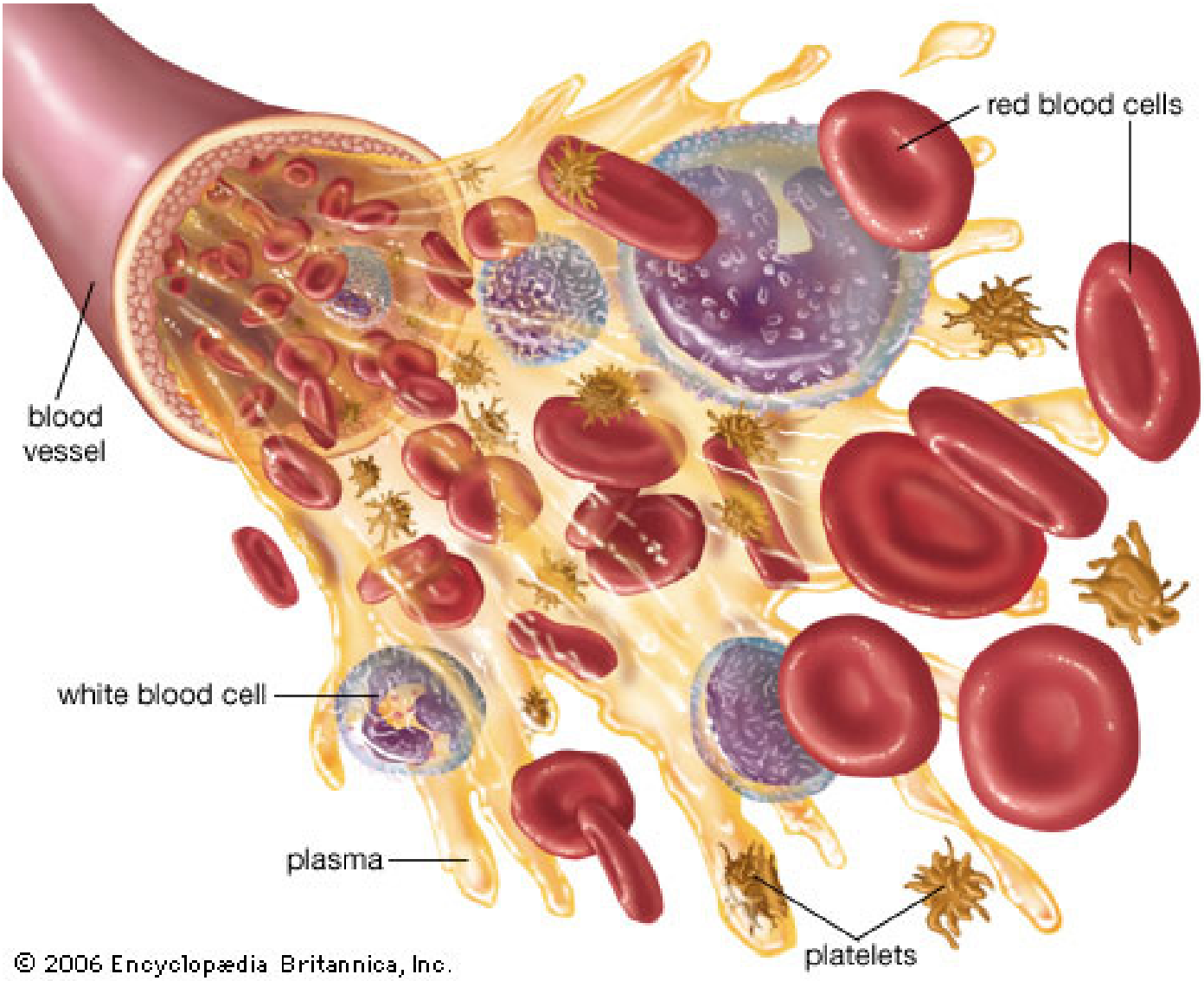
Histology Licture (8) Blood:
Slide (1):



*Is special type of the connective tissue.

