SKELETAL STRUCTURES

Objectives for Exam #1:
1. Provide information on the various structures and functions of the skeletal system.
2. Describe various skeletal system disorders, including imaging techniques used to diagnose these disorders.

Objective for Portfolio #1:
Summarize this activity’s information on the skeletal system in brief paragraphs.

Part I: Skeletal Stations
Station A: Bones of the Body
1. This is the list of bones you will be responsible for knowing for the exam. Using the display and Human Body book p. 60-71 Label each of the following bones on the photo below: skull, maxilla, mandible, clavicle, scapula, sternum, humerus, ribs, vertebrae, radius, ulna, carpal, metacarpal, phalanges (hand), pelvis, femur, patella, tibia, fibula, tarsals, metatarsals, phalanges (foot).

2. To check that you know the names and locations of these bones, look at the x-rays and name each bone (or group of bones) featured in each x-ray.
Station B: Bone Structure
Parts of Bone
1. Using the model at your table (and p. 72-73 of the Human Body), label all of the following on the photo below: Include: periosteum, compact bone (where the osteons are), spongy bone (just a small amount), medullary canal (includes bone marrow).

![Bone Model Image]

2. Sketch a single osteon from the model. Label: osteocytes, Haversian (central) canal, blood vessels (vein, artery), nerve.

3. From The Skeletal and Muscular Systems poster, where are new blood cells made?

4. From last week’s recitation what type of tissue is bone (epithelial, connective, muscle, or nervous)? ____________________

Station C: Cells and Tissues
Bone Cells
1. Osteocytes (bone cells) are found in the lacunae, small cavities in the bone tissue. Additional bone cells are responsible for building and remodeling the edges of bone. From the Bone Health model, the cells that build bone are called ___________________, the cells that erode bone are called ____________________. How does the bone of a patient with osteoporosis (osteoporotic bone) differ from healthy bone?
2. From the *Osteoporosis* poster, what are some of the causes of osteoporosis?

**Bone vs. Cartilage Connective Tissues**

3. There are a wide variety of connective tissues. Last week you examined fat, loose, and dense connective tissues. In this laboratory you are examining bone and cartilage. Both bone and cartilage have a tough but flexible matrix, with cartilage (like your ear) being more flexible. Draw and label bone and cartilage under the microscope.

![Bone (400x) and Cartilage (400x)](image)

**Station D: Skull**

1. How many bones make up the skull? ____________

2. Look at the sutures (where bones come together) in the skull model and think about the ways bones come together in other parts of your body (like your knee or hip). How do the suture joints of the skull differ from most other joints in the human body?

3. Before a human is eighteen months old, what filled the space between the skull bones?

**Station E: Spinal Vertebrae**

1. There are three main types of vertebrae in three zones of the spine (*Human Body*, p. 68-70): ____________ vertebrae support the head, the ____________ vertebrae anchor the ribs, and the ____________ vertebrae provide a strong center of gravity for stable movement.
2. On the spine image below, label the three vertebral regions: cervical (seven bones), thoracic (twelve bones), and lumbar (five bones). Also label the sacrum and coccyx.

3. Using the model showing the effect of the disease osteoporosis on vertebrae. Of the three vertebrae, one is normal, one has lost some bone density, the third has a severe loss of bone density. Indicate which vertebra shows the most bone loss in the model (top, middle, bottom):

4. Cartilage discs between the vertebrae absorb forces and give the spine flexibility. The model of a spinal prolapse (slipped disc) indicates the prolapsed area with a red color. What is the prolapsed disc touching (causing pain)? __________(also refer to p. 321 of Human Body)
5. **Magnetic resonance imaging (MRI)** uses radio waves within a magnetic field. These images can be used to monitor blood flow through vessels, and subtle changes in tissues. The lumbar spine MRI can sometimes show whether a disc is herniated (prolapsed, bulging, ruptured, slipped). It cannot show other conditions like muscle strain. The two lumbar spine MRIs are taken from two different individuals. Which MRI (A or B) shows a prolapsed disc? ___________

6. Back pain is currently the most common reported chronic (long-term) disease of Americans. From the display, what are some of the most frequent causes of back pain?

