

# IV. ARTICULAR SYSTEM

## CLASSIFICATION OF JOINTS

Bones are connected at joints (articulations), and all bone movements occur at joints. Joints are structurally classified as fibrous, cartilaginous, or synovial. They are functionally classified as immovable, partly movable, or freely movable. The most secure joints are immovable; the most vulnerable are freely movable. The architecture of freely movable joints determines their directions and ranges of motion.

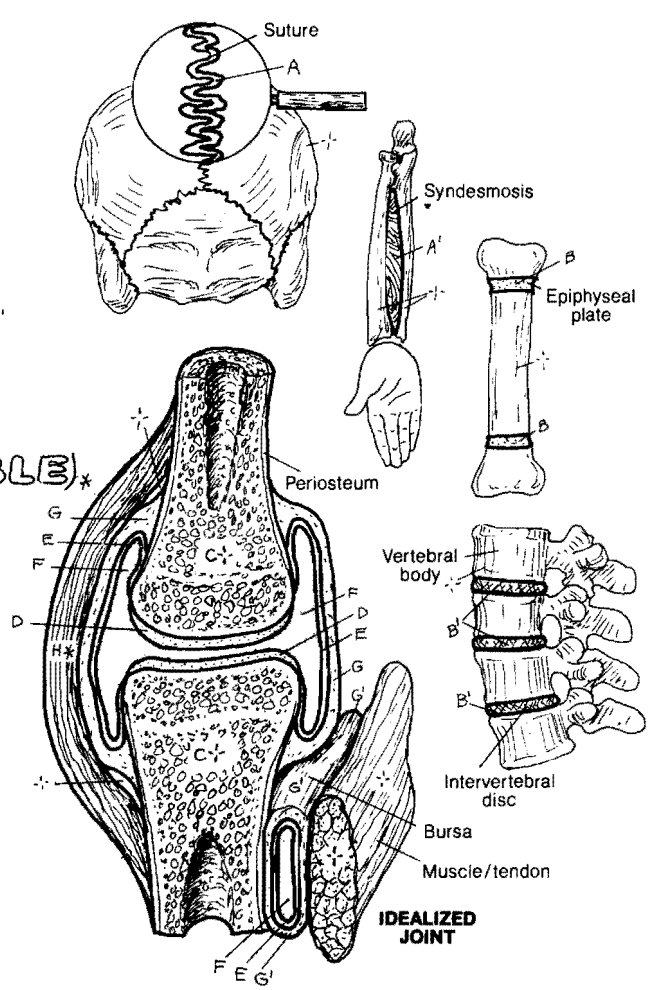
**FIBROUS JOINT\***  
**IMMOVABLE<sub>A</sub> / PARTLY MOVABLE<sub>A'</sub>**  
*Fibrous joints*, where bone is connected to bone by fibrous tissue, are immovable or partly movable. Sutures are *immovable* fibrous joints; so are teeth and their sockets. Syndesmoses, here represented by the interosseous ligament of the forearm, are *partly movable* fibrous joints.

**CARTILAGINOUS JOINT\***  
**IMMOVABLE<sub>B</sub> / PARTLY MOVABLE<sub>B'</sub>**  
*Cartilaginous joints*, where bone is connected to bone by cartilaginous or fibrocartilaginous tissues, are immovable or partly movable. The epiphyseal growth plates are *immovable* cartilaginous joints, replaced by bone at skeletal maturity. The intervertebral discs are *partly movable* fibrocartilaginous joints.

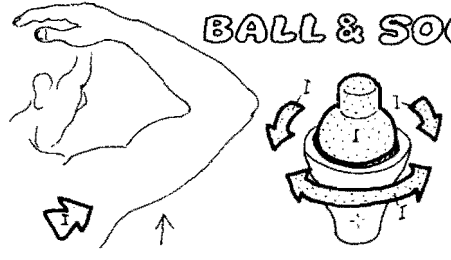
**SYNOVIAL JOINT (FREELY MOVABLE)\***  
**ARTICULATING BONES<sub>C</sub>**  
**ARTICULAR CARTILAGE<sub>D</sub>**  
**SYNOVIAL MEMBRANE<sub>E</sub>**  
**SYNOVIAL CAVITY (FLUID)<sub>F</sub>**  
**JOINT CAPSULE<sub>G</sub>**  
**BURSA<sub>H</sub>**  
**COLLATERAL LIGAMENT<sub>H\*</sub>**

