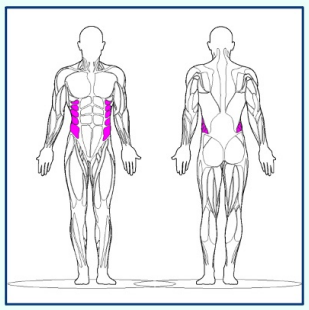


Student Recording Sheet for stations

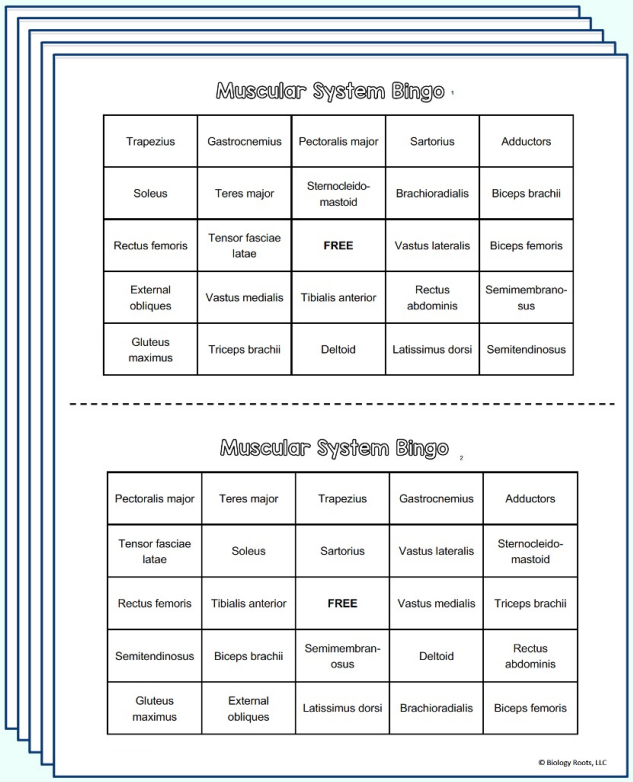
Muscle Bingo







Hosted on Google Slides



Muscular System Bingo

Trapezius	Gastrocnemius	Pectoralis major	Sartorius	Adductors
Soleus	Teres major	Sternocleido-mastoid	Brachioradialis	Biceps brachii
Rectus femoris	Tensor fasciae latae	FREE	Vastus lateralis	Biceps femoris
External obliques	Vastus medialis	Tibialis anterior	Rectus abdominis	Semimembrano-sus
Gluteus maximus	Triceps brachii	Deltoid	Latissimus dorsi	Semitendinosus

Muscular System Bingo

Pectoralis major	Teres major	Trapezius	Gastrocnemius	Adductors
Tensor fasciae latae	Soleus	Sartorius	Vastus lateralis	Sternocleido-mastoid
Rectus femoris	Tibialis anterior	FREE	Vastus medialis	Triceps brachii
Semitendinosus	Biceps brachii	Semimembran-osus	Deltoid	Rectus abdominis
Gluteus maximus	External obliques	Latissimus dorsi	Brachioradialis	Biceps femoris