*The ground substance is fluid in consistency instead of the jelly like ground substance.

Histology Licture (8) Blood:
Slide (2):
Connective Tissue:
-C.T. proper:

-C.T. constituents:
->Cells: few, widely separated.
->fibers are present in the ground substance.
Fibers: A-Collagen Fibers (Most Common). B-Elastic Fibers. C-Reticular Fibers.
->Intercellular substance: abundant Jelly like ground substance :
Because of:
-Glucose Amino Glycans.
-Proteglycans.
-Adhesive Glycoproteins.
-Tissue Fluid.
->Blood vessels: rich
->Origin: mesodermal
->Function: support, defence and nutrition
1- Loose C.T.
-Adipose C.T.
-Reticular C.T.
- Mucoid C.T.
2-Dense C.T. (Regular (Dense C.T and white fibrous connective tiisue) / Irregular)

-Modified C.T.:

->Hard = bone
->Firm= Cartilage
->Fluid nature= Blood
->Modified type of CTMesodermal in origin
->Considered modified connective tissue because it contains:
-cells
-a liquid ground substance (called plasma)
-dissolved protein fibers. ---> (Normal Condition)
In the normal condition the fiber is dissolved (Fibringen), if an injury happen the fibringen turns into “FIBRIN THREAD”.
-In the normal condition the fibers are not aberrant.

Histology Licture (8) Blood:
Slide (3):

-Blood makes up 6–8% of our
total body weight.

-Normal adult blood volume is 5-6 L.
-In closed circulation = CVS
-Blood is made up of cellular
material in a fluid called plasma.

->Blood is responsible for.....
1-Transporting gases (O2 & CO2).
-Transports the O2 from the lung to the tissues. Then, returns the CO2 to the lung to get rid of it.
2-Transporting waste products .
3-Transporting nutrients.
4-Helping remove toxins from the body.

Histology Licture (8) Blood:
Slide (4):

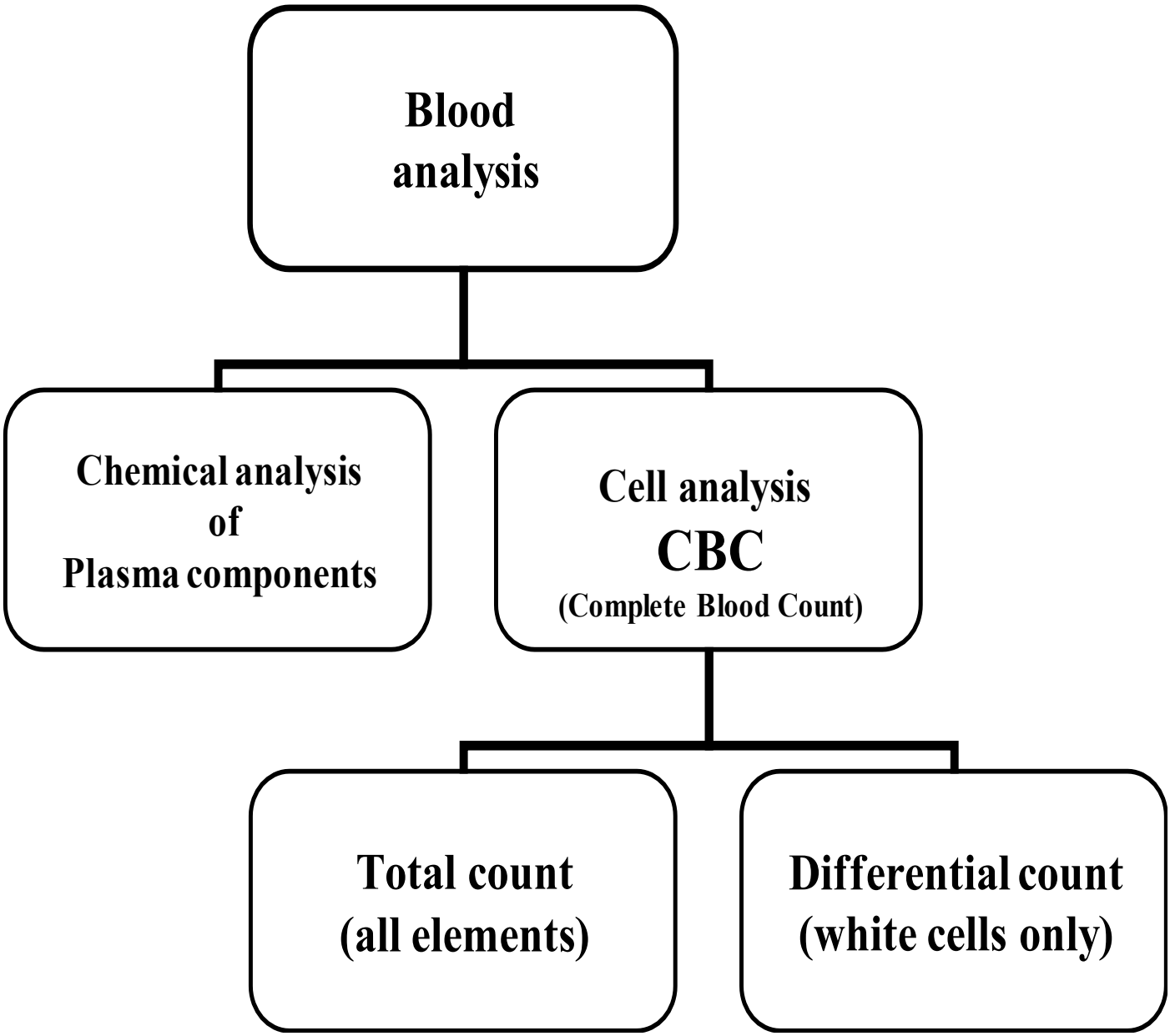
-Blood:

