# Physiology Class 4:
# Muscular, Nervous and Skeletal Physiology

## Activities

These activities are designed to be done at home. There is no grade given for these and they do not have to be turned in. The answer key has been emailed to your grown up.

### Describe a muscle contraction

In your own words, describe how a muscle contraction happens when you decide you want to move a certain part of your body.

**Answer:**

When someone decides to move a body part — like raising an arm — the brain sends an electrical signal down the spinal cord and through a motor neuron to the muscles involved in that movement.

At the **neuromuscular junction** (where the nerve meets the muscle), the nerve releases a chemical messenger called **acetylcholine (ACh)** into the **synapse** (gap).

This triggers an electrical signal in the muscle cell, causing **calcium ions** to be released inside the muscle.

Calcium allows two proteins in the muscle fiber, **actin** and **myosin**, to slide past each other — this is what shortens the muscle and causes contraction.

When the contraction is over, calcium is taken back up, and the muscle relaxes.

### Describe the reflex reaction when touching a hot stove

Describe what happens in the body when you reach out to touch something to find that it is really, really hot, like a stove.

**Answer:**

When someone touches a very hot object, like a stove, the heat is detected by **sensory receptors** in the skin.

These receptors send a signal through **sensory neurons** to the **spinal cord**, not the brain — this makes the response super fast.

In the spinal cord, the signal connects with an **interneuron**, which immediately activates a **motor neuron**.

The motor neuron sends a message to the **muscles in the arm or hand** to pull away quickly.

This whole process is called a **reflex arc** — it helps protect the body from harm by reacting quickly, without waiting for the brain to decide what to do.

The brain finds out what happened **after** the body has already moved.

### Know your strength!

Explain why you don't crush something like an egg when you use your muscles to pick it up.

**Answer:**

We don't crush something delicate like an egg when we pick it up because of how the **nervous system controls muscle force**.

The brain decides how many **motor units** (groups of muscle fibers controlled by a motor neuron) to activate depending on the task.

For something light and fragile, like an egg, the brain only activates a **small number of motor units**, which produces **low force** and allows for **fine, precise control**.

Sensory feedback from our fingers helps us **adjust grip pressure** in real time to avoid squeezing too hard.

This coordination between the **nervous system and muscular system** allows us to hold an egg gently without breaking it.

# Pre-Assessment Quiz:
# Muscular, Nervous and Skeletal Physiology

1. What structure inside muscle fibers contains actin and myosin?

A. Mitochondria

**B. Myofibrils**

C. Sarcomeres

D. Motor units

2. Which molecule is necessary for both muscle contraction and relaxation?

A. Calcium

B. Oxygen

C. Glucose

**D. ATP**

3. What is a motor unit composed of?

**A. One neuron and many muscle fibers**

B. One muscle fiber and one neuron

C. Several tendons

D. Myosin and actin

4. Which energy source is used first for quick muscle activity?

A. Fat oxidation

**B. Creatine phosphate**

C. Aerobic respiration

D. Glycogen breakdown

5. What do muscle fibers contain that make them energy-rich and structurally suited for contraction?

**A. mitochondria and myofibrils**

B. calcium

C. Vitamin D

D. Fats

6. What is the basic repeating unit of a muscle contraction called?

A. Actin

B. Myosin

**C. Sarcomere**

D. Synapse

7. Which type of glial cell forms myelin in the central nervous system?

A. Astrocyte

**B. Oligodendrocyte**

C. Schwann cell

D. Microglia

8. What is the threshold potential in neuron signaling?

A. The strength of muscle contraction

**B. The minimum signal needed to trigger an action potential**

C. A type of synapse

D. The space between neurons

9. Which hormone promotes bone formation and inhibits bone breakdown?

A. PTH

B. Cortisol

**C. Calcitonin**

D. Insulin

10. Which process increases bone strength in response to mechanical stress?

A. Calcification

**B. Remodeling**

C. Degeneration

D. Ossification