Exercise 11: *Appendicular Skeleton*

**Activities 1-5**

Objectives:

- Using your lab manual, textbook, atlas, the articulated skeleton, bone box, and your own body when possible, identify the bones and characteristic bone markings and related structures as listed on the following pages (an excellent idea would be to highlight the listed structures on the diagrams in your lab book BEFORE you come into lab).
- You will need to know the right bone from the left bone.
- Notice how the bones articulate and be able to state which bones articulate at each joint.
- Compare male and female pelvises using the model available.

The Pectoral Girdle

1. **Clavicle** (p. 107)
   - Sternal (medial) end
   - Acromial (lateral) end

2. **Scapula** (p. 107)
   - Spine
   - Acromion
   - Coracoid process mnemonic: ____________________________
   - Glenoid cavity
   - Superior border
   - Medial (vertebral) border
   - Lateral (axillary) border
   - Superior angle
   - Inferior angle
   - Supraspinous fossa
   - Infraspinous fossa
   - Subscapular fossa
   - Suprascapular notch

The Arm

1. **Humerus** (p. 108)
   - Head
   - Surgical neck
   - Greater tubercle
   - Lesser tubercle
   - Intertubercular groove
   - Deltoid tuberosity
   - Trochlea
   - Capitulum
   - Medial epicondyle
   - Lateral epicondyle
• Coronoid fossa
• Radial fossa
• Olecranon fossa

2. *Radius* (p.109) mnemonic: ________________________________
   • Head
   • Neck
   • Radial tuberosity
   • Ulnar notch
   • Styloid process

3. *Ulna* (p. 109) mnemonic: ________________________________
   • Olecranon process
   • Coronoid process
   • Trochlear notch
   • Radial notch
   • Head
   • Styloid process

---

**The Hand** (p.110)
1. *Carpals* (know all 8) mnemonic: ________________________________
2. *Metacarpals*
3. *Phalanges*

**The Pelvic Girdle**
*Coxal Bones* (Os Coxae) (pp. 111 – 113)
   • Ilium
   • Ischium
   • Pubis
   • Acetabulum

1. *Ilium*
   • Iliac crest
   • Auricular surface
   • Anterior superior iliac spine
   • Anterior inferior iliac spine
   • Posterior superior iliac spine
   • Posterior inferior iliac spine
   • Iliac fossa
   • Pelvic brim and arcuate line
   • Greater sciatic notch

2. *Ischium*
   • Ischial tuberosity
   • Ischial spine
   • Lesser sciatic notch
   • Ischial ramus
   • Obturator foramen
3. Pubis
   • Ramus
   • Symphysis pubis
   • Pubic crest
   • Arcuate line

The Leg
1. Femur (p.114)
   • Head
   • Fovea capitus
   • Neck
   • Greater trochanter mnemonic: ________________________________
   • Lesser trochanter
   • Intertrochanteric line and crest
   • Gluteal tuberosity
   • Linea aspera
   • Medial condyle
   • Lateral condyle
   • Intercondylar fossa
   • Patellar surface
   • Medial epicondyle
   • Lateral epicondyle

2. Patella (p.114)
   • Base
   • Apex

3. Tibia (p. 115)
   • Lateral condyle
   • Medial condyle
   • Intercondylar eminence
   • Shaft
   • Tibial tuberosity
   • Anterior crest
   • Medial malleolus mnemonic: ________________________________
   • Fibular notch

4. Fibula (p.115)
   • Head
   • Lateral malleolus mnemonic: ________________________________

The Foot (p.116)
1. Tarsals (all 7)
2. Metatarsals (5)
3. Phalanges (14)

Arches of the Foot
   • Medial longitudinal arch
   • Lateral longitudinal arch
   • Transverse arch
Exercise 12: The Fetal Skeleton

Complete Exercise 12 using the fetal skull and skeleton available in lab. Note the following structures and answer the following questions.

- Identify the major bones of the fetal skull and compare them with the adult skull.
  - Why does the fetal skeleton (+/-275) have more than the adult skeleton (206)?
  - What happens to the “extras?”
  - Pay particular attention to the frontal and temporal bones.
  - How do they differ from the adult skull?
  - Note the ossification centers. What process of ossification occurs here?
  - What are the fontanels? Identify the anterior and posterior fontanels.
- Examine the fetal skeleton.
- Review the associated study questions.

Exercise 13: Articulations and Body Movements

Objectives:
- Study Fig. 13.1 “Types of Joints” in your lab manual to visually locate the different types of joints. Identify these joints on the articulated skeleton and on yourself.
- Use Table 13.1 as needed to organize your knowledge of structural and functional classification of joints.
- Use Fig. 13.4 to help you understand how various types of synovial joints work.

