Lab #9, #10, and # 11 Bone Classification BIOL&241

LEARNING OBJECTIVES

1. List the functions of the skeletal system.
2. Identify the two major types of bone.
3. Identify the anatomical areas of a longitudinally cut bone.
4. Identify major regions of an osteon (compact bone) and trabeculae (spongy bone) on histological specimens.
5. Explain the role of inorganic salts and organic matrix in flexibility and hardness of bone.
6. Learn the bones of the skull, significant bone markings, and locations.
7. Learn the bones of the axial skeleton, significant bone markings, and locations.
8. Name the three bone groups composing the axial skeleton: by isolated bones, on an articulated skeleton - and note the bone markings of each as listed below.
9. Distinguish by examination the different types of vertebrae from each area.
10. Differentiate lordosis, kyphosis, scoliosis and identify a herniated disc.
11. Define the fontanels and discuss its function and fate in the fetus.
12. Learn the bones of the upper appendage, significant markings, and locations.
13. Learn the bones of the lower appendage, significant markings, and locations.
14. Identify the bones on an articulated skeleton: bones of the shoulder and pelvic girdles and attached limbs
15. Arrange a disarticulated skeleton with the bones in the relative proper positions.
16. Identify bone markings.
17. Differentiate between a female and a male pelvis.
18. Relate structure and function of the Appendicular skeleton.

KEY WORDS

Axial/Appendicular skeleton	Compact bone	Spongy bone	
Long bones	Short Bones	Flat bones	Irregular bones
Wormian (Extra sutural) bones	Sesamoid bones	Diaphysis	Periosteum
Osteoblasts	Epiphysis	Articular cartilage	Epiphyseal plate
Medullary cavity	Yellow marrow	Red marrow	Endosteum
Trabeculae	Central canal	Osteocytes	Lacunae
Lamellae	Osteon	Canaliculi	Perforating canals

And all bones and bone parts listed below

EXPERIMENTS

Do all the sections of lab exercises 9, 10 and 11 work on your own and/or in a group.

Locate the following bones and note the position in the body relative to each other and the organs of the body.

I. Bones of the Axial skeleton

Skull

Vertebrae

Hyoid

Sternum

Ribs and costal cartilage

II. Bones of the Appendicular Skeleton

Clavicle

Scapula

Humerus

Radius

Ulna

Carpals

Metacarpals

Phalanges

os coxa (pelvic bones)

Femur

Patella

Tibia

Fibula

Tarsals

Metatarsals

Phalanges

Study questions:

1. Somewhere between 5 and 10 million years have passed since distant human ancestors swung through trees. We still retain evidence of this *brachiating* mode of locomotion and *bipedal* locomotion. What features of the human skeleton support this arboreal type of locomotion?
2. What is the significance of the materials that make up bones; i.e. what do these indicate about our origins (*think about how bones form developmentally*)? What functions do they perform now?
3. Why do you think it is important to learn many parts of the skeleton? Is there any future use? What do you gain from such an exercise?

SKELETAL SYSTEM

I. Bone Classification, Structure, and Relationships

A. Bone markings - Identify the markings listed under Key Words or after the bones on the list below

B. Classification of Bones

Differentiate between compact and spongy bone in diagrams.

Differentiate the relative gross anatomy of the bones into the four groups - be able to place any bone into one of these groups

C. Gross Anatomy of a Typical Long Bone

Be able to label the diaphysis, periosteum, epiphysis, articular cartilage, epiphyseal plate/line, marrow (medullary) cavity and endosteum

D. Microscopic Anatomy of Bone

Differentiate between compact and spongy bone under a microscope and the parts that make up these two different types of bone.

II. Axial Skeleton lab 10

A. Skull - cranial bones

Frontal (1):	frontal sinus
Parietal (2):	sagittal suture, coronal suture
Temporal (2):	squamous suture, external auditory meatus, zygomatic process, mastoid process, mandibular fossa, jugular foramen
Occipital (1):	lamboidal suture, foramen magnum, occipital condyles
Sphenoid (1):	greater and lesser wings, superior orbital fissure, sella turcica, foramen rotundum, foramen ovale, foramen spinosum
Ethmoid (1):	crista galli, cribiform plate

B. Facial -

Mandible (1):	body, ramus, mandibular condyle, coronoid process, mental foramen, mandibular symphysis
Maxillae (2):	palatine process, infraorbital foramen
Palatine (2)	
Zygomatic (2)	zygomatic arch
Lacrimal (2)	
Nasal (2)	
Vomer (1)	
Paranasal sinuses -	
Fetal skull	same major bones as above, anterior, posterior, mastoid, sphenoid fontanels

C. Neck region

Hyoid (1):

SKELETAL SYSTEM - continued

D. Vertebral Column

Intervertebral discs	
Vertebrae:	body, vertebral foramen, transverse processes, spinous process, superior and inferior articular processes, intervertebral foramina
Cervical (7):	atlas, axis, odontoid process (dens)
Thoracic (12):	
Lumbar (5):	
Sacrum (5 fused):	sacral foramina, sacral canal
Coccyx (3-5):	

E. Bony Thorax

Sternum:	manubrium, body, xiphoid process
Ribs:	true, false, floating, head, neck, shaft

