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  Irregular bones
Long bones  Short Bones  Flat bones  Periosteum
Wormian (Extra sutural) bones  Sesamoid bones  Diaphysis  Endosteum
Osteoblasts  Epiphysis  Articular cartilage  Lacunae
Medullary cavity  Yellow marrow  Red marrow  Canaliculi
Trabeculae  Central canal  Osteocytes  Perforating canals
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):          lambdaidal 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 arch
   Zygomatic (2)           zygomatic arch
   Lacrimal (2)            Lacrimal
   Nasal (2)               Nasal
   Vomer (1)               Vomer
   Paranasal sinuses -
   Fetal skull            same major bones as above, anterior, posterior, mastoid, sphenoid fontanel

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):
- Thoracic (12):
- Lumbar (5):
- Sacrum (5 fused):
- 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, deltoïd 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
- 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 skull. 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!
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 - symphyses
  - Synchondroses
  - Synovial - structural characteristics
    - Gliding
    - Hinge
    - Pivot
    - Condylar
    - 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.
**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 pubofemoral, posterior & inferior ischiofemoral

**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