Chapter 6 – Bones and Skeletal Tissues

Student Objectives:

- Compare and contrast structural and functional differences found in health and disease
- Apply critical thinking skills in various anatomical and physiological situations

Terms for review:

- Recall the definitions of the following terms or concepts
  - Connective tissue
  - Cartilages

Terms:

- Define the following terms
  - articular cartilage
  - Calcification
  - canaliculi
  - cancellous
  - central canal (Haversian canal)
  - circumferential lamellae
  - compact bone
  - diaphysis
  - Endochondral ossification
  - endosteum
  - epiphyseal line
  - epiphyseal plate (epiphyseal cartilage)
  - epiphysis
  - fracture
  - interstitial lamellae
  - Intramembranous ossification
  - lamellae
  - medullary cavity (marrow cavity)
  - metaphysis
  - Ossification
  - Osteoblasts
  - Osteoclasts
  - Osteocytes
  - Osteoid
  - osteon
  - Osteoprogenitor cells
  - perforating canals (Volkmann canals)
  - perforating fibers (sharpey’s fibers)
  - periosteum
  - red marrow
  - Reduction
  - spongy bone
  - trabeculae
  - yellow marrow

- Describe the functions of the skeletal system
- Classify bones according to their shapes and give examples of each type
- Describe the general structures of a bone
- Discuss the function, make up and location of yellow and red marrow
- Explain what gives bones their strength and hardness
- Compare the structures and functions of compact bone and spongy bone
- Explain how the arrangement of collagen fibers in the osteon provide strength
- Discuss how bones grow in length
- Discuss how bones grow in width
- Discuss the timing of bone formation and growth, and account for the differences in the internal structure of the bones of adults
- Explain how bones are supplied with blood
- Describe the remodeling and homeostatic mechanisms of the skeletal system
- Discuss the effects of nutrition, hormones, exercise and aging on bone development and the skeletal system
- Discuss the steps in fracture repair
- Describe the types of fractures and how they heal

I. Introduction
   A. Primary functions
      1. support
      2. storage
      3. blood cell production
      4. protection
      5. leverage
II. Gross Anatomy
A. Bone shapes
   1. long bones
   2. flat bones
   3. sutural bones
   4. irregular bones
   5. short bones
   6. sesamoid bones
B. Bone Structure
   1. Long bones
      a. Diaphysis
         i. Compact bone
      b. epiphysis
         i. Spongy bone
      c. epiphyseal line
      d. articular cartilage
      e. periosteum
      f. medullary cavity (marrow cavity)
      g. endosteum
   2. flat bones

III. Bone Histology
A. Matrix
   1. Inorganic components
   2. osteoid
B. Cells
   1. osteoprogenitor cells
   2. osteoblasts
      a. osteoid
   3. osteocytes
   4. osteoclasts
C. Bone structure
   1. compact bone
      a. osteon
      b. central canal (Haversian canal)
      c. perforating canal (Volkman’s canal)
      d. lamellae
         i. concentric lamellae
         ii. interstitial lamellae
         iii. circumferential lamellae
         iv. lacunae
         v. canaliculi
   2. spongy bone
      a. trabeculae
      b. interstitial lamellae
      c. canaliculi
      d. lacunae
   3. bone marrow
      a. red marrow
      b. yellow marrow
D. Periosteum and endosteum
   1. periosteum
      a. perforating fibers (Sharpey’s fibers)
   2. endosteum
IV. Bone formation and growth
A. Ossification (osteogenesis)
   1. calcification
2. types of ossification
   B. bone growth in length
      1. growth plate
   C. bone growth in width

V. blood and nerve supply
VI. Dynamic nature of bone
   A. Remodeling
   B. Effects of exercise on bone
      1. Bone anatomy and stress
   C. Hormonal and nutritional effects
   D. Skeleton as a calcium reserve
   E. Bone scans
   F. Fracture and repair of bone
      1. fracture repair
         a. fracture
         b. reduction
      2. common fractures
         a. degree of separation
            i partial (greenstick)
            ii complete
         b. degree of exposure
            i closed (simple)
            ii open (compound)
         c. by origin of fracture
            i avulsion
            ii stress
            iii direct
            iv indirect
            v pathologic
         d. by shape or direction
            i depressed
            ii oblique
            iii longitudinal
            iv transverse
            v spiral
            vi stellate
            vii fissure
            viii comminuted