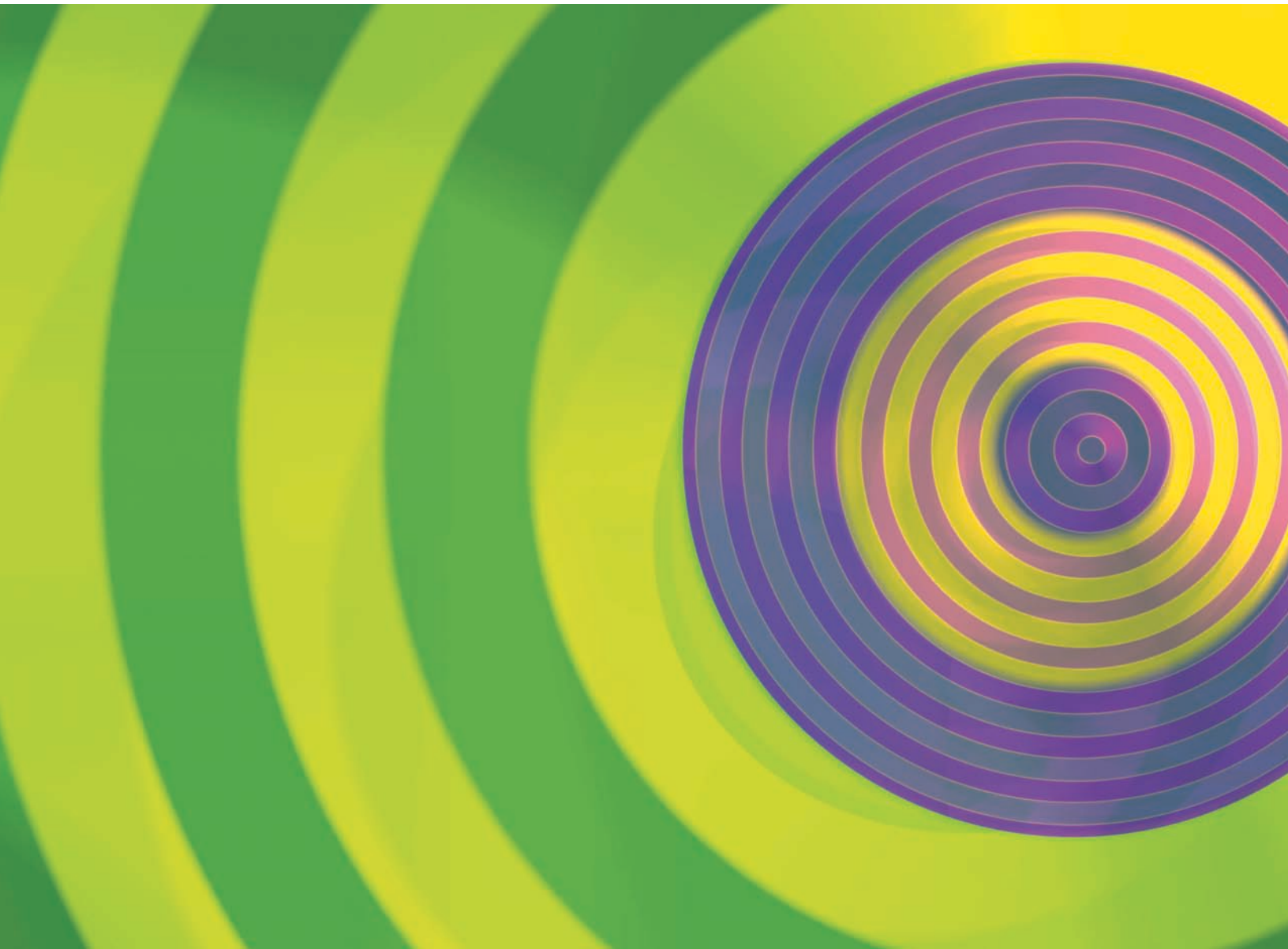


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Marieb Mitchell Smith
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Articulations and Body Movements

