

Connective tissue

Connective tissue typically consists mostly of fibers and ground substance, with widely separated cells.. The mesenchyme is a form of embryonic connective tissue. The connective tissues present after birth fall into three broad categories: *fibrous connective tissues*, *supportive connective tissues* (cartilage and bone), and *fluid connective tissue*(blood).

It consists of **cells**, **fibers**, and extra cellular substance called **matrix**. The extra cellular matrix consists of Connective tissues fluid, ground substance within which are embedded the different protein fibers (collagen, reticular, and elastic),and **the most common cells in the C.T** are the active fibroblast and in active fibroblast (**fibrocytes**), **Chondroblasts** , **chondrocytes**, **Osteoblasts & osteocytes**, **Adipose cells**, **Macrophages** ,**Mast cells**, **Plasma cells** , **leukocytes**.

The functions of connective tissue include the following:

1. **Binding of organs.** Tendons bind muscle to bone
2. **Support.** Bones support the body
3. **Physical protection.** The cranium, ribs, and sternum protect delicate organs such as the brain
4. **Immune protection.** Connective tissue cells attack foreign invaders, and connective tissue fiber forms a “battlefield” under the skin and mucous membranes
5. **Movement.** Bones provide the lever system for body movement
6. **Storage.** Fat is the body’s major energy reserve
7. **Heat production.** Brown fat generates heat in infants and children.
8. **Transport.** Blood transports gases

Fibers Three types of protein fibers are found in fibrous connective tissues:

- **Collagenous fibers.** These fibers, made of collagen, are tough and flexible and resist stretching
- **Reticular fibers.** These are thin collagen fibers coated with glycoprotein. They form a sponge like frame work for such organs as the spleen and lymph nodes.
- **Elastic fibers.** These are thinner than collagenous fibers

Ground Substance Amid the cells and fibers in some tissue sections, there appears to be a lot of empty space.

TYPE OF CONNECTIVE TISSUE

A) Fibrous (proper) Connective Tissue

Fibrous connective tissue is divided into two broad categories according to the relative abundance of fiber:

1. *Loose*

In loose connective tissue, much of the space is occupied by ground substance, which is dissolved out of the tissue during histological fixation and leaves empty space in prepared tissue sections. The loose connective tissues we will discuss are *areolar* , *reticular*, and *adipose* tissue.

2. *dense connective tissue.*

In dense connective tissue, fiber occupies more space than the cells and ground substance, and appears closely packed in tissue sections. The two dense connective tissues we will discuss are dense **regular** and dense **irregular** connective tissue

B) specialized C.T include :

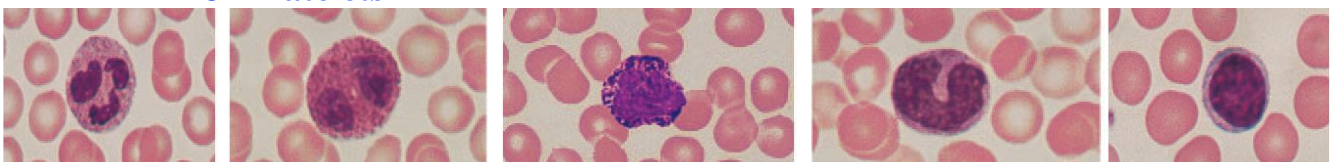
Vascular C.T (Hematopoietic (Lymphatic and myeloid))

1. **W.B.C include (1) Granular** such as
A-Neutrophil
B-Eosinophil
C-Basophil

- (2) a Granular such as :
*monocytes
*lymphocyte

2. **R.B.C**

3. **Platelets**



Blood

Blood is unlike other types of connective tissue in that the matrix (i.e., plasma) is not made by the cells.

Functions of Blood

The functions of blood fall into three categories: transport, defense, and regulation.

1. Transport

Blood moves from the heart to all the various organs, where exchange with tissues takes place across thin capillary walls. Blood picks up oxygen from the lungs and nutrients from the digestive tract and transports these to the tissues. It also picks up and transports cellular wastes, including carbon dioxide, away from the tissues to exchange surfaces, such as the lungs and kidneys. We will see that capillary exchanges keep the composition of tissue fluid within normal limits.