Activity 8: Examining the Knee Joint

Use Fig. 13.7, p. 179 to identify the following structures of the knee joint.

- What three bones make up the knee joint?
- Identify the following parts of the knee joint using the models provided.
  - Patellar ligament
  - Lateral (fibular) collateral ligament (LCL)
  - Medial (tibial) collateral ligament (MCL)
  - Posterior cruciate ligament (PCL)
  - Anterior cruciate ligament (ACL)
  - Medial and lateral meniscus
  - Infrapatellar fat pad (view on diagram)
  - Synovial cavity (view on diagram)
Activity 5: *Movements of Synovial Joints* (we’ll do this with muscles after practical 1)

- Describe the relationship between bones, joints, and muscles.
- Define the origin and insertion of a muscle and their relationship to movement.
- What 2 factors determine the type of movement that will occur?
- Describe and demonstrate these movements. Note the angle/degree of the movement. (See Fig. 13.5, pp. 174-5):

<table>
<thead>
<tr>
<th>Movement</th>
<th>Movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td>Inversion **</td>
</tr>
<tr>
<td>Extension</td>
<td>Eversion **</td>
</tr>
<tr>
<td>Hyperextension</td>
<td>Dorsiflexion **</td>
</tr>
<tr>
<td>Rotation</td>
<td>Plantar flexion **</td>
</tr>
<tr>
<td>Abduction</td>
<td>Protraction</td>
</tr>
<tr>
<td>Adduction</td>
<td>Retraction</td>
</tr>
<tr>
<td>Circumduction</td>
<td>Elevation</td>
</tr>
<tr>
<td>Pronation*</td>
<td>Depression</td>
</tr>
<tr>
<td>Supination*</td>
<td></td>
</tr>
</tbody>
</table>
* Note positions of the radius and ulna during supination and pronation.
**Inversion, eversion, dorsiflexion and plantar flexion refer to actions of the foot
Appendicular Skeleton:

1. What is meant by **appendicular** skeleton?

2. The **pectoral girdle** (shoulder girdle) is composed of what 2 bones? Does the pectoral girdle articulate with the vertebral column? What type of joint exists between the pectoral girdle and the humerus?

3. Describe the **clavicle** and associated structures.
   - With what does the clavicle articulate medially?
   - With what does the clavicle articulate laterally?
   - Why is the clavicle the most often broken bone of the body?

4. Describe the **scapula** and its associated structures.
   - The medial (vertebral) border of the scapula is saturated almost parallel to the _____________.
   - Which part of the scapula are you most likely to feel on the dorsal surface of your body?
   - Feel it now. If you follow the scapular spine laterally, you will reach the ____________ process which articulates with the lateral end of the clavicle.
   - Feel this. If you now move interiorly, you will feel a large round structure. This is your _______________ of your _______________. It articulates in the _______________ fossa (cavity).
   - Another projection (which you can't feel) acts as an attachment for muscles and is at the lateral end of the superior border of the scapula. It is called the _______________ process.
   - If you look at the lateral border view of your scapula you will see that the acromion and coracoid processes along with the glenoid fossa make a large cavity into which the head of the humerus is placed. What do the supraspinous, infraspinous, and subscapular fossas have in common?

5. Describe the **humerus** and its associated structures.
   - The humerus articulates proximally with the _________________.
   - The humerus articulates distally with the _______________ and the _______________.
   - If you feel what you might ordinarily call your "shoulder", you are actually feeling the _______________ _______________ of the humerus.
   - The _______________ _______________ runs between the greater tubercle and the head of the humerus.
   - The lesser tubercle is on the (anterior, posterior) side of the body.
   - What runs between the two tubercles?
   - The constricted portion of the proximal end of the humerus just inferior to the tubercles is the _______________ _______________ – named like this due to its
association with fractures of the humerus. Distally, the two projections (one medially and one laterally) are the medial _______ and the lateral _________. Feel these on your arm.

At the most distal part of the humerus (anterior side), you will find two rounded knobs called the ____________ (lateral) and the ____________ (medial) which articulate with the head of the ____________ and the trochlear notch of the ____________.

The coronoid fossa receives the ____________ process of the ____________ when the forearm is flexed.

The radial fossa receives the ____________ of the radius with the forearm is flexed.

On the posterior side of the humerus and at the distal end, the ____________ fossa receives the ____________ process of the ulna with the forearm is extended.

What is the function of the deltoid tuberosity?

6. Describe the radius and the ulna and their associated structures.

In the anatomical position, the radius is located (medially, laterally) to the ulna. With which digit do you associate the radius?

The proximal end of the radius is called the ____________.

The proximal end of the radius articulates with the ____________ of the ____________.