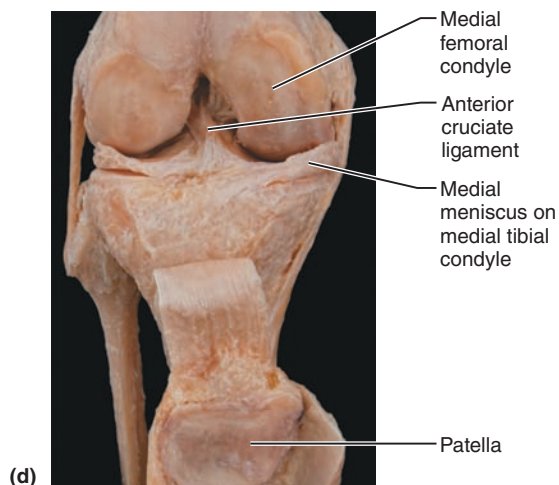
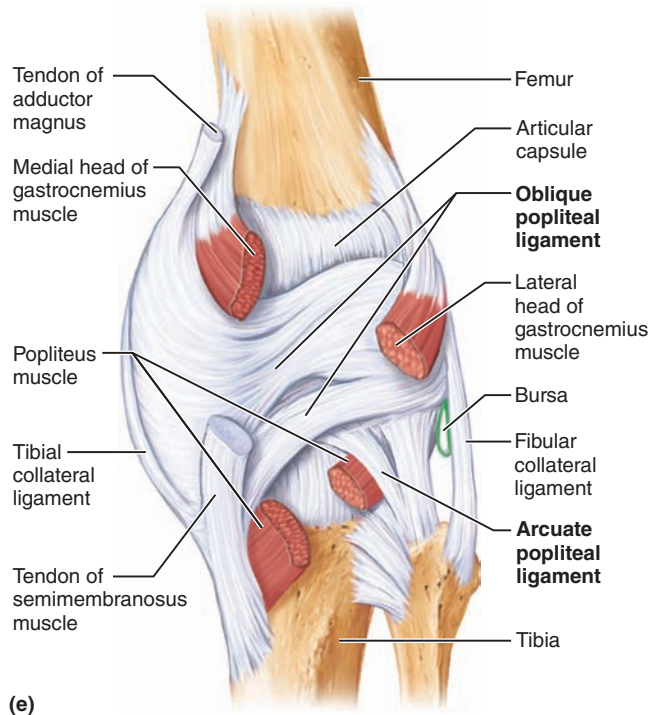
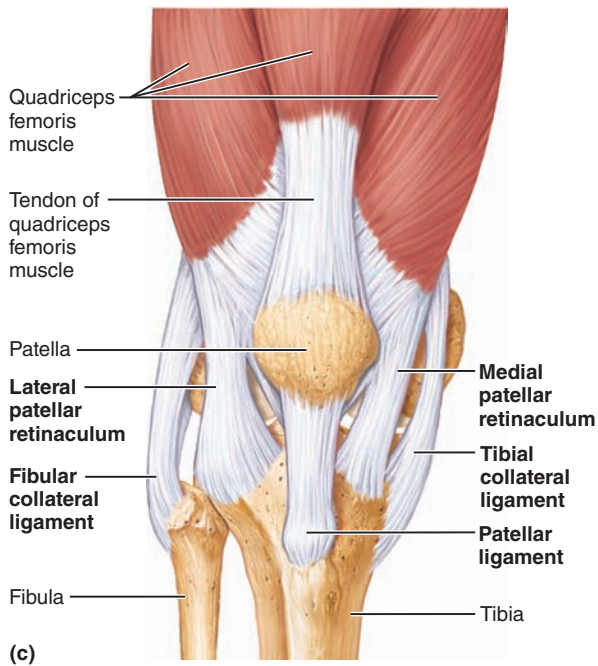
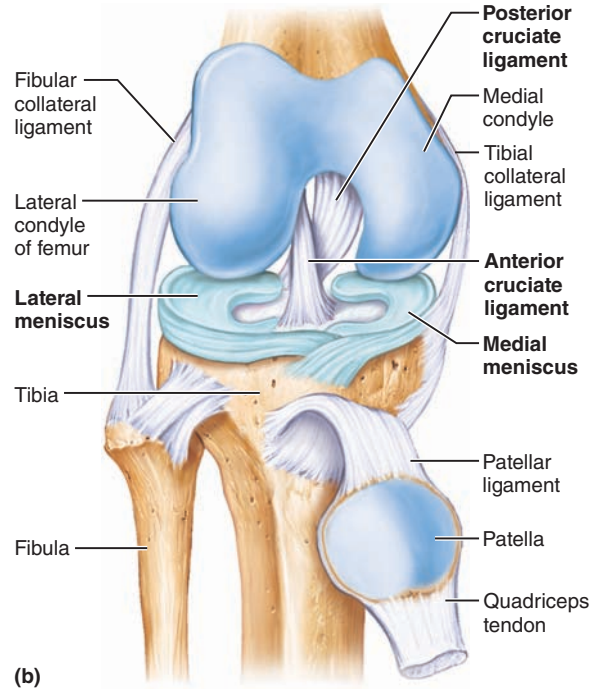
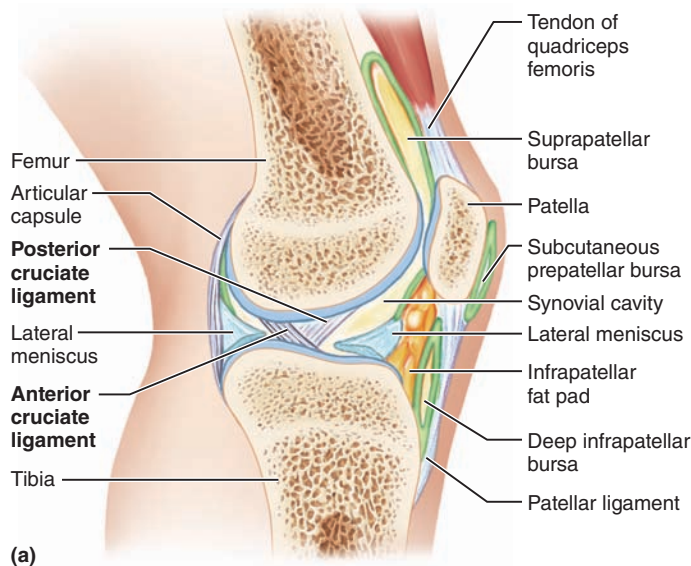


