

## AXIAL / APPENDICULAR SKELETON

**CN:** Use light but contrasting colors for A and B

(1) Color the axial skeleton (A) in all three views

Do not color the spaces between the ribs (intercostal)

(2) Color the darker outlined appendicular skeleton (B)

(3) Color the arrows identifying bone shape/classification

### CLASSIFICATION OF BONES

LONG

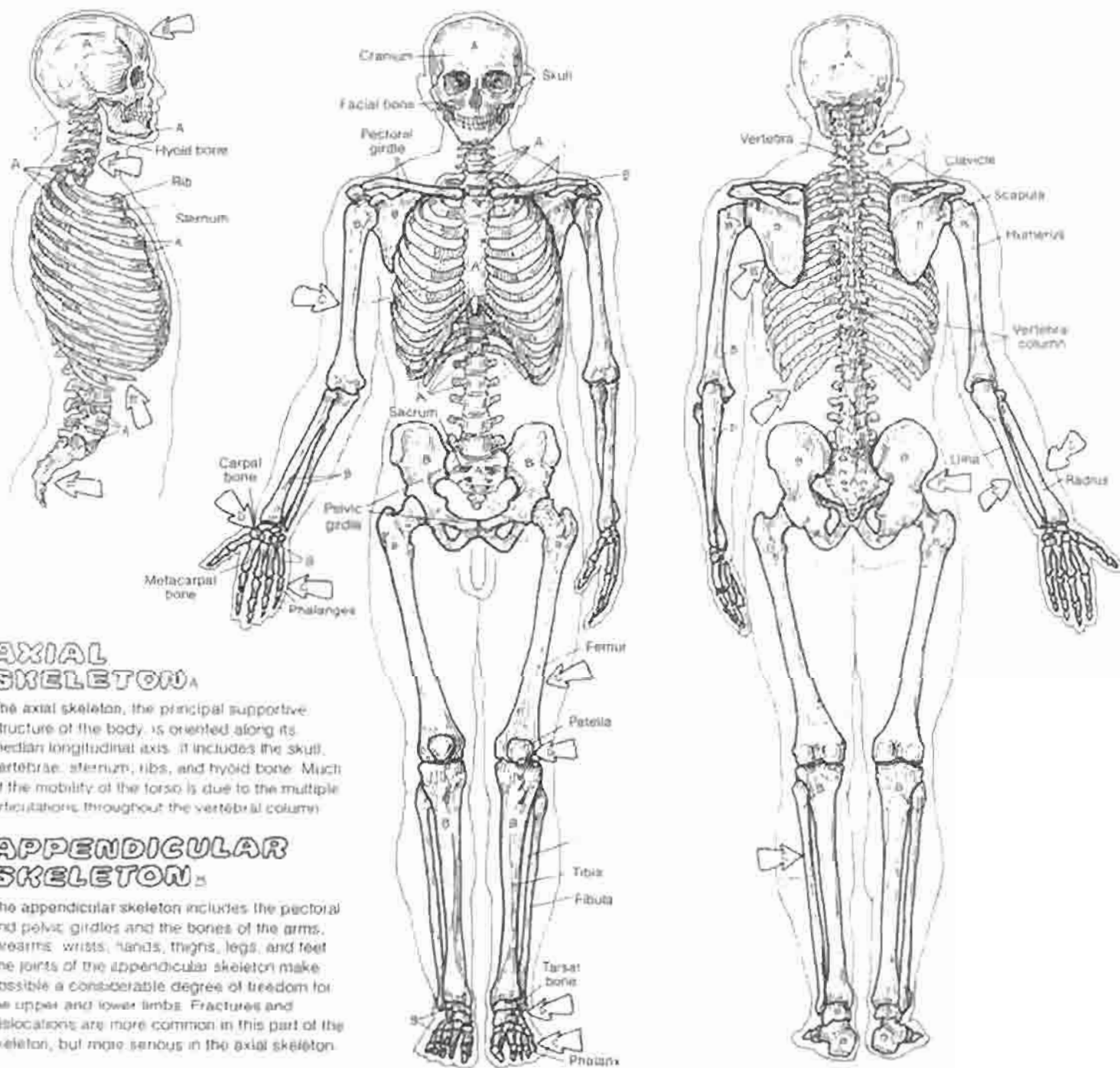
SHORT

FLAT

IRREGULAR

SESAMOID

Bones have a variety of shapes and defy classification by shape, yet such a classification historically exists. *Long bones* are clearly longer in one axis than in another. They are characterized by a medullary cavity, a hollow diaphysis of compact bone, and at least two epiphyses—e.g., femur, phalanx. *Short bones* are roughly cube-shaped. They are predominantly cancellous bone with a thin cortex of compact bone and have no cavity—e.g., carpal and tarsal bones. *Flat bones* (cranial bones, scapulae, ribs) are generally more flat than round, and *irregular bones* (vertebrae) have two or more different shapes. Bones not specifically long or short fit this latter category. *Sesamoid bones* are developed in tendons (e.g., patellar tendon); they are mostly bone, often mixed with fibrous tissue and cartilage. They have a cartilaginous articular surface facing an articular surface of an adjacent bone; they may be part of a synovial joint enveloped