Skeletal Labs are commonly done over 2 weeks, and cover several labs in the lab book.

You will not have enough time within lab to finish; please plan on spending extra time in the Study Lab with a lab partner.

You may want to do this "Lab Exercise" in a lab room, so you have some bone materials available. But it is not necessary.

**YOU WILL NEED YOUR TEXTBOOK!** I did not include skeletal labs in the lab book in order to save you money. Your lecture book has excellent sections on the skeleton. Of course, there are usually extra textbooks in lab, but there are not enough for everyone!

I did include an articulation lab in this lab book, but it is rudimentary, and you will still need your lecture book.

**Before trying to do these steps, we should have read the pertinent sections in the lab and/or lecture book, and watched any online videos my instructor has available.**

**Make sure you cover the following in the lecture book, using the lecture book images:**

Bone Tissue Chapter: "Bones & Osseous Tissue", "The Shapes of Bones", "General Features of Bone", and "Compact Bone", along with the accompanying image "Histology of Osseous Tissue".

Axial Skeleton Chapter: The Skull - articulated only!
Axial Skeleton Chapter: Fetal Skull
Axial Skeleton Chapter: Bony Thorax - articulated only!
Axial Skeleton Chapter: Vertebrae
Appendicular Skeleton Chapter: Pectoral Girdle
Appendicular Chapter: Pelvic Girdle
Articulations Chapter: Classification
Articulations Chapter: Parts of a Synovial Joint (*not in lab book; see image in textbook*)
Articulations: Elbow, Shoulder, Hip and Knee.
Make sure you use the images in your lab book as well as your text book.

Some semester, I do “Movement Terms” during this lab. Other semesters, I do them with the muscles. If I skip them during this lab, you do not have to do those sections in the lab.

Make sure you do the exercises in the lab book. I may put one of these on the lab practical to make sure you did them!

The 'Lab Exercise Guides' will use this sequence (no matter which order they appear in your book):

**Week 1:**
- Intro to the Skeletal System (uses a lab in the lab book and lecture text material)
- The Axial Skeleton (no lab in lab book. Use images in text)

**Week 2:**
- The Appendicular Skeleton (no lab in lab book. Use images in text)
- Articulations (Joints) (uses a lab in the lab book and lecture text material)

We will also be using images in your Lecture Textbook. Please remember that there are textbooks available within the lab room.

**The Steps** found in this "Lab Exercise Guide" do NOT have to be done in the order they are found.

Before you start, be able to:

1. Identify the separate chapters in your lab book.
2. Identify the separate chapters in your lecture book.
3. Make sure your lab table has an articulated and disarticulated skeleton.
Step 1. Understanding the Basics Terminology and Regions of the Skeleton

Use both your lab and lecture book to answer these questions. You may have to dig around a little bit to get the answers! Do not expect all the answers to be in one place!

Q1. Using your lab book, write down 5 functions of the skeleton:

Q 2. Define the Axial Skeleton. Include its function, as well as the 3 main parts or regions:

Q 3. Define the Appendicular Skeleton. Include its function, as well as the 2 girdles and limbs:

Q 4. Define a girdle:

Q 5. Define the words "Disarticulated" and "Articulated":

Q 6. Which one of these images is the Appendicular skeleton, and which is the axial skeleton? Label the parts that you identified in questions 3, 4 & 5 above.
Step 2: Understanding the major bones and joints

This will need info from both the "Intro to Skeletal System" and "Joints" labs in the lab book:

Q 7. What is an articulation? Do not just say "joint".

Q8. How many bones are there in the human body? __________

Different instructors focus on different bones in the body, although most instructors do the same basic bones. List all the bones that you need to know, and label them on the images. If it is not clear to you which you need to know, just start with the image in your lab book:
Step 3. Understanding the shoulder joint, while learning some basic feature terms.

You will be referencing the image "The Human Skeleton" and the table "Bone Features" in the "Introduction" lab, and images in the "Joints" lab to answer some of these questions.

#1
Find the image of the shoulder joint in your lab or lecture book.

#2

#3 (If you are not in a lab, you may skip #3)

If you are in a lab and have access to bones: Out of the "disarticulated skeleton box", pull out all the bones that are involved with ONE shoulder joint.

Q9: Now....label the bones on this image:
Q9: Using the table "Bone Markings" in your book, look at the real bones and categorize the labeled structures on the image below, filling out the table below it. We started you out by placing "A" on the table.

