Lab Exercise 5
Axial Skeleton

Textbook Reference: See Chapter 8

What you need to be able to do on the exam after completing this lab exercise:

Be able to name all the listed bone and bone features on the skull models.

Be able to name the listed parts of the ribcage and sternum on the models in the lab.

Be able to name the hyoid bone, if shown individually.

Be able to name the different vertebrae, if shown individually, as given in this lab exercise.

Be able to name the listed features of each vertebra on the vertebrae in the lab.

Be able to name the sacrum and the listed parts of the sacrum on the models in the lab.

Be able to name the coccyx, if individually shown.
The following tables contain terms that are useful when learning the various bone features. The terms will **NOT** be on the test. They are simply here for you to use when learning the names of the bone features.

### Table 6.1: Bone Markings

<table>
<thead>
<tr>
<th>Table 6.1: Bone Markings</th>
<th>NAME OF BONE MARKING</th>
<th>DESCRIPTION</th>
<th>ILLUSTRATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projections That Are Sites of Muscle and Ligament Attachment</td>
<td>Tuberosity (too-bé-ros’-te)</td>
<td>Large rounded projection; may be roughened</td>
<td><img src="image1" alt="Tuberosity" /></td>
</tr>
<tr>
<td></td>
<td>Crest</td>
<td>Narrow ridge of bone; usually prominent</td>
<td><img src="image2" alt="Crest" /></td>
</tr>
<tr>
<td></td>
<td>Trochanter (tro-kan’ter)</td>
<td>Very large, blunt, irregularly shaped process (the only examples are on the femur)</td>
<td><img src="image3" alt="Trochanter" /></td>
</tr>
<tr>
<td></td>
<td>Line</td>
<td>Narrow ridge of bone; less prominent than a crest</td>
<td><img src="image4" alt="Line" /></td>
</tr>
<tr>
<td></td>
<td>Tubercle (too’ber-kle)</td>
<td>Small rounded projection or process</td>
<td><img src="image5" alt="Tubercle" /></td>
</tr>
<tr>
<td></td>
<td>Epicondyle (ep’kon-dil)</td>
<td>Raised area on or above a condyle</td>
<td><img src="image6" alt="Epicondyle" /></td>
</tr>
<tr>
<td></td>
<td>Spine</td>
<td>Sharp, slender, often pointed projection</td>
<td><img src="image7" alt="Spine" /></td>
</tr>
<tr>
<td></td>
<td>Process</td>
<td>Any bony prominence</td>
<td><img src="image8" alt="Process" /></td>
</tr>
</tbody>
</table>

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<tbody>
<tr>
<td>Projections That Help to Form Joints</td>
<td>Head</td>
<td>Bony expansion carried on a narrow neck</td>
<td><img src="image9" alt="Head" /></td>
</tr>
<tr>
<td></td>
<td>Facet</td>
<td>Smooth, nearly flat articular surface</td>
<td><img src="image10" alt="Facet" /></td>
</tr>
<tr>
<td></td>
<td>Condyle (kon’dil)</td>
<td>Rounded articular projection</td>
<td><img src="image11" alt="Condyle" /></td>
</tr>
<tr>
<td></td>
<td>Ramus (ra’mus)</td>
<td>Armlike bar of bone</td>
<td><img src="image12" alt="Ramus" /></td>
</tr>
</tbody>
</table>

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<tbody>
<tr>
<td>Depressions and Openings</td>
<td>For Passage of Blood Vessels and Nerves</td>
<td>Groove</td>
<td>Furrow</td>
</tr>
<tr>
<td></td>
<td>Fissure</td>
<td>Narrow, slitlike opening</td>
<td><img src="image14" alt="Fissure" /></td>
</tr>
<tr>
<td></td>
<td>Foramen (for-a’men)</td>
<td>Round or oval opening through a bone</td>
<td><img src="image15" alt="Foramen" /></td>
</tr>
<tr>
<td></td>
<td>Notch</td>
<td>Indentation at the edge of a structure</td>
<td><img src="image16" alt="Notch" /></td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meatus (me-a’tus)</td>
<td>Canal-like passageway</td>
<td><img src="image17" alt="Meatus" /></td>
</tr>
<tr>
<td></td>
<td>Sinus</td>
<td>Cavity within a bone, filled with air and lined with mucous membrane</td>
<td><img src="image18" alt="Sinus" /></td>
</tr>
<tr>
<td></td>
<td>Fossa</td>
<td>Shallow, basinlike depression in a bone, often serving as an articular surface</td>
<td><img src="image19" alt="Fossa" /></td>
</tr>
</tbody>
</table>
Axial Skeleton

The **axial skeleton** consists of the skull, the ribcage, and the vertebrae.

**The Skull**

Know the following bones/bone features on the skull models.

