Chp. 11 SKELETAL S.
Functions of the skeletal system?
1. Supports the body
2. Protects the soft body parts
3. Produces blood cells
4. Stores minerals (calcium and phosphate) and fat
5. Allows for movement by attaching muscles

What is the anatomy of a long bone?
- Diaphysis – shaft of the bone made of compact bone and filled with yellow marrow
- Epiphysis – ends of the bone made mostly of spongy bone
- Articular cartilage – hyaline cartilage found on the ends of long bones
- Yellow bone marrow – stores fat
- Red bone marrow – makes blood cells found in spongy bone and flat bones
- Periosteum – living, outer covering of fibrous connective tissue
- Ligaments – fibrous connective tissue that connects bones

More detail on bone…
- Compact bone
  - Composed of osteons with a central canal containing blood vessels
  - Contains living bone cells called osteocytes chambers called lacunae
- Spongy bone
  - Made of plates with spaces filled with red bone marrow
Where are the 3 types of cartilage found?

- Cartilage – flexible connective tissue: based on the type and arrangement of matrix fibers

- Types:
  - Hyaline cartilage – ends of long bones, nose, ends of ribs, larynx and trachea
  - Fibrocartilage – disks between vertebrae and in the knee; stronger than hyaline cartilage
  - Elastic cartilage – ear flaps and epiglottis; more flexible than hyaline cartilage

What are the important cells in bone growth, remodeling and repair?

- Osteoblasts – bone-forming cells
- Osteocytes – mature bone cells that maintain bone structure derived from osteoblasts
- Osteoclasts – bone-absorbing cells
- Chondrocytes – cartilage-forming cells

How does bone develop?

Ossification - the formation of bone in two distinct ways:
1. Intramembranous ossification – bone development between sheets of fibrous connective tissue; used in flat bones
2. Endochondrial ossification – cartilage is replaced by bone; used by most bones
How does endochondral ossification occur?

1st Cartilage model – chondrocytes lay down hyaline cartilage in the shape of the future bones

2nd Bone collar formation – osteoblasts secrete bone matrix and results in a collar made of compact bone

3rd Primary ossification center – osteoblasts are brought interiorly by blood and lay down spongy bone

4th Secondary ossification sites – bone centers in the epiphyses formed after birth

5th Epiphyseal plate – a cartilage band that acts as a growth plate that allows bones to lengthen

How do bones lengthen?

How do hormones affect bone growth?

- Growth hormone (GH) – stimulates general bone growth and the epiphyseal plates
- Sex hormones – increases growth during adolescence
- Vitamin D – converted to a hormone to allow calcium absorption in the intestine
What is bone remodeling and what is its role in homeostasis?

- Bone remodeling – bone renewal at a rate of up to 18% per year
- Remodeling allows bones to respond to stress
- Regulates the calcium in the blood through hormones:
  - Parathyroid hormone (PTH) – increases blood calcium by accelerating bone recycling
  - Calcitonin – decreases blood calcium

Bone repair

1. Hematoma
2. Fracture site
3. Primitive/Boney Union
4. Remodeling
5. Fully Healed/Remodelled

The 206 bones of the skeleton
The skull – the cranium

- Cranium
  - Protects the brain
  - Composed of 8 bones
  - Some contain sinuses

Bones of the face and the hyoid bone

- Facial bones
  - Mandible
  - Maxillae
  - Zygomatic bones
  - Nasal bones

- Hyoid
  - Only bone that does not articulate with another bone

The vertebral column

- Types of vertebrae
  - 33 vertebrae
    - Cervical (7)
    - Thoracic (12)
    - Lumbar (5)
    - Sacrum (5 fused)
    - Coccyx (4 fused into tailbone)

- Intervertebral disks
  - Fibrocartilage between vertebrae
11.3 Bones of the axial skeleton

The rib cage

- Ribs – protects heart and lungs
  - Flattened bone originating from the thoracic vertebrae
  - 12 pairs:
    - 7 pr. true ribs
    - 3 pr. false ribs
    - 2 pr. floating ribs
- Sternum
  - Known as the breastbone

11.4 Bones of the appendicular skeleton

The appendicular skeleton

- Pectoral girdle
  - Scapula and clavicle
- Upper limb
  - Arm and hand bones

- Pelvic girdle
  - Coxal bone
- Lower limb
  - Leg and foot bones
Types of joints
(where bones meet bones)

- **Fibrous** – usually immovable such as the sutures between cranial bones

- **Cartilaginous** – tend to be slightly movable such as the intervertebral disks

- **Synovial** – freely movable joints such as the ball-and-socket hip and shoulder joints and the knee joint

Anatomy of a synovial joint

Visualizing synovial joints movements