Figure 8 Knee joint relationships. (a) Midsagittal section of right knee joint. (b) Anterior view of slightly flexed right knee joint showing the cruciate ligaments. Articular capsule has been removed; the quadriceps tendon has been cut and reflected distally. (c) Anterior superficial view of the right knee. (d) Photograph of an opened knee joint corresponds to view in (b). (e) Posterior superficial view of the ligaments clothing the knee joint.

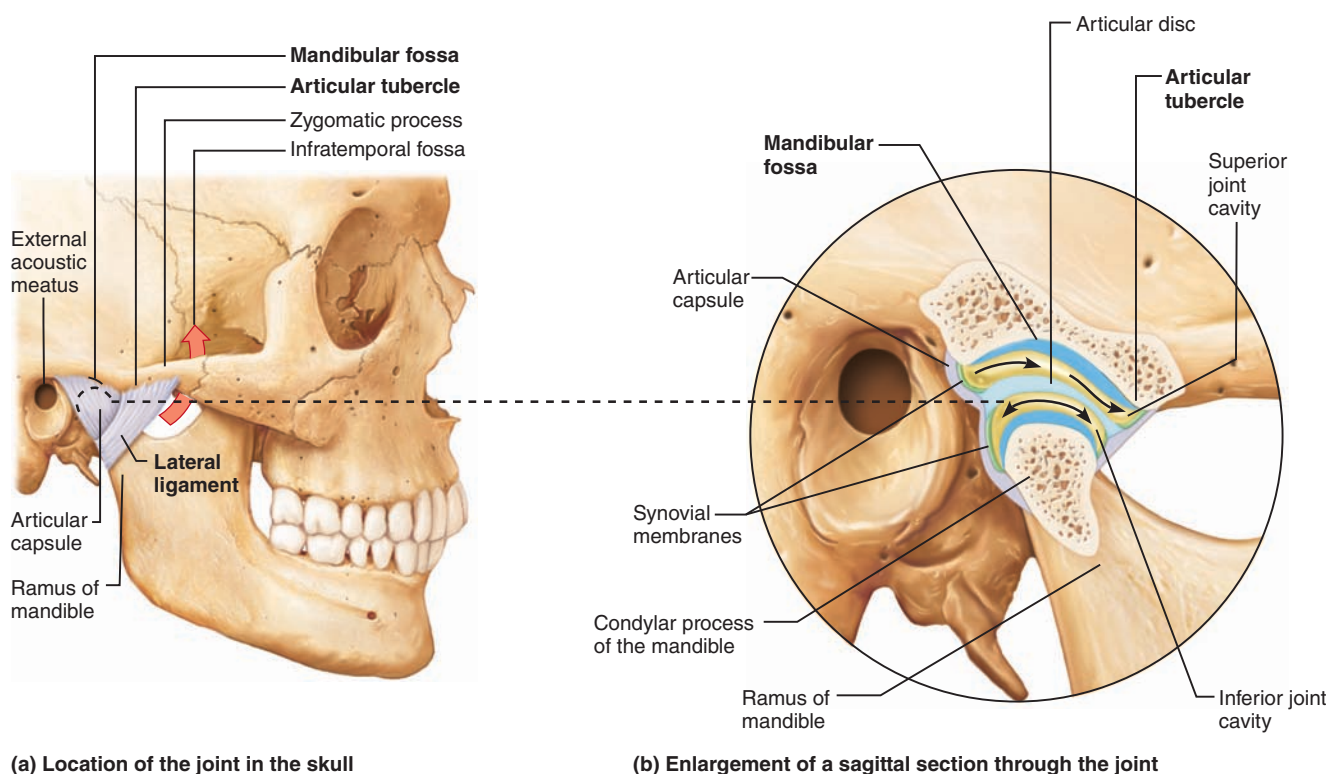


Figure 9 The temporomandibular (jaw) joint relationships. Note that the superior and inferior compartments of the joint cavity allow different movements indicated by arrows.

GROUP CHALLENGE

Articulations: "Simon Says"

Working in groups of three or four, play a game of "Simon Says" using the movements defined in Activity 5. One student will play the role of "Simon" while the others perform the movement. For example, when "Simon" says, "Simon says, perform flexion at the elbow," the remaining students flex their arm. Take turns playing the role of Simon. As you perform the movements, consider and discuss whether the joint allows other movements and whether the joint is uniaxial, biaxial, or multiaxial. (Use Table 1 as a guide.) After playing for 15–20 minutes, complete the tables below.

1. List two uniaxial joints, and describe the movement at each.

Uniaxial Joints

Name of joint	Movements allowed

2. List two biaxial joints, and describe the movement at each.

Biaxial Joints

Name of joint	Movements allowed

3. List two multiaxial joints, and describe the movement at each.

Multiaxial Joints

Name of joint	Movements allowed

Table 1 Structural and Functional Characteristics of Body Joints

Illustration	Joint	Articulating bones	Structural type*	Functional type; movements allowed
	Skull	Cranial and facial bones	Fibrous; suture	Synarthrotic; no movement
	Temporo-mandibular	Temporal bone of skull and mandible	Synovial; modified hinge [†] (contains articular disc)	Diarthrotic; gliding and uniaxial rotation; slight lateral movement, elevation, depression, protraction, and retraction of mandible
	Atlanto-occipital	Occipital bone of skull and atlas	Synovial; condylar	Diarthrotic; biaxial; flexion, extension, lateral flexion, circumduction of head on neck