The distal end of the radius is (smaller, larger) than the proximal end.

Located on the distal end of the radius is the ____________ process.

The distal end of the radius articulates with the ____________ and ____________ bones of the wrist (these are two of the carpals).

The distal end, medial side of the radius articulates with the ________ at the ulnar notch.

A common fracture of the radius due to a fall on outstretched arms is called a ____________ fracture (NOTE: this usually occurs in older osteoporotic bones. In younger people it is more common for the wrist – specifically the scaphoid (navicular) to break off for the clavicle to break). With Colle's fracture, the hand is displaced upward and downward. If you can imagine a lateral view of this fracture, you may see why this is also referred to as a "silver fork deformity".

Feel the styloid process of your radius. What is the function of the radial tuberosity?

The proximal end of the ulna should be reviewed in detail. What articulates with the following structures?

a. trochlear notch
b. coronoid process
c. radial notch
d. olecranon process

Which digit do you associate the distal end of the ulna?

Which process is your "elbow"?

Locate and feel the head of your ulna (NOTE: it is at the distal end of the bone). You
can't feel the styloid process because it is too deeply embedded. The distal end of the ulna is (larger, smaller) than the proximal end.

7. Describe the **carpals**, **metacarpals**, and **phalanges**. Locate them on your own hand and wrist.

   The two bones of the wrist that articulate with the radius are?
   What is the clinical significance of the scaphoid?
   What is *carpal tunnel syndrome*?

   Where on your hand do you find the metacarpals?
   How are the phalanges of the first digit different from those of the others?
   Where on your hand do you find the phalanges?
   What are your knuckles?

8. What structures make up the **pelvic girdle** (pelvis)?
   What bones (3) fuse to form the coxal bone (*os coxae*)?
   Where does fusion of these three bones occur?
   What is the function of the acetabulum?
   Your "hip bones" are actually which bones? Feel them.
   Which part of these bones are you feeling?
   What does the auricular surface articulate with?
   What passes through the greater sciatic notch?
   Where is your ischial tuberosity?
   What is the obturator foramen?
   What is the difference between the true and false pelvis?

   What is the difference between the pelvic inlet and the pelvic outlet?
   Compare a male to a female pelvis.
   The pubic bones articulate at the ______________ ____________.
   What type of cartilage is found in this joint?
   What other two bones do the pubic bones articulate with?

9. Describe the **femur** and its associated structures.
   The proximal end of the femur articulates with the ____________.
   The distal end of the femur articulates with the ____________.
   Does the femur articulate with the fibula?
   How does this compare with the bones of the upper appendages?
   Which specific part of the femur articulates with the acetabulum of the coxal bone?
   The greater trochanter is located (*medially, laterally*) to the lesser trochanter.
   The greater trochanter might be thought of as the door slamming bone (if you slam the door with the side of your leg).
   A common area that fractures in older people is at the ____________ because it can no longer support the weight of the body.
What is the function of the trochanters?
Locate the linea aspera of your femur. What is its function?
The medial and lateral condyles of the femur articulate with the medial and later condyles of the __________.
Superior to the condyles on the femur you would find corresponding __________.

10. The patella is commonly referred to as the _________________.
What type of bone is the patella?
Why is it this type of bone?
It is shaped like a _________________.
The ____________ is superior and the ________________ is inferior.
It articulates with which two bones?
Feel your patella.

11. Describe the tibia and its associated structures.
The tibia articulates proximally with the ____________ and _____________ (laterally).
The intercondylar eminence projects up into the _____________ of the femur.
What is the function of the tibial tuberosity?
Locate your medial malleolus on your ankle. It is the distal and medial end of your tibia.
What articulates with the fibular notch?
A fracture associated with the fibula at the tibial articulation is a _____________ fracture.

12. Describe the fibula and its associated structures.
How is the fibula associated with the tibia (lateral, medial)
The head of the fibula articulates with the ________________ of the ____________ at its proximal end.
The distal end of the fibula is the _____________ ___________. Feel it on your ankle.

13. Describe the tarsals, metatarsals, and phalanges of the foot with respect to numbers and locations of each.
The only bone of the foot which articulates with the tibia and fibula is the ________.
The heel bone is the _________________________.
How does the number of carpals compare to the number of tarsals?
This is because the calcaneus was once two bones but has become fused.

14. Name the two arches of the foot.
Note them on your foot.
Why would someone have "flat feet" and which arch is associated with this condition?
15. Briefly compare male and female skeletons considering the following:
   a. size of the bones in general
   b. musculature and points of attachment
   c. pelvic inlet and pelvic outlet
   d. sacral curvature
   e. pubic arch
   f. pubic symphysis
   g. anterior superior iliac spines
   h. acetabulum