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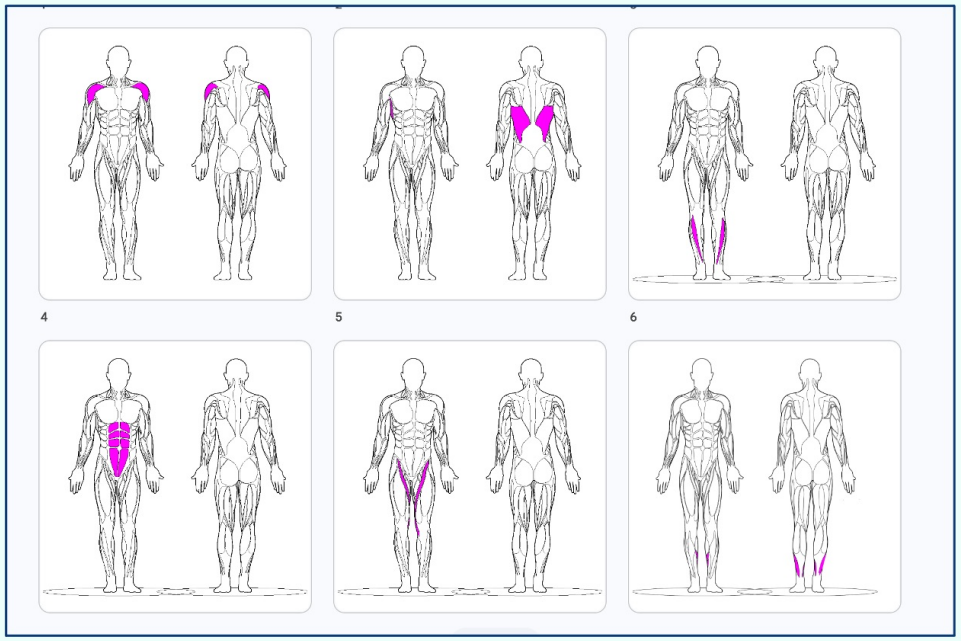
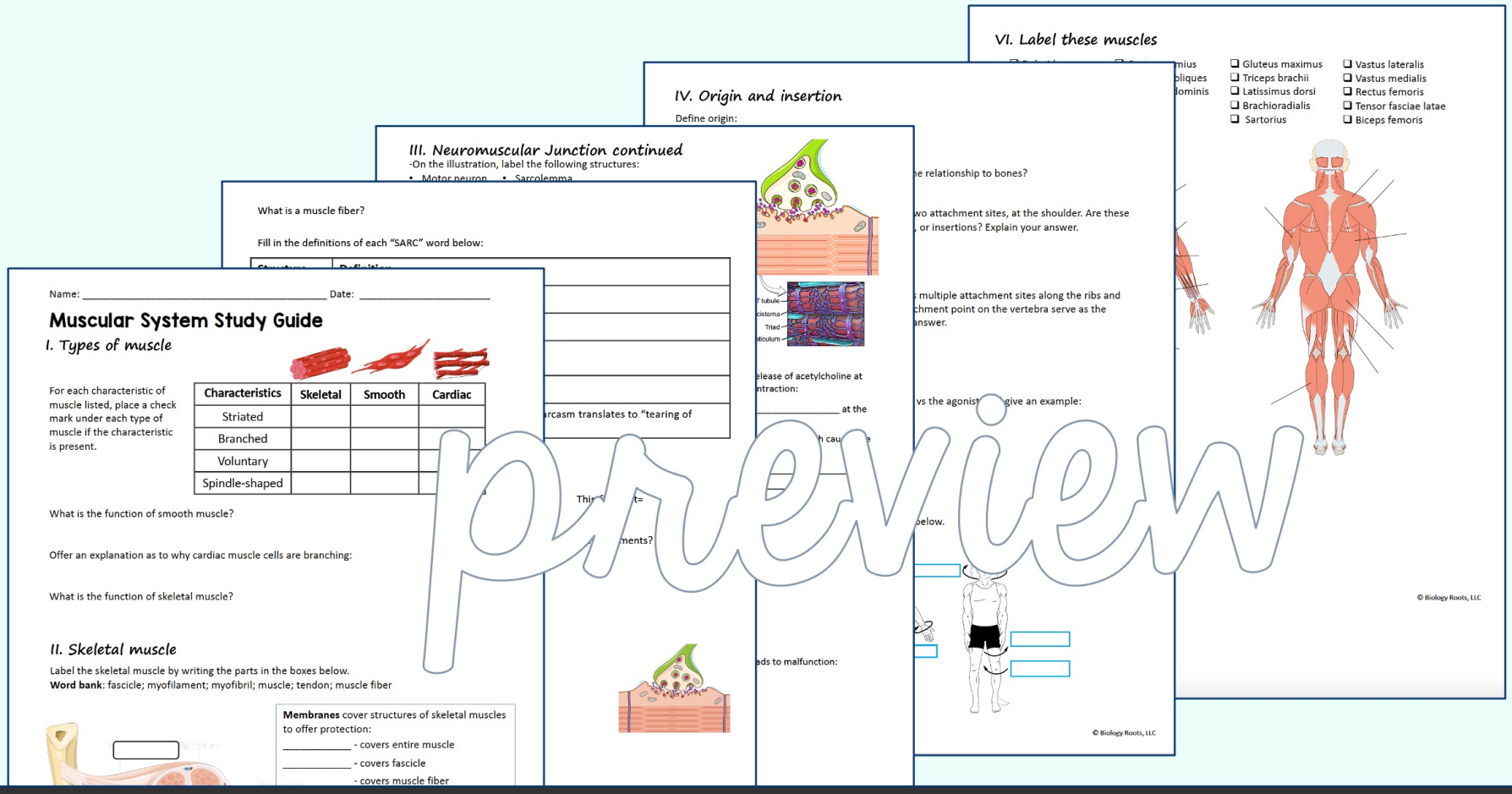
20 different cards