	Atlantoaxial	Atlas (C ₁) and axis (C ₂)	Synovial; pivot	Diarthrotic; uniaxial; rotation of the head
	Intervertebral	Between adjacent vertebral bodies	Cartilaginous; symphysis	Amphiarthrotic; slight movement
	Intervertebral	Between articular processes	Synovial; plane	Diarthrotic; gliding
	Costovertebral	Vertebrae (transverse process or bodies) and ribs	Synovial; plane	Diarthrotic; gliding of ribs
	Sternoclavicular	Sternum and clavicle	Synovial; shallow saddle (contains articular disc)	Diarthrotic; multiaxial (allows clavicle to move in all axes)
	Sternocostal (first)	Sternum and rib 1	Cartilaginous; synchondrosis	Synarthrotic; no movement
	Sternocostal	Sternum and ribs 2–7	Synovial; double plane	Diarthrotic; gliding
	Acromio-clavicular	Acromion of scapula and clavicle	Synovial; plane (contains articular disc)	Diarthrotic; gliding and rotation of scapula on clavicle
	Shoulder (glenohumeral)	Scapula and humerus	Synovial; ball and socket	Diarthrotic; multiaxial; flexion, extension, abduction, adduction, circumduction, rotation of humerus
	Elbow	Ulna (and radius) with humerus	Synovial; hinge	Diarthrotic; uniaxial; flexion, extension of forearm
	Proximal radioulnar	Radius and ulna	Synovial; pivot	Diarthrotic; uniaxial; pivot (head of radius rotates in radial notch of ulna)
	Distal radioulnar	Radius and ulna	Synovial; pivot (contains articular disc)	Diarthrotic; uniaxial; rotation of radius around long axis of forearm to allow pronation and supination
	Wrist	Radius and proximal carpals	Synovial; condylar	Diarthrotic; biaxial; flexion, extension, abduction, adduction, circumduction of hand
	Intercarpal	Adjacent carpals	Synovial; plane	Diarthrotic; gliding
	Carpometacarpal of digit 1 (thumb)	Carpal (trapezium) and metacarpal I	Synovial; saddle	Diarthrotic; biaxial; flexion, extension, abduction, adduction, circumduction, opposition of metacarpal I
	Carpometacarpal of digits 2–5	Carpal(s) and metacarpal(s)	Synovial; plane	Diarthrotic; gliding of metacarpals
	Metacarpophalangeal (knuckle)	Metacarpal and proximal phalanx	Synovial; condylar	Diarthrotic; biaxial; flexion, extension, abduction, adduction, circumduction of fingers
	Interphalangeal (finger)	Adjacent phalanges	Synovial; hinge	Diarthrotic; uniaxial; flexion, extension of fingers