2. Defense

Blood defends the body against invasion by **pathogens** (microscopic infectious agents, such as bacteria and viruses) in several ways. When an injury occurs, blood forms a clot, and this prevents blood loss.

3. Regulation

Blood helps regulate body temperature by picking up heat, mostly from active muscles, and transporting it about the body, blood plays a role in helping to maintain its own water-salt balance.

Plasma

Plasma is the liquid portion of blood, and about 92% of plasma is water. The remaining 8% of plasma is composed of various salts (ions) and organic molecules.

Table 11.1 Blood Plasma Solutes

Plasma proteins	Albumin, globulins, fibrinogen
Inorganic ions (salts)	Na^+ , Ca^{2+} , K^+ , Mg^{2+} , Cl^- , HCO_3^- , HPO_4^{2-} , SO_4^{2-}
Gases	O_2 , CO_2
Organic nutrients	Glucose, fats, phospholipids, amino acids, etc.
Nitrogenous waste products	Urea, ammonia, uric acid
Regulatory substances	Hormones, enzymes

C) supporting C.T (skeletal C.T.) include :

1. **Bone**
2. **Cartilage**

In **cartilage**, the cells (*chondrocytes*), which lie in small chambers called **lacunae**, are separated by a matrix that is solid yet flexible

The three types of cartilage are

classified according to the type of fiber in the matrix.

1. **Hyaline cartilage** is the most common type of cartilage. The matrix, which contains only very fine collagenous fibers, has a glassy, white, opaque appearance.
2. **Elastic cartilage** has a matrix containing many elastic fibers, in addition to collagenous fibers. For this reason, elastic cartilage is more flexible than hyaline cartilage
3. **Fibrocartilage** has a matrix containing strong collagenous fibers.

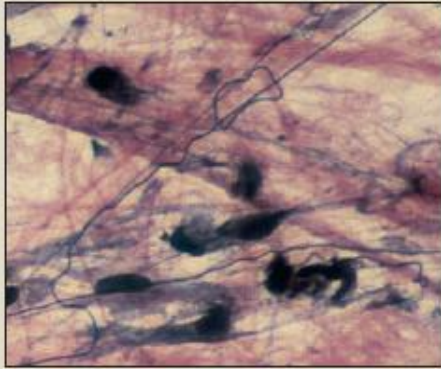
Bone

Bone is the most rigid of the connective tissues. It has an extremely hard matrix of mineral salts, notably calcium salts, deposited around protein fibers. The minerals give bone rigidity, and the protein fibers provide elasticity and strength,

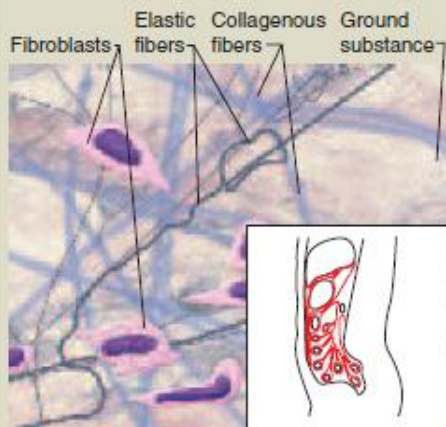
- *Compact Bone*
- *Spongy Bone*

Table 5.4 Loose Connective Tissues

Areolar Tissue

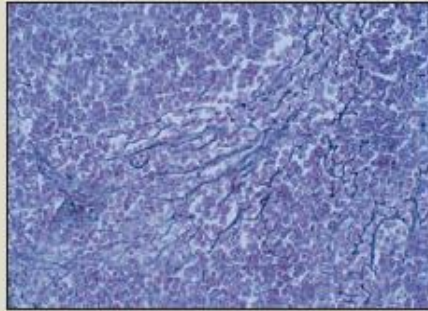


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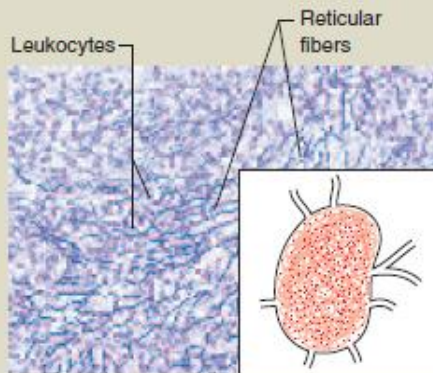