Students review the muscles with this easy to use slideshow! Includes 24 muscles total (plus a "free" square)





preview

Muscular System Study Guide

Includes advanced version for honors

- Honors version covers troponin and cycling of proteins

Differentiated tests

This unit comes with editable versions of both a college prep test AND an honors test

Group extension activity: What's going on with those muscles?

What's going on….

With those muscles?!

1

Alessandro played a tough game! Running faster and jumping higher, he pushed himself to his limits.

The next day, his quadriceps were very sore to the point he could barely walk!

What is Alessandro suffering from?

On a physiological scale, what are some explanations for this?



2

During Mia's pilates workout she did many isometric holds- that is holding one side of the body in a pose for a period of time.

While doing a side plank, her obliques were on FIRE!

Offer an explanation for this burning sensation.



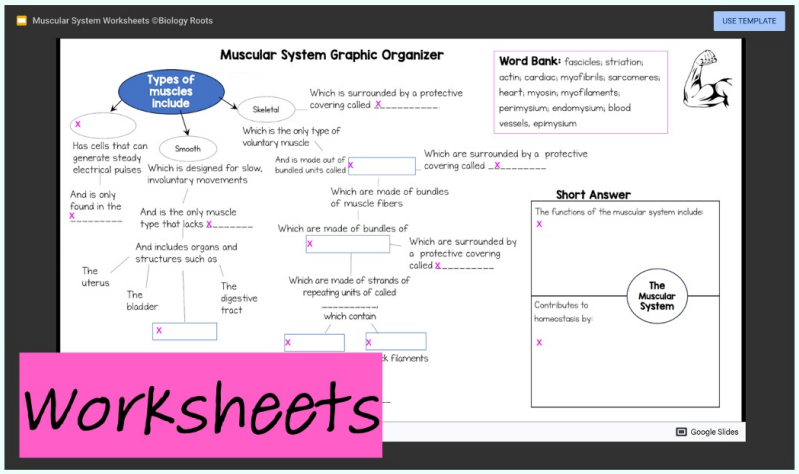
Arnold didn't always look like this.

Explain what happened to his muscles after many years of bodybuilding, including what the scientific term is called, as well as an explanation of why it happens!

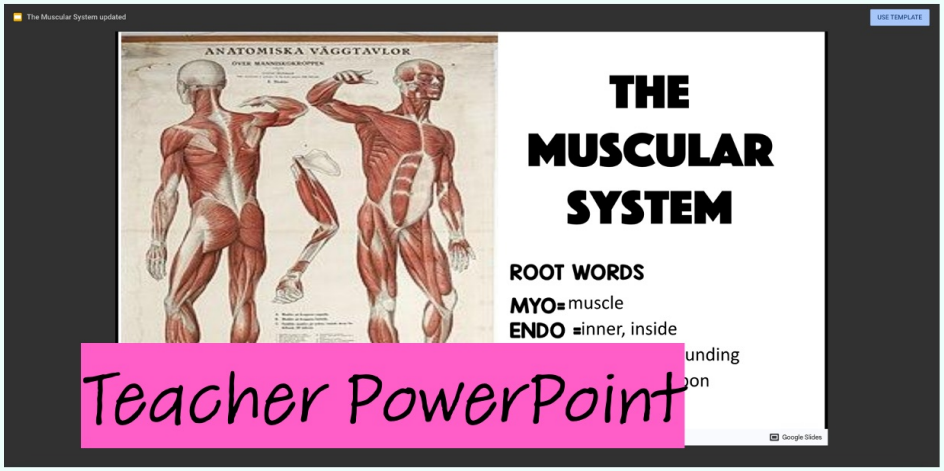


Students work in 6 groups to come up with an explanation for 6 different scenarios and present to the class (great for review!)

