Articulations

Contact between two or more bones (or teeth)
Structure determines degree of movement and strength
Structural factors
  – Fit of surfaces
  – Flexibility of connective tissue binding joint
  – Position of associated components (ligaments, tendons, & muscles)

Classification of Joints
Structural: presence of synovial cavity and type of connective tissue
  – Fibrous - collagenous connective tissue
  – Cartilaginous - cartilage connective tissue
  – Synovial - fluid filled articular capsule
Functional: degree of movement
  – Synarthroses - immovable
  – Amphiarthroses - slightly movable
  – Diarthroses - freely movable

Synarthroses
Suture - fibrous joint, dense fibrous connective tissue binds bones of skull
  – Synostosis - ossification of suture
Gomphosis - fibrous joint, cone shaped root of teeth held in socket by peridontal ligament
Synchondrosis - cartilaginous joint
  – hyaline cartilage at epiphyseal plate before ossification, manubrium and 1st rib (both becomes a synostoses when ossified)

Amphiarthroses
Symphysis - cartilaginous joint, a disc of fibrocartilage
  – Pubic symphysis, intervertebral joints, sternum and manubrium
Syndesmosis - fibrous joint, fibrous connective tissue forming an interosseous membrane
  – More flexibility than suture
  – Distal articulation between tibia and fibula, interosseous membrane between tibia and fibula

Diarthroses
All are synovial joints with synovial cavity
Articular (hyaline, sometimes fibrocartilage) cartilage along with synovial fluid reduce friction & absorb shock (no perichondrium)
Articular capsule surrounds cavity - two layers
  – Outer fibrous capsule of dense irregular connective tissue
    • Merges with periosteum of bones, may integrate ligaments
More Diathroses
- Inner synovial membrane of areolar connective tissue
  - Binds with articular cartilage
  - May have associated articular fat pads
  - Secretes synovial fluid (hyaluronic acid and interstitial fluid) for lubrication and metabolic support of cartilage
  - Suspended phagocytic cells to consume debris and microbes

Accessory Structures of Diathroses
- Extra and intracapsular ligaments
- Articular discs (menisci) composed of fibrocartilage
  - Improve fit between bones and stabilize
- Bursae
  - Added articular capsules between skin, bones, ligaments, tendons and muscles
  - Bursitis - inflammation due to wear or trauma

Degree of Movement
- Structure, shape, and orientation
- Strength & tension of ligaments
- Arrangement and tension of muscle/tendons
- Hormones that increase flexibility of connective tissue (e.g. relaxin - allows expansion of pubic symphysis during childbirth)

Types of Movement
- Flexion/extension
- Rotation; circumduction
- Abduction/adduction

Types of Diathroses
- Planar (gliding or arthrodial)
  - Back and forth, or side to side
  - Carpals, tarsals, rib tubercles, clavicle at both ends
- Hinge (ginglymus)
  - Concave surface fitting a convex surface
  - Flexion & extension & monaxial
  - Knee, elbow, ankle, interphalangeal joints

More Types
- Pivot (trochoid)
  - Extension of one protrude into ring of another
  - Rotational & monaxial
  - Atlas & axis, radius around ulna
- Condyloid (ellipsoidal)
  - Oval chondyle in elliptical depression
  - Circumduction, abduction, adduction & biaxial
– Carpals at radius, metacarpophalangeal joints (2-5)

**Even More Types**

- **Saddle** (sellaris)
  - One saddle shaped, other rides saddle
  - Flexion & extension, abduction & adduction, circumduction & biaxial
  - Only example: trapezium and metacarpal of thumb

- **Ball and socket** (spheroid)
  - Ball fitting cup-like depression
  - Flexion & extension, abduction & adduction, circumduction, rotation & multiaxial
  - Only examples: shoulder & hip

**Special Movements**

- Elevation/depression - mandible
- Protraction/retraction - mandible, pectoral girdle
- Inversion/eversion - sole of foot
- Dorsiflexion/plantar flexion - foot
- Supination/pronation - hand
- Opposition - thumb and fingers

**Knee Joint**

- Planar or gliding portion: patella & femur
- Hinge portion: medial & lateral condyles of femur, menisci, and condyles of tibia

- 10 major parts
  - Articular capsule - incomplete combination of ligamentous sheaths and muscle tendons
  - Medial & lateral patellar retinacula - fused tendons of quadriceps femoris insert on tibia
  - Patellar ligament - extension of quadriceps tendon

**More Knee Joint**

- Oblique popliteal ligament & semimembranous muscle tendon (posteriorly)
- Arcuate popliteal ligament (posteriorly)
- Tibial (medial) collateral ligament
- Fibular (lateral) collateral ligament
- Intracapsular ligaments (2 sets interior)
  - Anterior cruciate ligament
  - Posterior cruciate ligament
- Articular discs (2 menisci)
- Bursae (3)
  - Prepatellar, infrapatellar, suprapatellar

**Football Knee**

- Three C’s
— medial collateral ligament
— anterior cruciate ligament
— medial menisci cartilage

• Arthroscopic surgery
• Arthroplasty: joint replacement

**Other Disorders**

• Arthritis - inflammation of joint and decline of movement
• Rheumatoid arthritis - autoimmune response causing inflammation of synovial membrane, articular cartilage erodes, potential for fusion (ankylosis)
• Osteoarthritis (degenerative joint disorder) - degeneration of articular cartilage in weight-bearing joints

**Even More Disorders**

• Gouty arthritis - sodium urate crystals deposited in soft tissues of joints (diet can control production of excess uric acid)
• Luxation (dislocation) - tearing of ligaments, tendons, and articular capsules — Bo Jackson
• Sprain - wrenching of joint with stretching or tearing of fibers