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Reticular Tissue

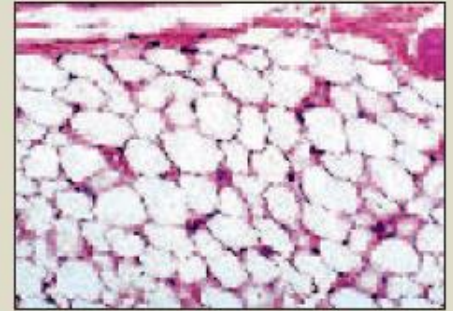


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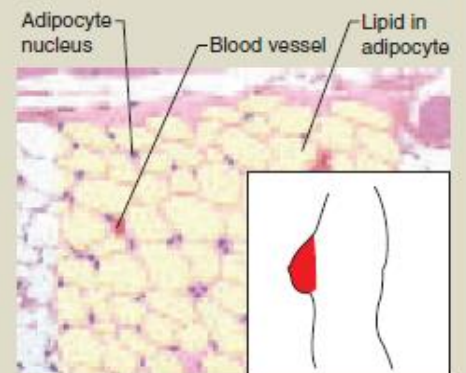


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Adipose Tissue



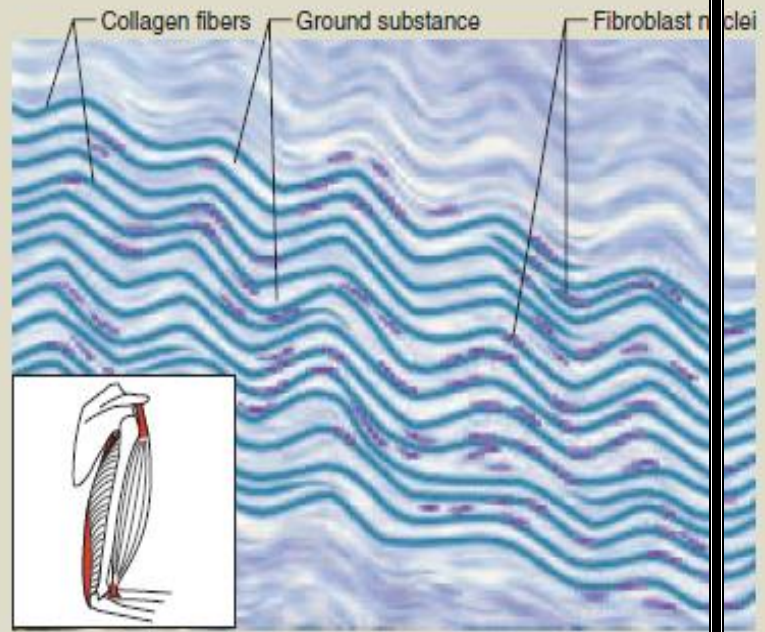
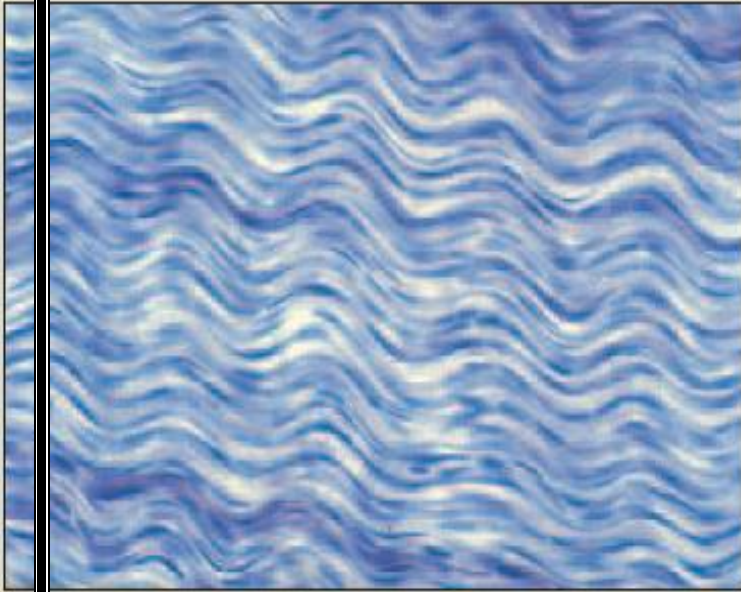
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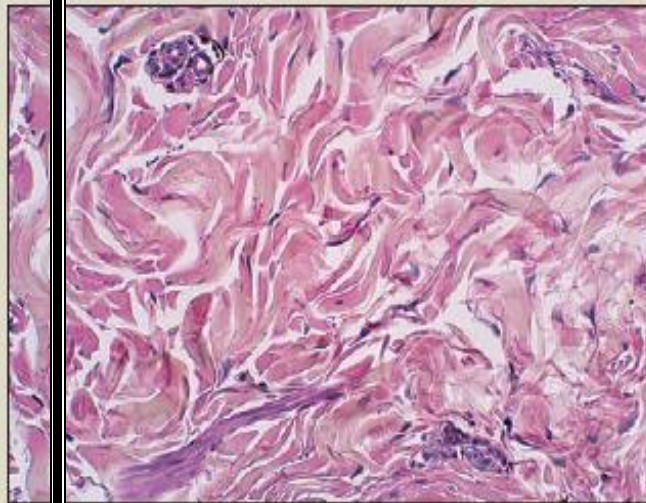
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Table 5.5 Dense Connective Tissues

