

Design Your Own Muscular System

Goal Summary:

- Think more like a scientist
 - Be creative.
 - Be critical.
 - Ask questions.
- Practice your understanding of muscle anatomy.
- Learn something about muscle physiology.

One way that scientists try to understand the natural world is to ask how they would solve a particular problem. In other words he or she creates what they believe to be an ideal solution to the problem. Then they compare this solution to the solution nature has actually found. Here you will apply this methodology to understanding muscle physiology.

Directions

In this lab you will design a muscular system of your own and then compare it to the actual human body. You only have so much muscle strength to use to build your body. The stronger the muscle is, the more money it costs. You have \$100 dollars to spend when designing your muscle system. The idea behind the money is to make you think about which muscles you *most* need to be strong, given that you only have so much to spend.

To begin, pick any section of the body to analyze from the section below:

1. Leg
2. Arm
3. Torso
4. Face

Go through the sections below for one body part. Then repeat these steps for each of the other body parts.

You need to complete all 4 body parts and at least 16 muscles. You only have \$100 total, so on average you will spend no more than \$6.25, per muscle.

Step 1 - Where Would You Place Muscles? How Big Would They Be?

For the body part you have picked, write down the answers to the following questions on a separate sheet of paper:

1. Identify the motions you would want this body part to make (e.g. abduction and adduction). Explain why.
2. Identify the motions you would *not* want this body part to make. Explain why.
3. Create at least 4 muscles of your own for this body part: You should do this without looking up any information about the human muscular system, but you can use any other means you wish. This should be based on your answers to Questions 1 and 2. Make the following choices, **and then justify them**.
 - a. Make up a name for the muscle.
 - b. Write down how much money you would spend on making the muscle strong.
 - c. List the muscles at the bottom of this lab and place a unique number or letter next to it.
 - d. Label the insertion of the muscle: use the unique number or letter of the muscle and the letter I
 - e. Label the origin of the muscle: use the unique number or letter of the muscle and the letter O

Step 2 - What Do the Muscles Actually Look Like?

For the body part you have picked, pick at least 2 muscles from the actual human body to compare to the muscles you designed in step 1, and write down the answers the following questions on a separate sheet of paper.

Make **interesting** choices for these muscles. Find the muscles that are the most unlike your own design.

1. Pick a unique letter or number to identify the muscle
2. Place the insertion point of the muscle on the second skeleton provided.
3. Place the origin on the second skeleton.
4. Assign a monetary value to the muscle, based on any information you can obtain about how large and thick the muscle is.
5. Explain why you picked this muscle.
6. Describe the function of the muscle (you can look this up).

Step 3 - Compare Your Solution to the Human Body

Compare your muscles to the muscles people actually have by answering the following questions on a separate sheet of paper:

1. List at least 4 ways in which the choices for your muscles differ from the human body. For example, this can be something about the strength (i.e. the cost of the muscle), the position, or the function of the muscle. Try to pick a difference for which the following questions will be relevant.
2. For each difference:
 - a. List any advantages you see for your choice.
 - b. List any disadvantages you see for your choice.
 - c. Come up with a possible explanation for why you see this difference.
 - d. Pretend that no one in the world knows if your explanation is right or wrong: come up with one way you might be able to disprove your explanation (e.g. with an experiment). Remember that experiments can never prove things, only disprove them.

Followup Questions

Once you have completed the lab for all 4 body parts and 16 muscles, answer the following questions.

1. What, if anything, most surprised you about the lab?
2. A real scientist using the above approach will often need to come up with very precise answers to the questions you answered above. For example: where *exactly* should muscles be placed, and strong should they be *exactly*. List some of the methods you imagine a scientist might use to do this.