Table 1 (continued)

Illustration	Joint	Articulating bones	Structural type	Functional type; movements allowed
	Sacroiliac	Sacrum and coxal bone	Synovial; plane	Diarthrotic; little movement, slight gliding possible (more during pregnancy)
	Pubic symphysis	Pubic bones	Cartilaginous; symphysis	Amphiarthrotic; slight movement (enhanced during pregnancy)
	Hip (coxal)	Hip bone and femur	Synovial; ball and socket	Diarthrotic; multiaxial; flexion, extension, abduction, adduction, rotation, circumduction of femur
	Knee (tibiofemoral)	Femur and tibia	Synovial; modified hinge [†] (contains articular discs)	Diarthrotic; biaxial; flexion, extension of leg, some rotation allowed
	Knee (femoropatellar)	Femur and patella	Synovial; plane	Diarthrotic; gliding of patella
	Superior tibiofibular	Tibia and fibula (proximally)	Synovial; plane	Diarthrotic; gliding of fibula
	Inferior tibiofibular	Tibia and fibula (distally)	Fibrous; syndesmosis	Synarthrotic; slight “give” during dorsiflexion
	Ankle	Tibia and fibula with talus	Synovial; hinge	Diarthrotic; uniaxial; dorsiflexion and plantar flexion of foot
	Intertarsal	Adjacent tarsals	Synovial; plane	Diarthrotic; gliding; inversion and eversion of foot
	Tarsometatarsal	Tarsal(s) and metatarsal(s)	Synovial; plane	Diarthrotic; gliding of metatarsals
	Metatarso-phalangeal	Metatarsal and proximal phalanx	Synovial; condylar	Diarthrotic; biaxial; flexion, extension, abduction, adduction, circumduction of great toe
	Interphalangeal (toe)	Adjacent phalanges	Synovial; hinge	Diarthrotic; uniaxial; flexion, extension of toes

* **Fibrous joints** are indicated by orange circles; **cartilaginous joints** by blue circles; **synovial joints** by purple circles.

[†] These modified hinge joints are structurally bicondylar.

Joint Disorders

 Joint pains and malfunctions can be due to a number of causes. For example, a hard blow to the knee can cause a painful bursitis, known as “water on the knee,” due to damage to, or inflammation of, the patellar bursa. Slip-page of a fibrocartilage pad may result in a painful condition that heals slowly.

Sprains and dislocations are other types of joint problems. In a **sprain**, the ligaments reinforcing a joint are damaged by overstretching or are torn away from the bony attachment. Because both ligaments and tendons are cords of dense connective tissue with a poor blood supply, sprains heal slowly and are quite painful.

Dislocations occur when bones are forced out of their normal position in the joint cavity. They are normally accompanied

by torn or stressed ligaments and considerable inflammation. The process of returning the bone to its proper position, called *reduction*, should only be done by a physician. Attempts by an untrained person to “snap the bone back into its socket” are often more harmful than helpful.

Advancing years also take their toll on joints. Weight-bearing joints in particular eventually begin to degenerate. *Adhesions* (fibrous bands) may form between the surfaces where bones join, and extraneous bone tissue (*spurs*) may grow along the joint edges. Such degenerative changes lead to the complaint so often heard from the elderly: “My joints are getting so stiff. . . .”