1. frontal bone
2. parietal bone
3. occipital bone
4. temporal bone
5. mastoid process
6. mandibular fossa
7. styloid process
8. mandibular condyle
9. sphenoid bone
10. zygomatic bone
11. nasal bone
12. maxilla
13. ethmoid bone
14. lacrimal bone
15. temporal bone
16. occipital bone
17. mastoid process
18. mandibular fossa
19. styloid process
20. mandible
21. coronoid process
22. mandibular condyle
23. coronal suture
24. lambdoid suture
25. squamous suture
26. external auditory meatus
27. mental foramen
28. greater wing (of sphenoid)
3. occipital bone
4. temporal bone
5. mastoid process
8. mandibular fossa
9. styloid process
10. sphenoid bone
11. zygomatic bone
13. maxilla
16. vomer
17. palatine bone
19. occipital condyles
30. zygomatic arch
47. carotid canal
48. jugular foramen
62. greater wing
1. frontal bone
3. occipital bone
4. temporal bone
10. sphenoid bone
15. ethmoid bone

48. jugular foramen
58. crista galli
59. cribiform plate
61. lesser wing
62. greater wing
63. sella turcica
67. internal auditory meatus
68. hypoglossal canal
69. foramen magnum
1. frontal bone  
10. sphenoid bone  
11. zygomatic bone  
12. nasal bone  
13. maxilla  
15. ethmoid bone  
16. vomer  
20. mandible  
30. zygomatic arch  
39a. superior orbital fissure  
39b. inferior orbital fissure  
52. mental foramen  
62. greater wing
2. parietal bone
3. occipital bone
24. sagittal suture
25. lambdoid suture
Rib Cage

Know the following bones of the ribcage on the ribcage model:

The first seven pairs of ribs are true ribs because they attach directly to the sternum via the costal cartilage.

The last five pairs of ribs are false ribs because they either attach indirectly to the sternum or not at all.

The last two pairs of false ribs are floating ribs because they do not attach to the sternum at all.
The sternum is the breastbone. It is composed of three bones fused together.

The top bone is the manubrium. It has three notches, a jugular notch at the top for the jugular vein, and two clavicular notches, which articulate with the clavicles.

The middle bone is the body.

The bottom bone is the xiphoid process. It is usually pointed at the bottom and is used as a point of reference for the Heimlich maneuver.
The Ribs

The anterior end of a rib is the end that articulates with the costal cartilage.

The rib head articulates with the thoracic vertebra of the spinal column.

The tubercle is a small bump on the posterior end of the rib that articulates with the vertebra below the vertebra which with the head articulates.

The Hyoid Bone

The hyoid bone is found between the chin and the thyroid gland on the anterior neck. This U-shaped bone serves as an attachment site for several muscles that help elevate the larynx during swallowing. It also supports the tongue. The hyoid bone is the only bone in the body that does not articulate with another bone. During an autopsy, a fractured hyoid bone is an indicator of strangulation.
The Vertebrae

There are 7 cervical vertebrae, 12 thoracic vertebrae, 5 lumbar vertebrae, 1 sacrum, and 1 coccyx.

Cervical vertebrae

The atlas, the first cervical vertebra (C₁), articulates with the occipital condyles of the skull. It is the only vertebra without a body. It has a very large vertebral foramen through which the dens of the axis protrudes at the anterior end. It is also the only vertebra that does not have a spinous process. Instead, it has a posterior tubercle.

The axis, the second cervical vertebra (C₂), articulates with the atlas. It has a prominent, toothlike process, called the dens, that projects superiorly from the body of the vertebra and fits into the anterior portion of the vertebral foramen of the atlas.

All 7 cervical vertebrae have a vertebral foramen that is larger than the body (with the exception of the atlas, which has no body). The spinous process of the cervical vertebrae (except the atlas) is short and bifid (forked). Another distinctive feature of cervical vertebrae are the transverse foramina, two additional openings in the transverse processes.

The thoracic vertebrae are a bit larger than the cervical vertebrae (to support more body weight). The vertebral foramen is round, and the body is usually heart-shaped. The thoracic vertebrae become larger as they get closer to the lumbar vertebrae. They have a distinctively long, slender (triangular) spinous process. The transverse processes are long, thick, and strong. When viewed from the side, thoracic vertebrae resemble an elephant.

The lumbar vertebrae have large, thick bodies (to support much body weight). The large body has a wide oval shape. The vertebral foramen is small and somewhat triangular. The spinous process is thick, broad, flattened, and rounded at the tip. When viewed from the side, the lumbar vertebrae resemble a moose.

The sacrum is a large, triangular bone that articulates with the fifth lumbar vertebra. It consists of five fused vertebrae. It is concave on the anterior side, to give increased capacity to the pelvic cavity. There are four pairs of sacral foramina, for the passage of spinal nerves. The dorsal (posterior) side of the sacrum is convex. At the top of the dorsal side is the superior sacral canal, which forms a passageway for the spinal cord. At the inferior end is the sacral hiatus, which is an opening for the exit of inferior spinal nerves.

The coccyx consists of four (or five) fused vertebrae below the sacrum. They diminish in size from the first to the fourth. The coccyx is also known as the “tailbone”.

5-11
Cervical curvature (concave)  
7 vertebrae, C₁ – C₇

Spinous process
Transverse processes

Thoracic curvature (convex)  
12 vertebrae, T₁ – T₁₂
Intervertebral discs

Intervertebral foramen

Lumbar curvature (concave)  
5 vertebrae, L₁ – L₅

Sacral curvature (convex)  
5 fused vertebrae sacrum

Coccyx  
4 fused vertebrae

Anterior view  Right lateral view

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The Sacrum and Coccyx