Digital options available

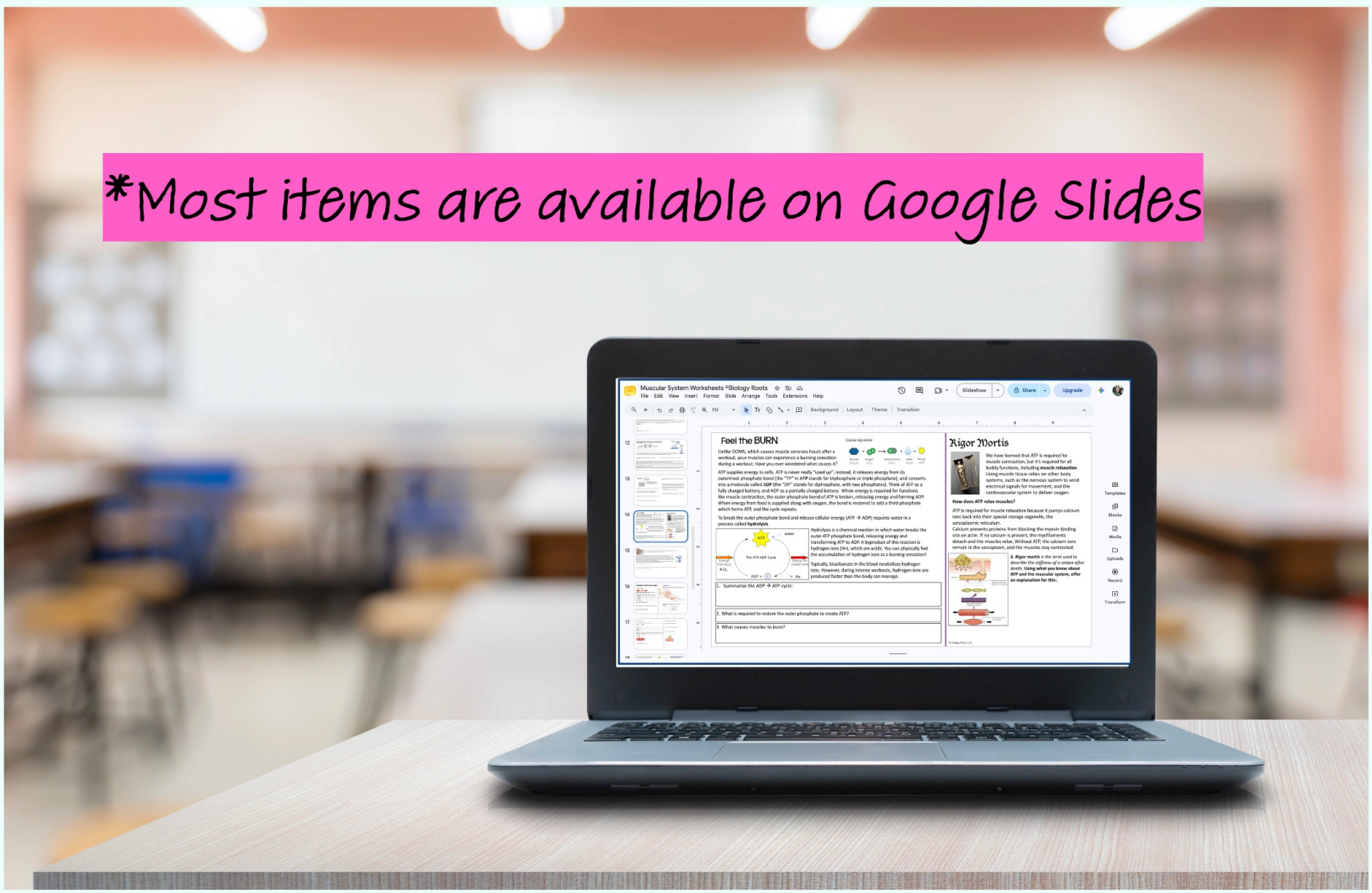


Worksheets



Teacher PowerPoint

*Most items are available on Google Slides



Still not sure if you need this resource?

This unit is for any teacher who is looking for a fully prepared anatomy unit from start to finish, with fun, fresh activities to keep your students engaged! The muscular unit is COMPLETE and can be used as is –or if you already have an existing unit, this can absolutely be used to supplement, support, or freshen up. Every piece has been thoughtfully curated and mapped out for your anatomy classroom to give you the most successful (and fun) year of anatomy yet!

Questions? Reach out to me at vanessa@biology-roots.com

-Vanessa