- If possible, compare an X-ray image of an arthritic joint to one of a normal joint. +

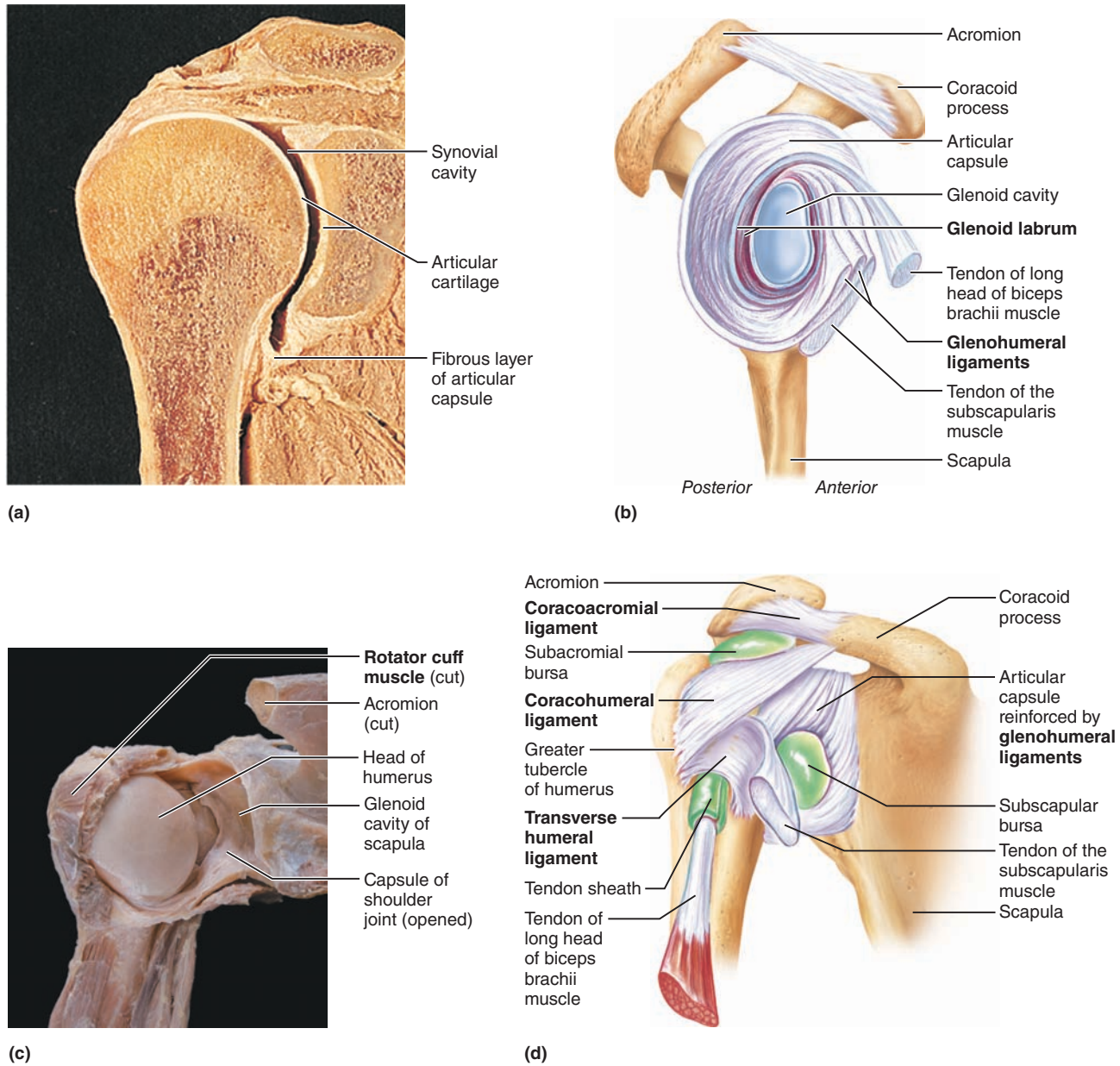


Figure 10 The shoulder joint. **(a)** Frontal section through the shoulder. **(b)** The right shoulder joint, cut open and viewed from the lateral aspect; the humerus has been removed. **(c)** Photo of an opened shoulder joint, anterior view. **(d)** Anterior superficial view of the right shoulder joint.