*Synovial joints* are all *freely movable* within in the limitations of the bony architecture. *Articular bones* are capped with *articular cartilage* at the joint interface. The joint cavity is lined internally with vascular *synovial membrane* (except over the articular cartilage) and secretes a nutrient, lubricating *synovial fluid*. The fibrous, sensitive *joint capsule* is reinforced by *ligaments*. A cushion of synovial membrane reinforced by dense irregular connective tissue can be found interposed between bone and a moving structure (tendon, muscle). Such a device (*bursa*) facilitates friction-free movement.

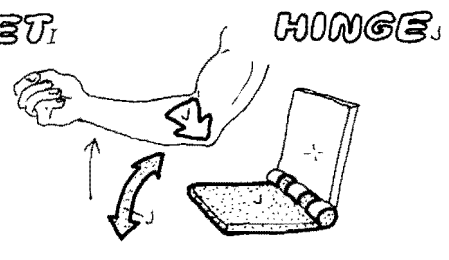
CN: Use a light blue for D, and dark color for F and gray for H. (1) Do not color the bones in the upper half of the plate. (2) Below, color the arrows pointing to the location of the joints as well as the joint representations.



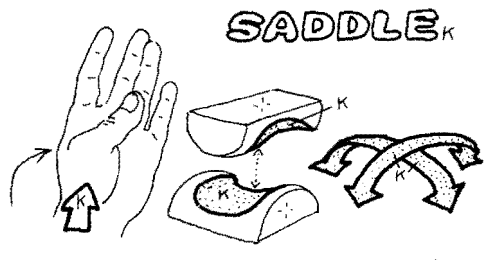
### TYPES OF SYNOVIAL JOINTS:\*



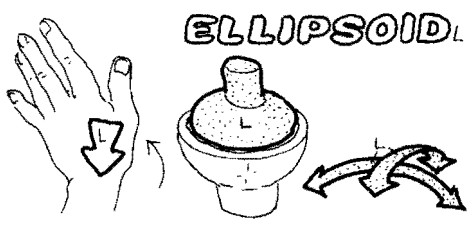
**BALL & SOCKET<sub>I</sub>**  
 The ball and socket joint is best seen at the hip and shoulder joints. Movements in all directions are permitted.



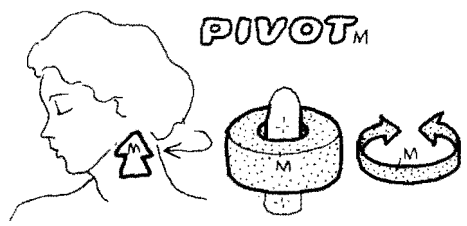
**HINGE<sub>J</sub>**  
 A hinge joint permits movement in only one plane: flexion/extension. It can be seen at the ankle, interphalangeal, and elbow (humeroulnar) joints.



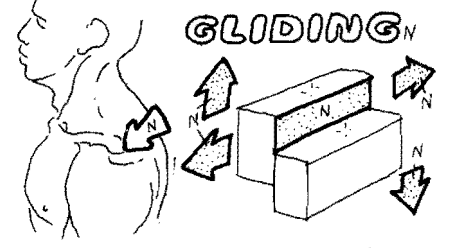
**SADDLE<sub>K</sub>**  
 The saddle (sellar) joint has two concave surfaces articulating with one another. The carpometacarpal joint of the thumb is the best example of this joint which permits all movements but rotation.



**ELLIPSOID<sub>L</sub>**  
 The ellipsoid (condyloid, condylar) joint is a reduced ball and socket configuration in which significant rotation is largely excluded, e.g., the bicondylar knee and temporomandibular joints, and radiocarpal (wrist) joints.



**PIVOT<sub>M</sub>**  
 A ring of bone (C1 vertebra) rotating about an axle of bone (odontoid process of C2 vertebra) is a pivot joint (atlantoaxial joint). Also the rounded humeral capitulum and the radial head (radiohumeral joint).



**GLIDING<sub>N</sub>**  
 A gliding joint consists of generally flat surfaces gliding across one another during movement, such as the facet joints of the vertebrae, acromioclavicular, and intercarpal/intertarsal joints.