-Consists of liquid and cellular components by a machine called a centrifuge.
-Formed Blood elements
-Cells : 45%
I- 99% RBC. II-Buffy Coat--> 1-WBC (leukocytes). 2-Platelets.
Originate in the red bone marrow
-Plasma: 55%

-No aberrant fibers.

1. Withdraw blood into a syringe and place in a glass tube.
2. Place the tube into a centrifuge and spin for about 10 minutes.
3. Components of blood separate during centrifugation to reveal plasma, buffy coat, and erythrocytes.

Histology Licture (8) Blood:
Slide (5):



-Count the subtype of the WBC and know The percent of each Sub-type of WBC compared to the total percent of WBC

Histology Licture (8) Blood: Slide (6):

-The blood is made up of cells that are suspended in liquid called plasma.

-Plasma makes up 55% of the blood.

-Plasma is made of 90% water and 10% proteins, lipids, carbohydrates, amino acids, antibodies, hormones, electrolytes, waste, salts, and ions

-Blood cells make up the remaining 45% of the blood.

-Red blood cells make up 99% of the blood cells.

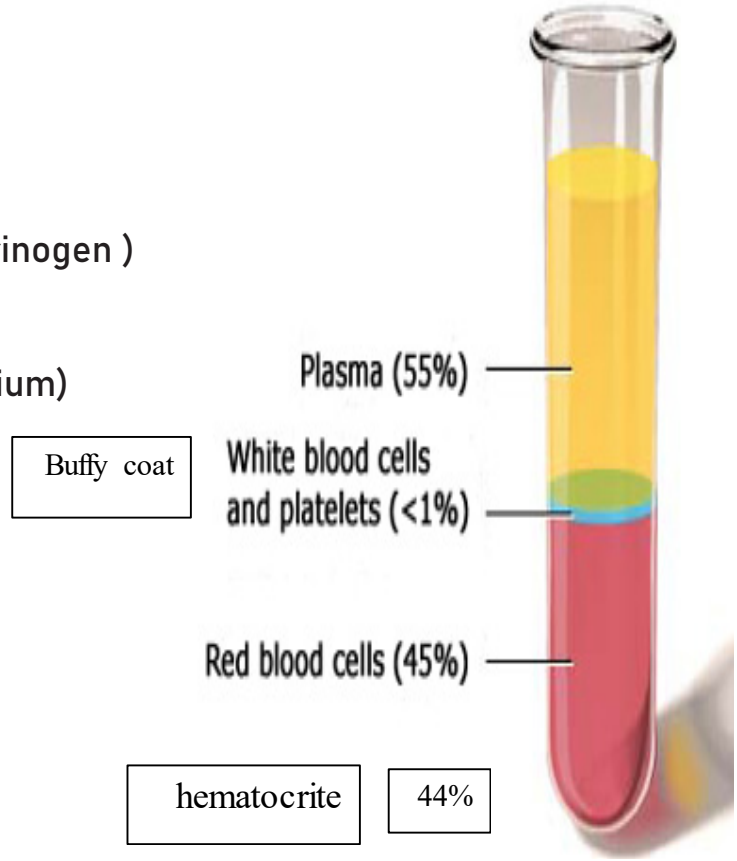
-White blood cells and platelets make up the other 1%.

Histology Licture (8) Blood: Slide (7):

55% of blood volume:

-Water 92%.
-organic substances:7 %

->plasma proteins
(albumin, globulin, prothrombin and fibrinogen)
->Hormones & enzymes.
-inorganic salts 1%
(NaCl, Bicarbonates, phosphates & calcium)



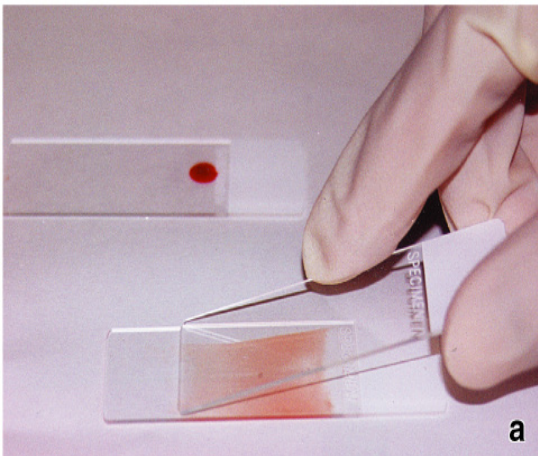
Histology Licture (8) Blood:
Slide (8):

The Blood Film= Smear

Preparation of blood for laboratory study

-Why do we do a blood film ?
1.To study blood elements.
2.To make differential leucocytic count.

Steps :
-Put a small drop of blood
-Spread into a thin film
-Stain with Leishman or Giemsa stain
 (methylene blue +eosin)