Dense Regular Connective Tissue



Dense Irregular Connective Tissue



- Bundles of collagen fibers
- Gland ducts
- Fibroblast nuclei
- Ground substance

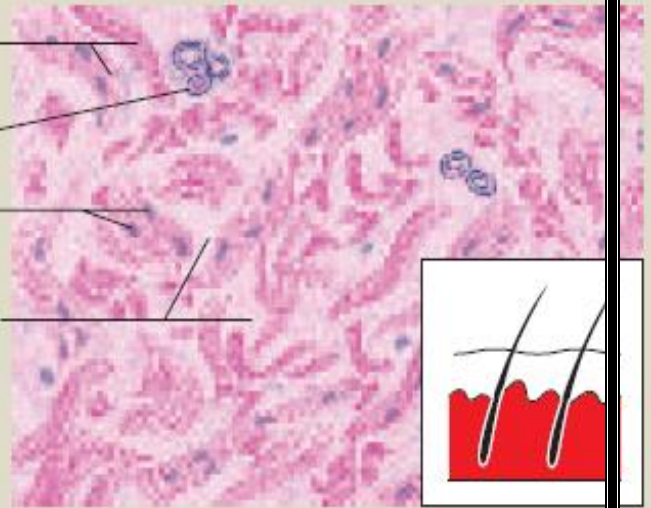


Table 5.6 Types of Cartilage

Hyaline Cartilage