within the fibrous joint capsule. The structures are generally pea-sized and are most commonly found in certain tendons/joint capsules in hands and feet, and occasionally in other articular sites of the upper and lower limbs. The largest is the patella, integrated in the tendon of quadriceps femoris. Sesamoid bones resist friction and compression, enhance joint movement, and may assist local circulation.



### AXIAL SKELETON<sup>A</sup>

The axial skeleton, the principal supportive structure of the body, is oriented along its median longitudinal axis. It includes the skull, vertebrae, sternum, ribs, and hyoid bone. Much of the mobility of the torso is due to the multiple articulations throughout the vertebral column.

### APPENDICULAR SKELETON<sup>B</sup>

The appendicular skeleton includes the pectoral and pelvic girdles and the bones of the arms, forearms, wrists, hands, thighs, legs, and feet. The joints of the appendicular skeleton make possible a considerable degree of freedom for the upper and lower limbs. Fractures and dislocations are more common in this part of the skeleton, but more serious in the axial skeleton.

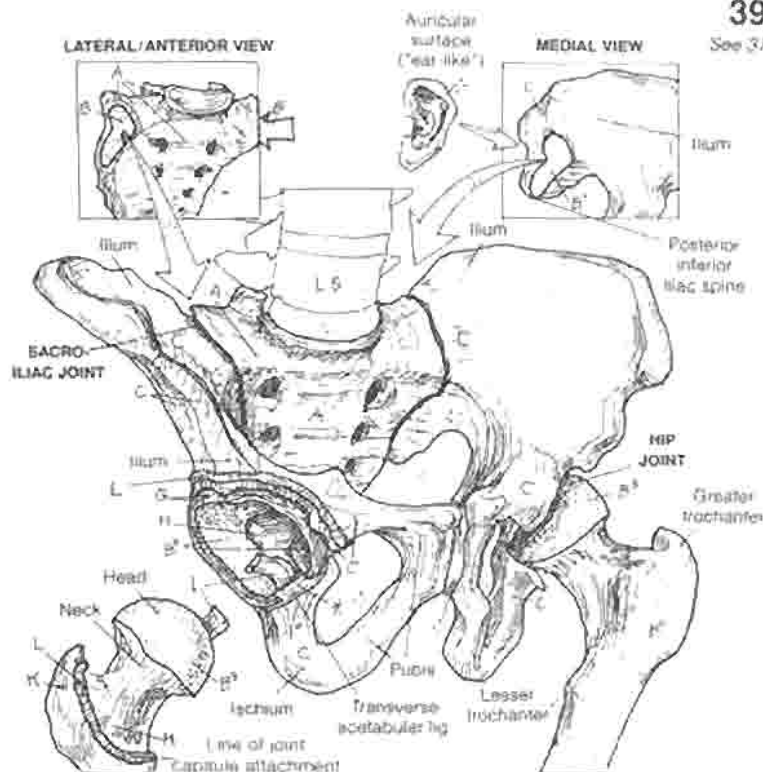
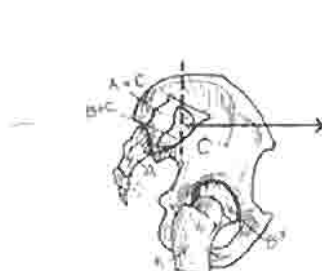
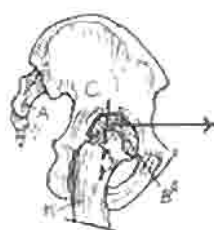
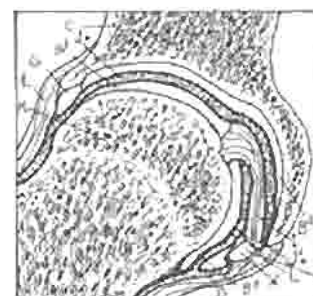
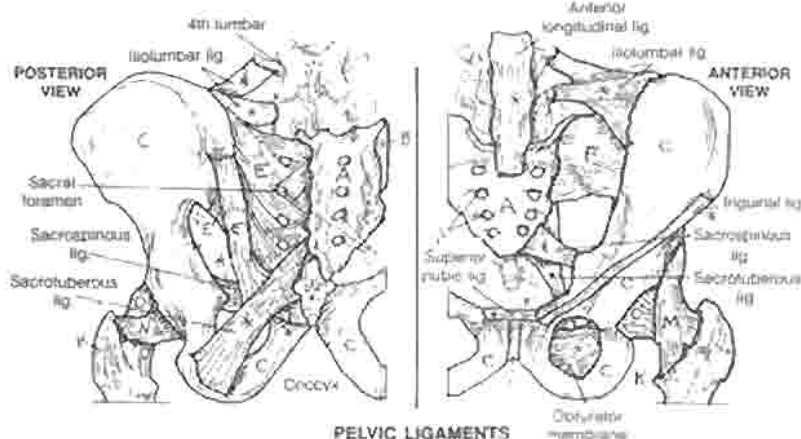
**SACROILIAC & HIP JOINTS**

