Bone is a living, vascular structure, composed of organic tissue and mineral. The organic component (cells, fibers, extracellular matrix, vessels, nerves) makes up about 35% of a bone's weight; 65% of the bone's weight is mineral (calcium hydroxyapatite). Bone functions as (1) a support structure; (2) a site of attachment for skeletal muscle, ligaments, tendons, and joint capsules; (3) a source of calcium; and (4) a significant site of blood cell development. The femur is classified as a **long bone**.

The **epiphysis** is the end of a long bone. The mature epiphysis is largely cancellous bone. Its articulating surface is lined with 3–5 mm of hyaline (articular) cartilage.

The **diaphysis** is the shaft of a long bone. It has a marrow-filled medullary cavity surrounded by compact bone that is lined externally by bone cell-forming periosteum and internally by bone-forming endosteum (not shown).

Articular cartilage is smooth, slippery, porous, malleable, insensitive, and bloodless; it is the only remaining evidence of an adult bone's cartilaginous past. It is the articulating surface in freely movable joints.

Periosteum is a fibrous, cellular, vascular, and highly sensitive life support sheath for bone, providing a source of bone cells throughout life.

Cancellous (spongy) bone consists of interwoven beams (trabeculae) of bone in the epiphyses of long bones, the bodies of the vertebrae, and other bones without cavities. The spaces among the trabeculae are filled with red or yellow marrow (see colorable arrows) and blood vessels. Cancellous bone forms a dynamic latticed truss capable of mechanical alteration in response to the stresses of weight, postural change, and muscle tension.

Compact bone forms the stout walls of the diaphysis and the thinner outer surface of other bones where there is no articular cartilage (e.g., the flat bones of the skull).

The **medullary cavity** is the cavity of the diaphysis. It contains marrow: red in the young, turning to yellow in many long bones in maturity. It is lined by thin connective tissue with many bone-forming cells (*endosteum*).

Red marrow is a red, gelatinous substance composed of red and white blood cells in a variety of developmental forms (*hematopoietic tissue*), and specialized capillaries (*sinusoids*) enmeshed in reticular tissue. In adults, red marrow is generally limited to the sternum, vertebrae, ribs, hip bones, clavicles, long bones, and cranial bones.

Yellow marrow is fatty connective tissue that does not produce blood cells.

The **nutrient artery** is the principal artery and major supplier of oxygen and nutrients to the shaft or body of a bone; its **branches** snake through the labyrinthine canals of the haversian systems and other tubular cavities of bones.