Elastic Cartilage

Fibrocartilage

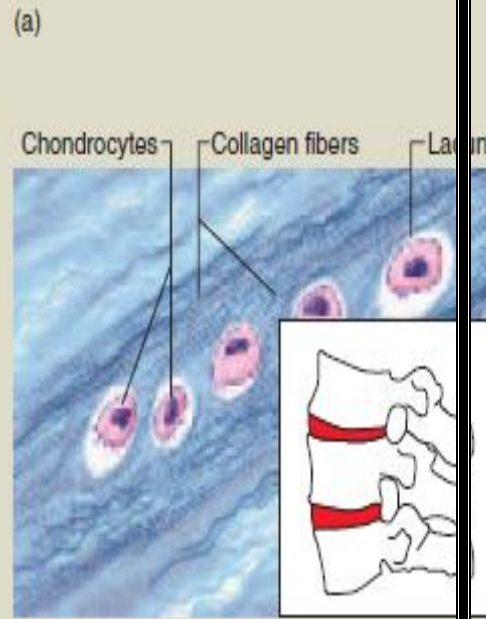
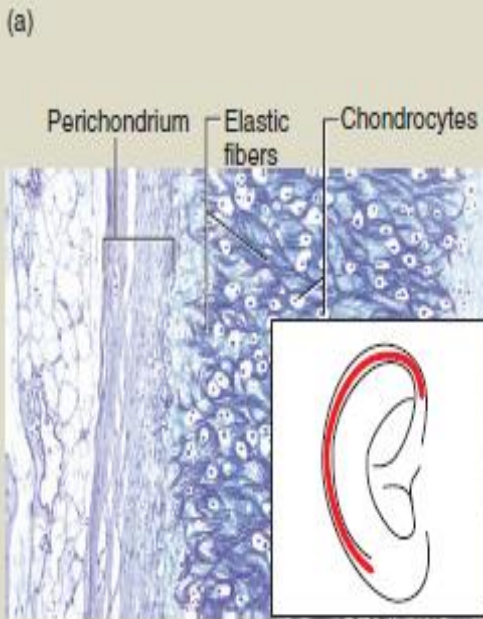
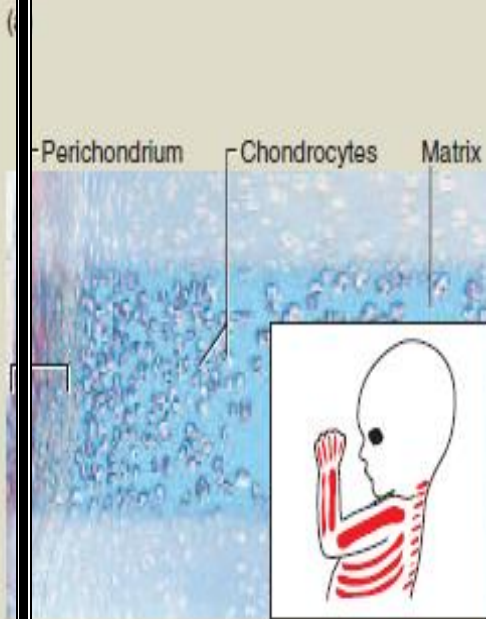
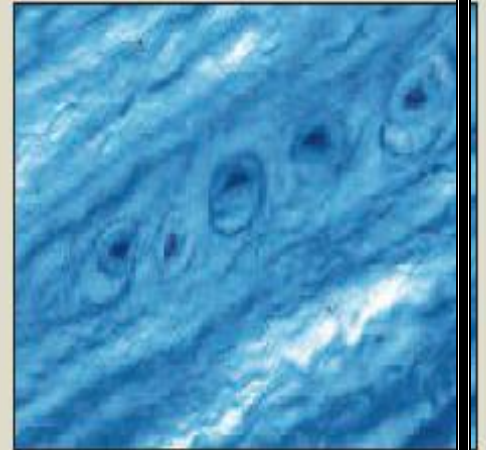
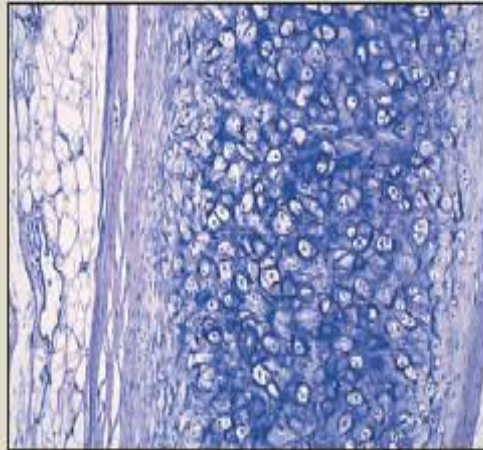