III. Appendicular Skeleton lab 11

A. Shoulder Girdle

Clavicle	
Scapula:	acromion, coracoid process, glenoid cavity, spine,

B. Arm:

Humerus:	greater and lesser tubercles, anatomical neck, deltoid tuberosity, trochlea, capitulum, medial and lateral epicondyles, olecranon fossa

C. Forearm:

Radius:	radial tuberosity, styloid process
Ulna:	coronoid, olecranon and styloid processes

D. Wrist:

Carpals (8)

E. Hand:

Metacarpals (5 each hand)

Phalanges (14 each hand): proximal, middle, distal

F. PELVIC GIRDLE Coxal bones:

Ilium:	auricular surface, iliac crest, anterior and posterior superior iliac spine (ASIS and PSIS), anterior and posterior inferior iliac spine (AIIS and PIIS), iliac fossa
Ischium:	ischial tuberosity, ischial spine
Pubis:	rami, obturator foramen, pubic symphysis

Other features

Acetabulum Pelvic brim False and True pelvis

G. Thigh:

Femur:	greater and lesser trochanter, lateral and medial condyles and epicondyles, linea aspera, patellar surface

SKELETAL SYSTEM - continued

H. Leg:

Tibia:	lateral and medial condyles, tibial tuberosity, medial malleolus
Fibula:	lateral malleolus

I. Foot:

Tarsals (7):	calcaneus and talus
Metatarsals (5 in each foot)	
Phalanges (14 each foot):	proximal, middle, distal

(1) Draw a typical long bone and label it with periosteum, diaphysis, articular cartilage, epiphyseal plate, medullary cavity and endosteum.

(2) Develop an acronym or ridiculous poem for the bones of the **skul**l. It is easier in groups!

(3) Develop an acronym or ridiculous poem for the bones of the **upper appendicular skeleton**. It is easier in groups!

(4) Develop an acronym or ridiculous poem for the bones of the **pelvic girdle**. It is easier in groups!

(5) Develop an acronym or ridiculous poem for the bones of the **lower appendicular skeleton**. It is easier in groups!

Lab #13 Joints (Articulations) BIOL&241

LEARNING OBJECTIVES

1. Identify the types of joints that join each pair of bones.
2. Name the structural categories of joints and compare their mobility.
3. Identify the types of movement seen in synovial joints.
4. Define the origin and insertion of muscles.
5. Be able to demonstrate or identify various body movements.

KEY WORDS

Types of joints:

Functional Classification =

Synarthroses amphiarthroses diarthroses

Structural Classification =

Fibrous - sutures syndesmoses

Cartilaginous - symphysis synchondroses

Synovial - structural characteristics

Gliding hinge pivot condyloid
Saddle ball and socket

Joint Disorders:

Bursitis
Sprain
Dislocation
Arthritis

Body Movements:

Origin	Insertion	Flexion	Extension
Abduction	Adduction	Rotation	Circumduction
Pronation	Supination	Inversion	Eversion
Dorsiflexion	Plantar Flexion		

EXPERIMENTS

Do lab 13, exercises 1, 2, & 5-10. Work on your own and/or in a group. Also note the extra joints that are listed above.

Study questions:

1. Which bones in the skull are movable?
2. How do the bones fit together?
3. What type of joint do the bones form?
4. How much movement is there at each joint?

(1) Using stick figure (s) draw and label **EACH** body movement and next to the label note a nifty way to remember it!

(2) For EACH of the THREE structural classification note **ONE** distinguishing feature of the group and ONE distinguishing feature of each of the subtypes.

(3) List functional classifications with **ONE** distinguishing feature of each.

Synovial Joints: Additional Information

Glenohumeral - head of humerus and glenoid fossa
cartilage lip around the fossa = glenoid labrum
superior and inferior glenohumeral ligaments
subacromial bursa - under acromion
rotator cuff - tendons of subscapularis, supraspinatus, infraspinatus, teres minor muscles
coracohumeral ligament - coracoid process to the greater tubercle of humerus
Intervertebral - synovial (between articulating facets) and fibrous (between vertebrae)
ligaments = anterior longitudinal, posterior longitudinal, interspinatus, supraspinatus
Hip (coxal) - deep ball and socket
cartilage lip around fossa = acetabular labrum
ligaments = superior & anterior iliofemoral, anterior pubiofemoral, posterior & inferior ishiofemoral
ligamentum teres - from fovea capitis to acetabulum
Knee - actually three joints
subpatellar bursa - from the synovial membrane
Extracapsular ligaments -
medial collateral - med. epicondyle of femur to med. condyle of tibia
lateral collateral - lat. epicondyle of femur to head of fibula
oblique popliteal - posterior part of the joint
Intracapsular ligaments -
Anterior cruciate ligament (ACL) - ant. intercondylar fossa to med. surface of lat. femur condyle
Posterior cruciate ligament - post. intercondylar fossa to lat. surface of med. femur condyle
Mensci - semilunar cartilage, C shaped, fibrocartilage, between condyles of tibia and fibula
Injuries - usually collateral ligaments
"Unhappy Triad" - medial meniscus, medial collateral, and ACL
Bursitis
Elbow - humeral trochlea and capitulum, with trochlear notch and head of radius = hinge
ligaments = annular - encloses head of radius
medial collateral - around the ulna - three bands
lateral collateral - around the radius - forms a triangle
these may be hard to locate on the model
- do the best you can and be able to describe the location
Flexion limited by soft tissue of arm and forearm, extension stopped by medial ligament