7. Referring to the display, what is the correct way to lift a heavy weight to minimize impact on the spine?

Station F: Arm and Leg Structure
1. Referring to the display and the x-rays from two patients, which bone(s) are broken in patient A’s x-ray? _________________________
   In patient B’s x-ray? _________________________

2. Using the model provided of what is commonly called a “hip fracture” in elderly people, which bone is actually frequently broken? _________________________ The model indicates different places where the fractures can occur (the red lines). How many different fractures are shown in the model? _________________________

Station G: Hand and Foot Structure
1. Label the locations of the carpal s, metacarpals, and phalanges in the human hand (*Human Body*, p. 64): 

![Hand Diagram](image)
2. The hand has similar structure to a foot. The carpals of the hand are equivalent to the ________________ of the foot. The metacarpals are equivalent to the ________________, and the phalanges are named the same in hands and feet.

3. From The Foot poster, what are the more common names for the conditions of “Pes planus” and “Pes cavus?”

4. X-rays are small amounts of electromagnetic radiation. Soft tissues of the body (skin, fat, and muscle) allow most of the x-rays to pass through and these tissues appear dark gray on the x-ray photo. Fewer x-rays pass through denser tissues (bones, tumors, etc.) and these tissues appear light in the photo. X-rays may show large deviations like a break in a bone, but do not reveal a lot of detail of internal organs. Looking at the copy of the x-ray provided, what bone appears to be broken? ________________

Station H: Joints
1. A joint is a location where two or more ___________________ come together.

2. From the display and Human Body p. 78-79, describe the moving action and location for each of the following types of movable joints in the human body:

<table>
<thead>
<tr>
<th>Movable Joint</th>
<th>Moving Action</th>
<th>Location in Human Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gliding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ball and Socket</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pivot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saddle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. From the display, what is “tennis elbow?”

4. Joint inflammation is referred to as arthritis. There are many types of arthritis, two of the most common are osteoarthritis and rheumatoid arthritis. From the Arthritis-Joint Inflammation mini-poster, what is the difference in symptoms between these two types of arthritis?

<table>
<thead>
<tr>
<th>Type of Arthritis</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osteoarthritis</td>
<td></td>
</tr>
<tr>
<td>Rheumatoid Arthritis</td>
<td></td>
</tr>
</tbody>
</table>
5. After injury or disease, some individuals receive a total hip replacement or total knee replacement. From the Hip and Knee mini-poster, what is being replaced?

**Part II: Skeletal System Paragraphs** (for portfolio #1)

**Skill:** Summarize this activity’s information on the skeletal system in brief paragraphs. Summarizing laboratory and recitation information in shorter written form is an effective way to study.

**Assignment:** Write five brief paragraphs that summarize some of this recitation’s information. In the first paragraph, select and describe two bone structures (parts of a bone) and their corresponding functions. In the second paragraph, describe the appearance of a bone impacted by osteoporosis and one possible cause of the disease. In the third paragraph, briefly describe what a prolapsed disc is, including where it occurs and how it can cause pain. In the fourth paragraph, describe how the bones of the human hand are similar to and different from the bones of the human foot. In the fifth paragraph, select two joints and describe how they move and where they are located in the human body. Two sentences per paragraph can be adequate for this assignment.

**Assessment:** This assignment is worth 5.0 points (1.0 point for two bone structures and their functions, 1.0 point for description of bone impacted by osteoporosis and what can cause the disease, 1.0 point for description of prolapsed disc and how it causes pain, 1.0 point for comparison of bones of the human hand and foot, and 1.0 point for description of the movement and location of two joints).

*Portfolio assignments represent your individual skills. Assignments should represent your personal abilities (like a take-home exam). Do not submit an assignment that is a duplication of any other individual’s work (see syllabus for additional information on academic honesty).*