<table>
<thead>
<tr>
<th>Process: A</th>
<th>Condyle:</th>
<th>Epicondyle:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fossa:</td>
<td>Head:</td>
<td>Spine:</td>
</tr>
<tr>
<td>Tubercle:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q10: How many of the above terms are type of process? Which one is not?

Q11: Is an epicondyle a type of condyle? What do you suppose its name means?
Step 4. Understanding the hip joint, while learning some basic feature terms.

#1 You will be referencing the image "The Human Skeleton" and the table "Bone Features" in the "Introduction" lab, and images in the "Joints" lab to answer some of these questions.

#2 Find the image of the hip joint in your lab or lecture book.

#3 (If you are not in a lab, you may skip #3)

Out of the "disarticulated skeleton box", pull out all the bones that are involved with ONE hip joint.

Q12. How many bones are there? Using the image in your lab book, name them in the space below:

Q13. Now...label the bone names on this image. Label all 3 bones of the os coxae:

Q14. How is the head seen on the femur SIMILAR to the head seen on the humerus? How are they different?
Q15: Using the table "Bone Markings" in your book, look at the real bones and categorize the labeled structures on the image below, filling out the table below it. We started you out by placing "E" on the table.

Step 5. Understanding the elbow joint, while learning some basic feature terms.

You will be referencing the image "The Human Skeleton" and the table "Bone Features" in the "Introduction" lab, and images in the "Joints" lab to answer some of these questions.

#1

Find the image of the elbow joint in your lab or lecture book.

(If you are not in a lab, you may skip #3)

#3

Out of the "disarticulated skeleton box", pull out all the bones that are involved with ONE elbow joint.

Q16 Name the bones, labeling them on this image.

Q17 Complete this sentence:

HINT: use the proper "Direction Terms" used in "Lab 1 - Intro to A&P & Terminology"

"The shoulder involves the _____________ end of the humerus, while the elbow involves the _____________ end of the humerus. "
Q18. Using the table "Bone Markings" in your book, look at the real bones and categorize the labeled structures on the image below, filling out the table below it. We started you out by placing "F" on the table.

<table>
<thead>
<tr>
<th>Process: C</th>
<th>Condyle: Epicondyle: C</th>
<th>Head: Neck:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fossa:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuberosity:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q19: How is the fossa seen on the ulna SIMILAR to the fossa seen on the scapula?
**Step 6. Vertebrae**

You will be referencing the image "The Human Skeleton" and the table "Bone Features" in the "Introduction" lab.

1. Find a vertebrae image in your book.

(If you are not in a lab, you may skip #2)

2. Out of the "disarticulated skeleton box", pull out the vertebral column.

Q20. How many bones are there?

3. Look at the individual vertebrae image in your book. Find one that looks similar to the one in the photo below.

Q21: FILL IN THE SECOND 2 BLANKS (I gave you the first answer!):

On the image above, "B" is pointing to the same thing as ______, "C" is pointing to the same thing as ________, and "D" is pointing to the same thing as __________.

Q22: Using the table "Bone Markings" in your book, look at the real bones and categorize the labeled structures on the image below, filling out the table below it. We started you out by placing "B" on the table.

<table>
<thead>
<tr>
<th>Process</th>
<th>Foramen</th>
<th>Spine: B</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facet</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q23: How is the spine seen on the vertebrae SIMILAR to the spine seen on the scapula?
**Step 7.** Bone on a gross level

To answer these questions, read and use these sections in your lecture book: "Bones & Osseous Tissue", "The Shapes of Bones", "General Features of Bone", and "Compact Bone", along with the accompanying image "Histology of Osseous Tissue".

**Q24.** What is another word for "bone tissue"?

**Q25.** Name the 2 types of bone tissue:

**Q26.** One the image below, classify these bones based on their shape. TRY TO DO THIS WITHOUT LOOKING THEM UP ... just by looking at the photo. You may use the bones on the skeleton if you’d like.
Below is an image of a dissected femur.

NOTE: There is no dissected femur in the Open Lab, so just use the image in that room:

Q27. Label the types of bone tissue indicated.