Table 5.7 Bone

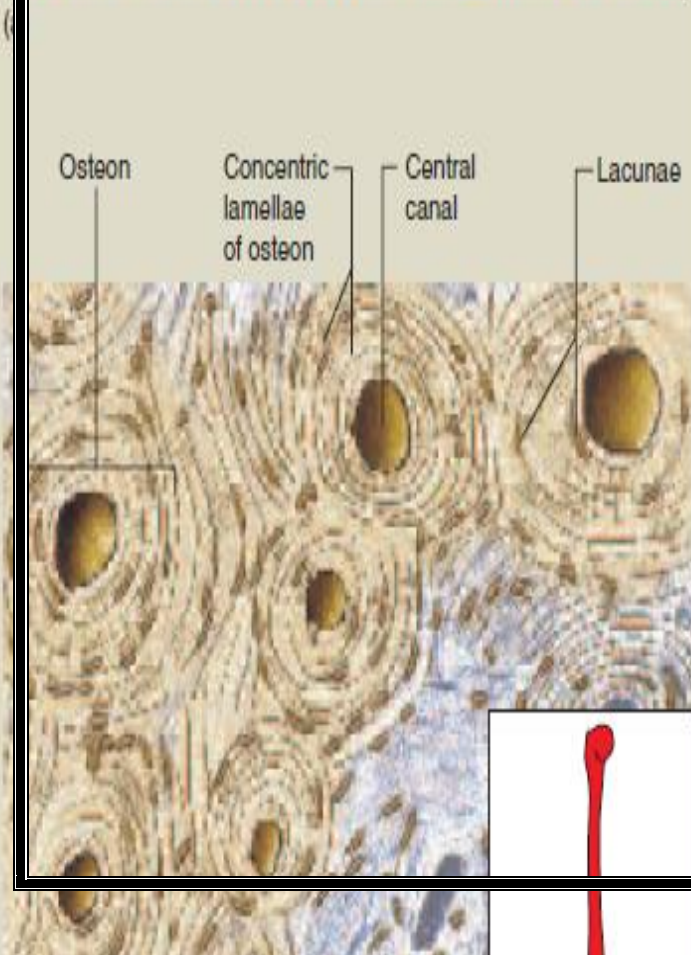
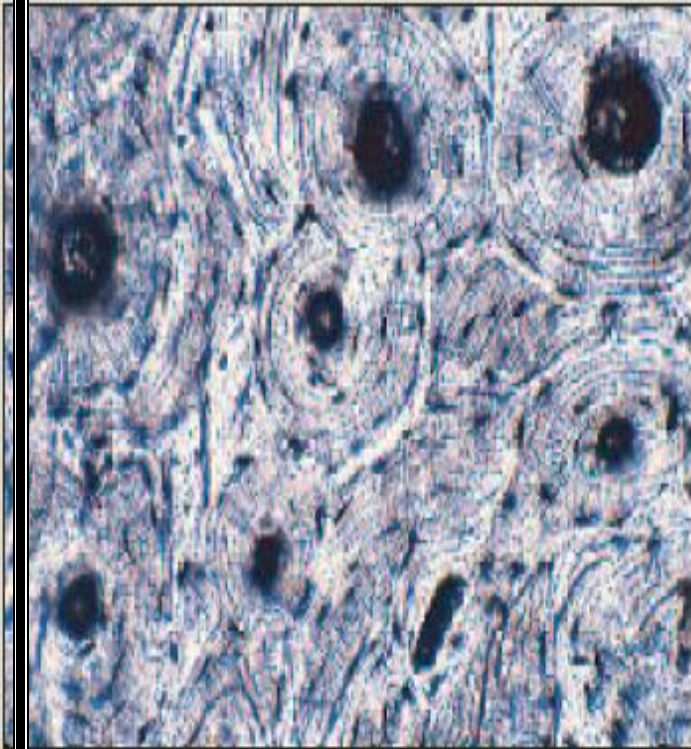


Table 5.8 Blood

