LEARNING OBJECTIVES FOR
BONES, SKELETON, AXIAL SKELETON, APPENDICULAR SKELETON

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BONES
1. List and briefly describe five (5) functions of the skeletal system.
   Classification of Bones
2. Discuss the differences between spongy and compact bone.
3. Describe and give an example of long short, flat, and irregular bones.

Bone Structure
4. Give the location, function and description of: diaphysis, medullary cavity, yellow bone marrow, epiphysis, epiphyseal line, periosteum, osteoblasts, Sharpey's fibers, endosteum osteoclasts, articular cartilage.
5. Name the tissue and its location which promotes hematopoiesis.
6. Describe the structure of an osteon (Haversian system). What is in the central (Haversian) canal? What are lamellae? What is a lacuna? What are canaliculi? What is their function? What is the difference between an osteocyte and an osteoblast? What are interstitial lamellae?
7. How is spongy bone organized?
8. What are the chemical components of the intercellular matrix? What do each of these components contribute to the property of bone tissue?
9. Describe the following bone markings: 1) tuberosity, 2) crest, 3) trochanter, 4) line, 5) tubercle, 6) epicondyle, 7) spine, 8) head, 9) facet, 10) condyle, 11) ramus, 12) meatus, 13) sinus, 14) fossa, 15) groove, 16) fissure, 17) foramen.

Bone Development
10. What is ossification?
11. What bones are formed by intramembranous ossification? Briefly discuss the three steps of intramembranous ossification.
12. What bones are formed by endochondral ossification? Briefly discuss the five steps of endochondral ossification. What is a primary ossification center? What is a secondary ossification center? What is articular cartilage? What is the epiphyseal plate?
13. Describe the process of longitudinal bone growth. Identify from photomicrographs (or microscope slides) and describe the following structures of the epiphyseal plate: 1) zone of proliferating cartilage 2) zone of hypertrophic cartilage 3) zone of calcified matrix 4) zone of ossification.
14. Describe the process of appositional bone growth.
15. How is bone growth hormonally regulated during youth?
16. Briefly describe the processes of bone construction and destruction involved in the homeostasis of bone remodeling. What is the function of osteoblasts and osteoclasts? How is bone remodeling controlled?

SKELETON
The study of the skeleton includes identification from bones in the laboratory. You are expected to not only identify the listed parts but also learn where these parts articulate to form the skeleton.

Axial Skeleton
1. Name the major parts of the axial skeleton.
   Skull
2. What two sets of bones form the skull? What is the cranium? What are sutures?
3. Identify the following bones of the skull: frontal, sphenoid, zygomatic, parietal, ethmoid, mandible, temporal, nasal, lacrimal, occipital, maxillary, palatine.
7. Temporal bones: identify - squamous portion, petrous portion, mastoid process, external auditory meatus, zygomatic process, mandibular fossa, styloid process.
10. Mandible: identify - body, rami, mandibular condyle, coronoid process, alveolar process.
12. What forms the anterior and posterior portions of the hard palate?
15. Lacrimal bones: identify bones.
17. Inferior nasal conchae: identify bones.

**The Vertebral Column**
18. Describe the types and number of the different vertebrae found in the adult.
19. Describe the divisions and curvatures of the vertebral column.
21. Identify and describe the following parts which characterize a typical vertebra: 1) centrum, 2) vertebral foramen, 3) transverse process, 4) spinous process, 5) superior and inferior articulating processes, 6) intervertebral disc, 7) intervertebral foramina.
22. Identify a typical cervical vertebra. In addition to the structures of a typical vertebra, identify: 1) transverse foramen, 2) bifurcated process.
23. Identify the atlas. What attaches to the superior and inferior articulating processes?
24. Identify the axis. What attaches to the superior and inferior articulating processes? Identify the odontoid process.
25. Identify and describe a typical thoracic vertebra. Identify costal facets (receive heads of ribs) and facets on transverse processes (receive tubercles of ribs).
26. Identify and describe a typical lumbar vertebra.
27. Identify the sacrum. How many fused vertebrae does it contain? Identify - sacral canal, foramina, ala and its articulating surfaces (for attachment to ilium of each coxal bone).
28. Identify the coccyx. How many fused vertebrae does it contain?

**The Bony Thorax**
29. What elements make up the bony thorax?
30. Identify the sternum and its three parts. What attaches to the sternum.
31. How many pairs of ribs? How many pairs of true and false ribs? Distinguish in number and location: vertebrosternal, vertebrochondral and vertebral ribs. Where specifically on the vertebra (thoracic) do ribs articulate?

**The Appendicular Skeleton**
32. Name the parts of the appendicular skeleton.

**The Pectoral (Shoulder) Girdle**
33. What two bones make up the pectoral girdle?
34. Clavicles: identify. What articulates with each end of the clavicle?
35. Scapulae: identify - spine, acromion process, glenoid fossa, coracoid process, axillary border, vertebral border.

**The Upper Limb**
36. Humerus: identify - head, anatomical neck, greater tubercle, lesser tubercle, surgical neck, deltoid tuberosity, capitulum, radial fossa, trochlea, coronoid fossa, olecranon fossa, medial epicondyle, lateral epicondyle.
37. Ulna: identify - olecranon process, coronoid process, semilunar notch, radial notch, head, styloid process.
38. Radius: identify - head, radial tuberosity, styloid process.
39. Wrist: identify - (groups) carpals, metacarpals, phalanges.

**The Pelvic (Hip) Girdle**
40. What bones make up the pelvic girdle? What bones make up the coxal bone?
41. Ilium: identify - iliac crest, articular surface (for sacrum).
42. Ischium: identify - ischial tuberosity.
43. Pubis: identify - articular surface of symphysis pubis.
44. Coxal bone: identify- acetabulum, obturator foramen.

**The Lower Limb**
45. Femur: identify - head, neck, greater trochanter, lesser trochanter, medial condyle, lateral condyle, intercondylar fossa.
46. Patella: identify.
47. Tibia: identify - lateral condyle, medial condyle, tibial tuberosity, medial malleolus.
49. Foot: identify - tarsals, metatarsals, & phalanges as groups; talus, calcaneus.
50. Identify right from left: humerus, ulna, hand, femur, tibia, foot, coxal bone.

**LABORATORY**
ARTICULATIONS - JOINTS
1. Give the names of the three types of joints based on the structural classification (type of binding material and presence of cavity).
2. Give the names of the three types of joints based on the functional classification (amount of movement allowed at the joint).
3. Describe the structure of fibrous joints. Identify the three types of fibrous joints.
4. Describe the structure of cartilaginous joints. Identify two types.
5. Describe the structure of synovial joints. Describe five (5) characteristics.
6. Define the terms and give examples of: 1) flexion, 2) extension, 3) abduction, 4) adduction, 5) circumduction, 6) rotation, 7) supination, 8) pronation, 9) elevation, 10) depression, 11) eversion, 12) inversion.