Q28. Correctly label the regions of a long bone indicated on this image, using these terms: Proximal epiphysis, distal epiphysis, metaphysis, medullary cavity

Q29. In the above image, where would you find:

   The Growth Plate?
   The Bone Marrow?
   The Endosteum?
   The Periosteum?
Q30. Label this drawing below, using the wordlist below. There is a similar image in your *lecture book* You can use the terms more than once:

- Articular cartilage
- Compact bone (3 X)
- Epiphyseal line
- Medullary cavity
- Endosteum
- Periosteum (X2)
- Spongy bone (X2)
- Trabeculae
- Yellow marrow

(tissue type)

(layer)

(open space)

(protect on end)

(tissues or substant)

(tissue type)
Step 8. Bone on a microscopic level

For this step, you will be referencing the section in your lecture book entitled "Compact Bone", along with the accompanying image "Histology of Osseous Tissue". Read through the section, and answer the following:

Q31. What do we call a bone secreting cell?

Q32. Explain IN YOUR OWN WORDS the relationship between lacunae and osteocyte.

Q33. What do we call the structure that connects one osteocyte to another?

Q34. The "Bone Tissue Model" photo seen below is similar to the image in your lab book. Label the following:

- Osteon - (2 of them)
- Lamella (e) - (2 of them)
- Central canal - (2 of them)

 ALSO: On the diagram, label the endosteum and periosteum
Q36. There is a microscope in the room with a slide of **Compact Bone Tissue**. On the slide, find the following structures, while labeling both photos below using the terms listed.

**NOTE:** *There is a slide in the Open Lab, but if you do not feel comfortable with slides yet, you can just use the image below to study in that room:*

- Osteon
- Lamella
- Osteocytes in lacunae
- Central canal
- Canaliculi
Step 9. An Introduction To The Skeleton In The "Black Box"

Have someone in your group read this out loud, while the others follow along:

In the room, there is a black box with a skull and several bones inside. Certain features on the bones have been painted different colors so you can easily distinguish them.

Find this box and bring it over to your work area.

Open it up and pull out some of the bones. Locate the femur, which looks like the bone dissection seen in Step 6.

Turn to the page in either your lab book or lecture book where the parts of the femur are labeled. (use the index in back if necessary).

Find on the femur diagram the Greater Trochanter. Notice that the line indicating it (called a "callout" on the image) is a little vague as to where the Greater Trochanter "starts" and "stops". Can you distinguish the boundaries?

Now....look where we painted this feature on the femur in the box. Notice how you can clearly determine the boundaries of the Grater Trochanter.

You may reference the bones in this box during the skeletal labs if you are having problems understanding where certain features "start" and "stop". However, it will not be in the "OPEN LAB".
**Step 10.** Do Only If Available, and if your instructor asks you to:
Examining the effect of acid on bones.

#1 **This exercise may not be available; you should ask your instructor if your group needs to do this.**

#2 Read the section entitled "Composition of Bone Tissue" in your lab book. Then, have someone in your group read the following out loud, while the others follow along. Finish by answering the 2 questions at the end.

Although we think of inorganic calcium salts when we think of bone (collectively called the "hydroxyapatites"), bone is mostly collagen (the **ORGANIC PORTION**).

If there is a bone in lab that has been soaked in vinegar, examine it (**NOT available in the Open Lab**). Pick it up and GENTLY try to bend it. Note how the bone "looks", versus how it reacts to pressure, as per the questions in your lab book.

Collagen is a protein, so a person’s genetic material determines how it is made. A mutation can cause a problem with collagen formation in the body, and therefore bone structure and function.

Also, a person needs several hormones, vitamins and dietary protein to make collagen properly. Vitamin D, for example, is necessary for proper collagen production. Not surprisingly, people with a vitamin D deficiency have problems with the development of their bones.

Continued on the next page
So anything that affects the formation of collagen has a big impact on how bone tissue behaves. Below are 2 images: an X-ray of the forearms of a person with *Osteogenesis Imperfecta*, a genetic disease that causes defective collagen formation. Next to it is the photograph of someone with *Rickets*, a disease caused by a lack of Vitamin D in the diet.

Q37. Although these 2 pathologies affect all the bones, why do you suppose they are so obvious in the long bones? Why do the effects of these 2 TOTALLY UNRELATED PATHOLOGIES look so similar? Relate your answer to the anatomy of a long bone.

Q38. What do you think the disorder "*osteogenesis imperfecta*" gets its name?? Figure it out from the Latin name!