I. Classification of Articulations

Articulations or joints are the junctions between bones (all but one of the 206 bones in the human body articulate with another bone). Articulations may be classified by the material that holds the bones together (fibrous, cartilagenous, synovial) and/or by the amount of movement possible at the joint (synarthrotic, amphiarthrotic, diarthrotic).

A. Bony Fusion

B. Fibrous Joints - bones are tightly fastened together by fibrous connective tissue
   1. Suture (synarthrotic)
   2. Syndesmosis (amphiarthrotic)
   3. Gomphosis (synarthrotic)

C. Cartilagenous Joints - bones held together by hyaline or fibrocartilage
   1. Synchondrosis (synarthrotic)
   2. Symphyses (amphiarthrotic)

D. Synovial Joints - freely moveable joints (diarthrotic).

II. Synovial Joints - the most structurally and functionally complex type of joint, a synovial membrane interconnects bones forming freely moveable joints (diarthrotic).

1. Joint Capsule (outer layer): encloses the joint
   - continuous with the periosteum, composed of fibrous connective tissue
   - thickenings form ligaments that hold the joint together (reinforce the joint capsule)

2. Synovial Membrane (inner layer of joint capsule) - loose connective tissue which secretes gelatinous synovial fluid into the synovial cavity (lubricates and provides nutrients to the tissues of the joint)

3. Articular Cartilage: covers articulating surfaces of bones, resists wear, low friction

4. Spongy Bone: light, strong in multiple directions

5. Accessory Structures
   - ligaments (outside of the joint capsule):
     - menisci:
     - bursae:
     - tendon sheaths:

6. Types of synovial joints (FYI):
   a. ball and socket (spheroidal)
   b. condyloid (ellipsoidal)
   c. gliding (arthroidal)
   d. hinge (ginglymoidal)
   e. pivot (trochoidal)
   f. saddle (searral)

III. Movements at Joints - generated by muscle contraction. Muscles and bones together form lever systems (3 types).

1. class I: weight - fulcrum - force
2. class II: fulcrum - weight - force
3. class III: fulcrum - force – weight
A. Specific Movements (often paired):

- **flexion** - angle of joint is reduced
- **extension** - angle of joint is increased
- **abduction** - away from midline
- **adduction** - towards midline
- **supination** - palm forward (anatomical)
- **pronation** - palm backwards
- **inversion** - turn foot inwards
- **eversion** - turn foot outwards
- **dorsiflexion** - flexion of foot
- **plantar flexion** - extension of foot
- **protraction** - push forward
- **retraction** - pull back
- **elevation** - lift
- **depression** - lower
- **rotation** - rotation around an axis
- **circumduction** - describe a cone
- **hyper** - beyond anatomical position (i.e. hyperextension)

IV. Major Articulations

A. Intervertebral Articulations

B. Shoulder Joint (glenohumeral joint) - ball and socket joint

- Allows for the greatest range of movement of any joint in the body, consequently it is one of the weakest joints in the body.

C. Knee Joint – the knee is a hinge joint but is far more complex than this might imply, the knee is the largest and most complex joint in the body.

D. Elbow Joint - hinge joint

E. Hip Joint - ball and socket joint

V. Clinical Significance (FYI)

- **sprains** - overstretching and/or tearing of a ligament
- **strains** - overstretching and/or tearing of a muscle (muscle will tear before tendon)
- **dislocation** - articulating bones are displaced from each other
- **bursitis** - inflammation of the bursa
- **tendonitis** - inflammation of the tendon sheath
- **arthritis** - inflammation of the joint
  - **rheumatoid** - most painful and destructive form, involves inflammation and thickening of the synovial membrane forming a pannus followed by destruction of the articular cartilage. The joint becomes fibrotic and may ossify (ankylosis).
  - **osteoarthritic** - most common form, often as a result of aging - wear of the articular cartilage due to injury and disease (may lead to development of spurs on the articular ends of the bones)
  - **gouty** - hereditary metabolic error leads to excessive build up of uric acid crystals in the soft tissues and joints

VI. Additional Key Terms

- **bursa**
- **ligament**
- **tendon**
- **tendon sheath**