**ON:** Use light colors for A, C, and L and light blue for B. The hip bone (C) is a fusion of the ilium, ischium, and pubic bones (studied separately on Plate 37). All contribute to the hip joint. (1) The upper left inset shows only one of the two auricular surfaces of the sacrum; the partial arrow (B<sup>1</sup>) points to the unseen surface. The synovial membrane (H) of the hip joint is shown only in the large view (where the femur is displaced). (2) In the lower two views, use color for the relevant ligaments that appear among the tiles, while coloring the remaining ligaments gray.

**SACROILIAC JOINT:****SACRUM<sub>A</sub>****AURICULAR SURFACE<sub>B</sub>****HIP BONE:****AURICULAR SURFACE<sub>B</sub>****SYNOVIAL CAVITY<sub>H</sub>****INTEROSSEOUS SACROILIAC LIG.<sub>D</sub>****POSTERIOR SACROILIAC LIG.<sub>D,E</sub>****ANTERIOR SACROILIAC LIG.<sub>D,F</sub>****HIP JOINT:****HIP BONE<sub>C</sub>****ACETABULUM:****ACETABULAR LABRUM<sub>G</sub>****ARTICULAR CARTILAGE<sub>G</sub>****SYNOVIAL MEMBRANE<sub>H</sub>****LIGAMENTUM TERES<sub>I</sub>****SYNOVIAL CAVITY<sub>J</sub>****FEMUR<sub>K</sub>****ARTICULAR CARTILAGE<sub>G</sub>****JOINT CAPSULE<sub>L</sub>****ILIOFEMORAL LIG.<sub>M</sub>****ISCHIOFEMORAL LIG.<sub>N</sub>****PUBOFEMORAL LIG.<sub>O</sub>****ADDITIONAL PELVIC LIGS.<sub>\*</sub>**

