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Subject: Physical Education

Topic: The Skeletal System

Sub-Topic: Structure of a Typical Bone

The structure of a long bone allows for the best visualization of all the parts of a bone. A long bone has two parts: the **diaphysis** and the **epiphysis**. The diaphysis is the tubular shaft that runs between the proximal and distal ends of the bone. The hollow region in the diaphysis is called the **medullary cavity**, which is filled with yellow marrow. The walls of the diaphysis are composed of dense and hard **compact bone**.

The wider section at each end of the bone is called the epiphysis (plural = epiphyses), which is filled with spongy bone. Red marrow fills the spaces in the spongy bone. Each epiphysis meets the diaphysis at the metaphysis, the narrow area that contains the **epiphyseal plate** (growth plate), a layer of hyaline (transparent) cartilage in a growing bone. When the bone stops growing in early adulthood (approximately 18–21 years), the cartilage is replaced by osseous tissue and the epiphyseal plate becomes an epiphyseal line.

Bones are more than just the scaffolding that holds the body together. Bones come in all shapes and sizes and have many roles. Bone structure consists of a number of layers. These include the cartilage, spongy bone, marrow cavity, compact bone, periosteum and endosteum

**Cartilage** – This is also known as articular cartilage, it is a firm but elastic type of cartilage, which provides shock absorption to the joint. Cartilage covers the ends of bones where they form a joint with another bone. Exercise causes cartilage to become thicker.

**Spongy Bone** – This is a more porous, lightweight type of bone with an irregular arrangement of tissue which allows maximum strength. In a long bone, this is normally found at either end of the bone, in flat or irregular bones it is a thin layer found just inside the compact bone. If the bones grow thicker, we must also have more spongy bone, it helps with shock absorption and making more blood cells.

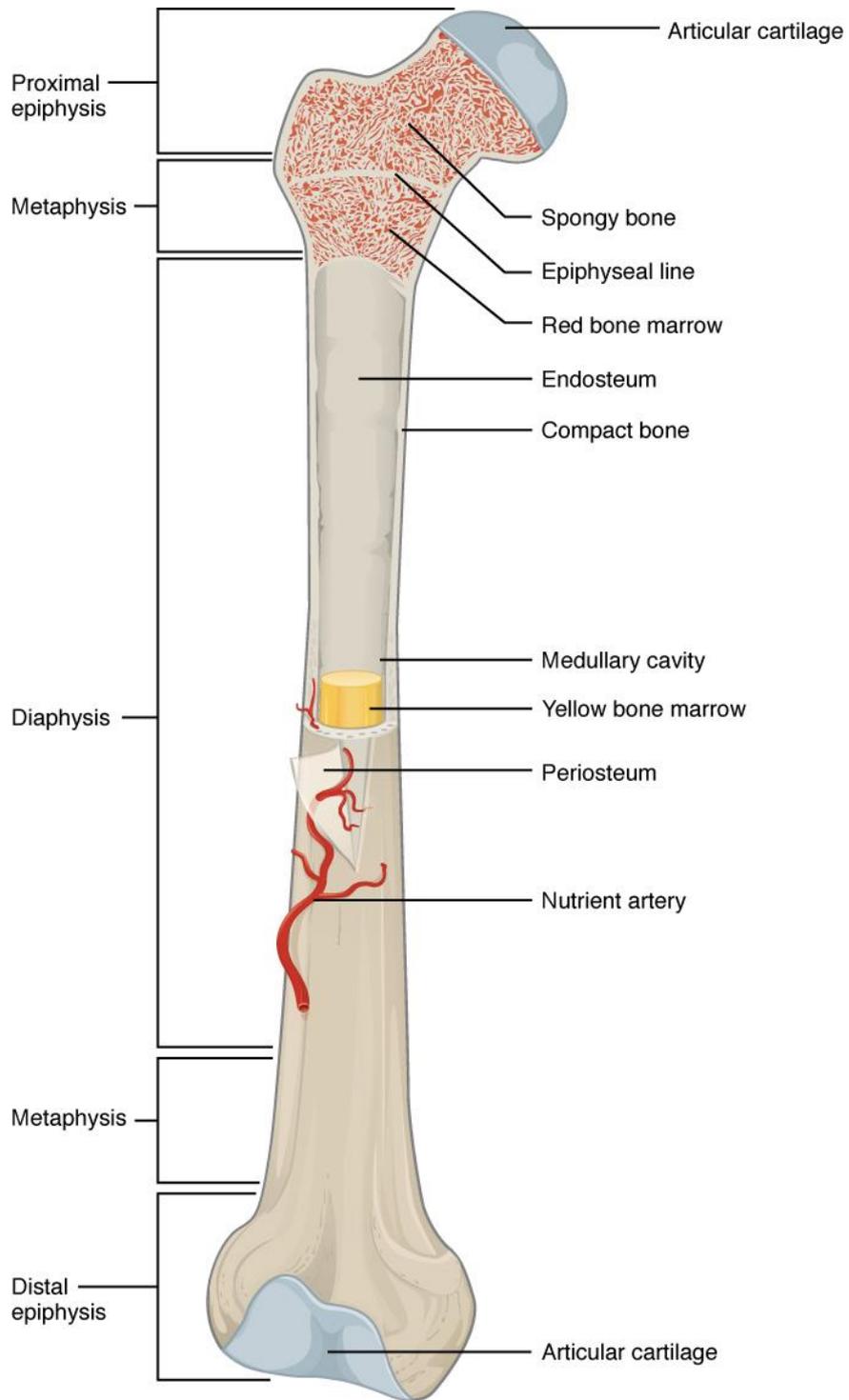
**Marrow Cavity** – The centre of the bone shaft is hollow and known as the Medullary Cavity. This contains both red and yellow bone marrow. Yellow bone marrow is mainly fatty tissue, while the red bone marrow is where the majority of blood cells are produced. This is found in higher proportions in the flat and irregular bones. With regular exercise, this process speeds up. More blood cells allow oxygen to be carried throughout the body.

**Compact Bone** – Forms the hard external layer of all bones and surrounds the medullary cavity, or bone marrow. It provides protection and strength to bones and consists of tightly stacked layers of bone which appear to form a solid section. This becomes thicker as we exercise which means we are better protected against impact injuries.

**Periosteum** – If you cut a cross-section through a bone, you would first come across a thin layer of dense connective tissue known as the Periosteum. It consists of two layers, an outer ‘fibrous layer’ containing mainly fibroblasts, and an inner ‘cambium layer’ containing progenitor cells. The progenitor cells develop into osteoblasts (the cells responsible for bone formation). The periosteum provides a good blood supply to the bone and a point for muscular attachment. It lay down bone cells which allows the bone to grow width. With exercise this process is increased so our bones are thicker and stronger.

**Endosteum** – a delicate membranous lining found inside the medullary cavity. It repairs, remodel and permits bone growth.

# Structure of a Bone



### **Activity**

1. Draw and label a structure of the long bone.
2. Explain in your own words the difference between the endosteum and the periosteum
3. Give a description of the spongy bone.
4. Where are cartilages located?
5. Explain a function of the cartilage.