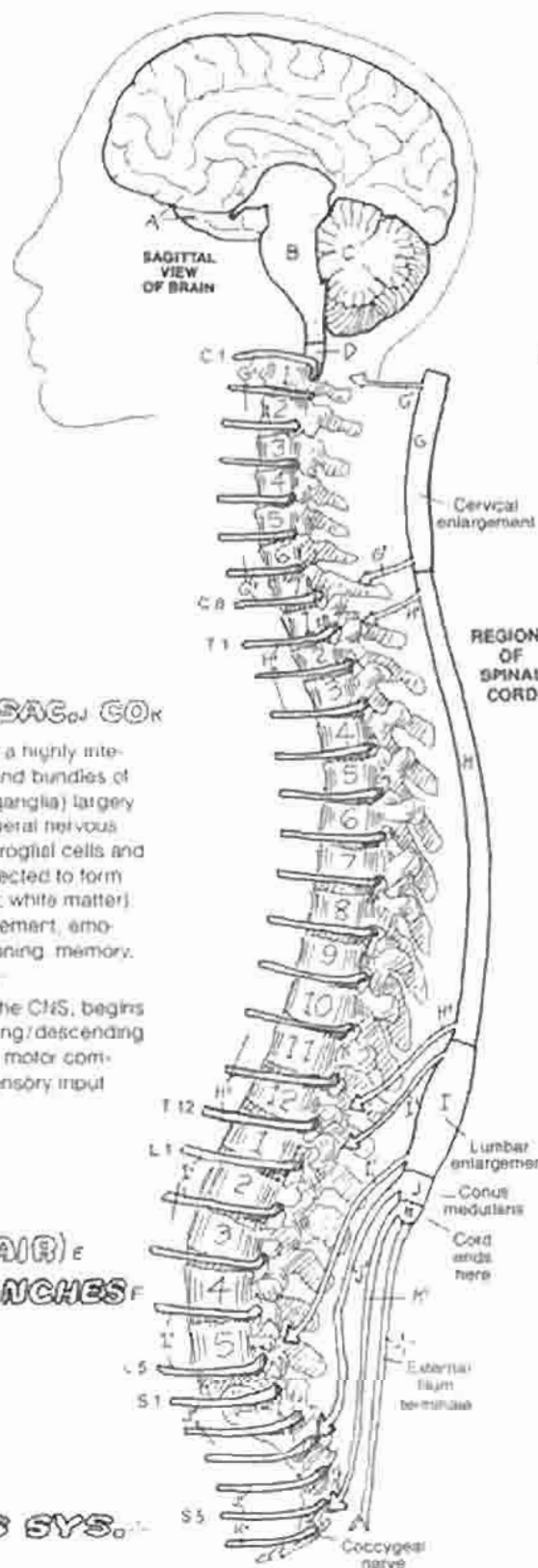
The sacroiliac joint is a significant load-bearing articulation. The auricular surfaces of the ilium and sacrum are roughened and cartilage-lined; the sacral surface is hyaline; the iliac surface is fibrocartilaginous and thinner. Only the lower half of the joint is synovial with a cavity; the upper half is ligamentous. A fibrous capsule surrounds the entire joint. The cavity becomes smaller in later life, and the joint surfaces may fuse with advanced age. Movement of the joint is controversial; some anterior and posterior movement, with rotation, has been described. This motion may be increased during pregnancy. Movement is sharply limited by the irregularity of the articular surfaces and by the dense, thick posterior sacroiliac and the thinner anterior sacroiliac ligaments. The joint, its ligaments, and crossing muscles are implicated in the painful "sacroiliac syndrome". Inflammation of the synovial part of the joint (sacroiliitis) is well recognized in many auto-immune-related diseases (e.g., ankylosing spondylitis, rheumatoid arthritis, and inflammatory bowel disease).

The hip joint is a ball and socket, synovial joint between the acetabulum of the hip bone and the head of the femur. The joint permits flexion, extension, adduction, abduction, medial and lateral rotation, and circumduction. Each joint surface is lined with articular cartilage; that of the acetabulum is C-shaped. The incomplete bony socket of the acetabulum is completed by the transverse acetabular ligament and is enhanced by a 360° fibrocartilaginous labrum. The joint is encapsulated; the three strong iliofemoral, ischiofemoral, and pubofemoral ligaments reinforce this fibrous capsule. Arising within the acetabulum between the arms of the acetabular cartilage is the ligament of the head of the femur (lig. teres). It offers little resistance to forced distraction, but it does transmit vessels to the femoral head. An adequate blood supply to the joint requires both femoral circumflex vessels in addition to the vessels in the ligamentum teres.

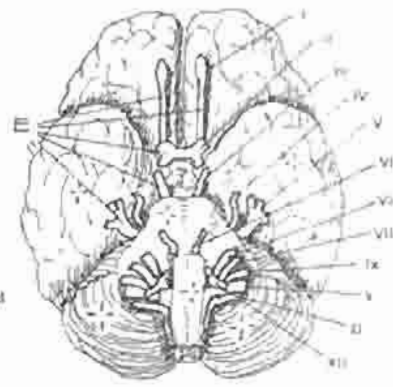
**LATERAL/ANTERIOR VIEW OF JOINT LOCATIONS****LATERAL VIEW****FRONTAL SECTION OF SACROILIAC JOINT****FRONTAL SECTION OF HIP JOINT****PELVIC LIGAMENTS**

**ORGANIZATION**

**CN:** Use very light colors for A and C. The numbers in parentheses following the titles under Spinal Nerves refer to the number of nerves in each of the regions listed. (1) in the central illustration, the spinal cord has been brought out of the vertebral column to show its regions in relation to the vertebrae. Spinal nerves, depicting regional limits, are shown with arrowheads pointing to the same spinal nerves emerging from the vertebral column. Avoid coloring the filum terminale—it is not a spinal nerve. (2) At upper right, color the cranial nerves. (3) At lower right color over the lines representing the spinal nerves and their branches on the left side of the figure. Color the autonomic ganglia on the right side of the spinal cord.



**VENTRAL VIEW OF CRANIAL NERVES**



**REGIONS OF SPINAL CORD**

**CENTRAL NERVOUS SYSTEM (CNS)**

**BRAIN**

- CEREBRUM
- BRAINSTEM
- CEREBELLUM

**SPINAL CORD**

**REGIONS**

- CERVICAL
- THORACIC
- LUMBAR
- SACRAL
- COCCYGEAL

The nervous system consists of neurons arranged into a highly integrated central part (central nervous system, or CNS) and bundles of neuronal processes (nerves) and islands of neurons (ganglia) largely outside the CNS making up the peripheral part (peripheral nervous system, or PNS). These neurons are supported by neuroglial cells and a rich blood supply. Neurons of the CNS are interconnected to form centers (nuclei, gray matter) and axon bundles (tracts, white matter). The brain is the center of sensory awareness and movement, emotions, rational thought and behavior, foresight and planning, memory, speech, and language and interpretation of language.

The spinal cord, an extension of the brain and part of the CNS, begins at the foramen magnum of the skull, travels in ascending/descending impulses, and is a center for spinal reflexes, source of motor commands for muscles below the head and receiver of sensory input below the head.

**PERIPHERAL NERVOUS SYSTEM (PNS)**

**CRANIAL NERVES (12 PAIR)**

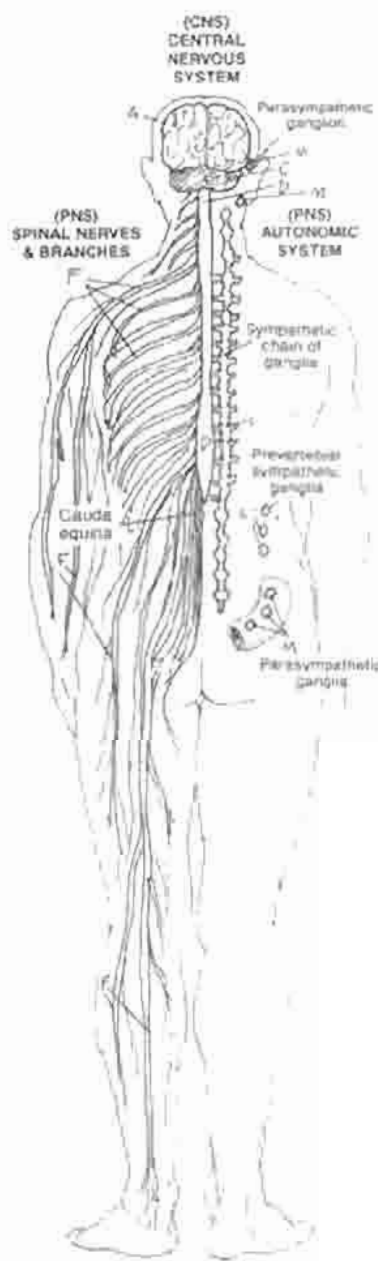
**SPINAL NERVES & BRANCHES**

- CERVICAL (8)
- THORACIC (12)
- LUMBAR (5)
- SACRAL (5)
- COCCYGEAL (1)

**AUTONOMIC NERVOUS SYS.**

- SYMPATHETIC DIV.
- PARASYMPATHETIC DIV.

The PNS consists largely of bundles of sensory and motor axons (nerves) radiating from the brain (cranial nerves) and spinal cord (spinal nerves) segmentally and bilaterally and reaching to all parts of the body (visceral and somatic) through a classic pattern of distribution. Branches of spinal nerves are often called peripheral nerves. Nerves conduct all sensations from the body to the brain and spinal cord; they conduct motor commands to all the skeletal muscles of the body. The autonomic nervous system (ANS) is a subset of ganglia and nerves in the PNS dedicated to visceral movement and glandular secretion and to the conduction of visceral sensations to the spinal cord and brain.



**VERTEBRAL COLUMN AND SPINAL NERVES**