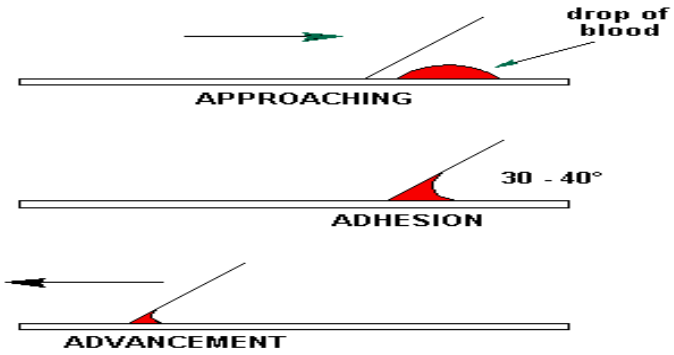
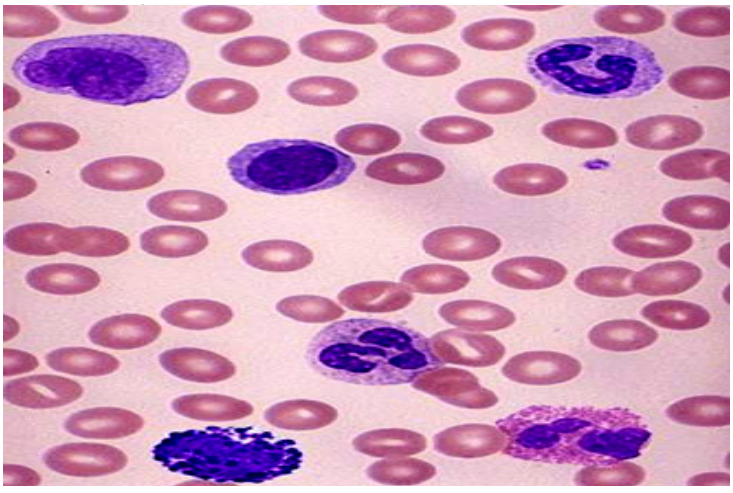
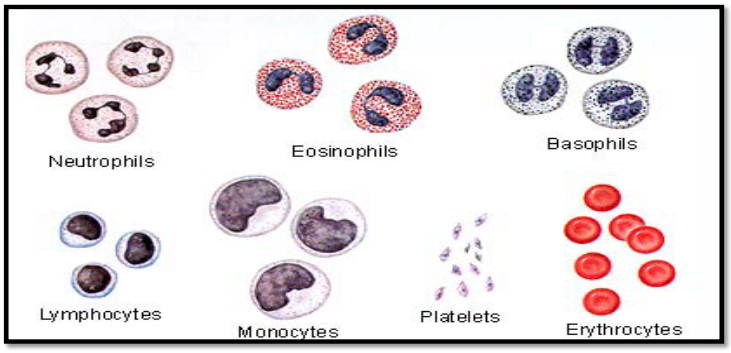


Fig. 7 - How to prepare a blood smear

Histology Licture (8) Blood:
Slide (9):

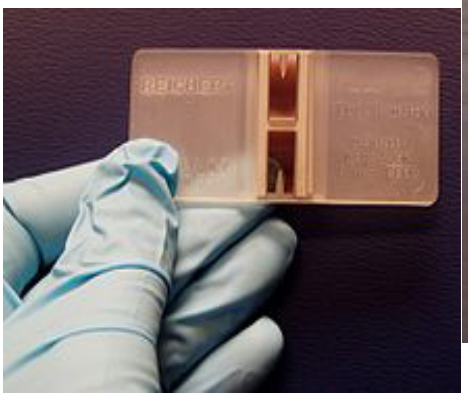


The Blood Film
Stains of blood film
Giemsa's / Leishman's
= methylene blue + eosin
->basophilic (violet)
->eosinophilic (pink)
->azurophilic (red purple)
-Platelets-> Biconvex + No nucleus.
-Erythrocytes-> Biconcave + No nucleus.
-WBC-> Rounded + have nuclei (all types)



Histology Licture (8) Blood: Slide (10):

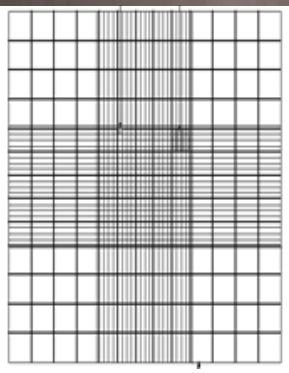
Blood Cell Count = CBC
->Manual method= Conventional =hemocytometer= counting chamber.



->Electronic method
= automated hematology analyzer.

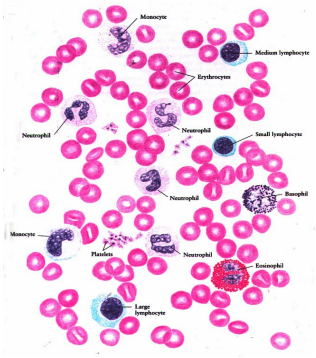
->RBC count 4.5-5 million/mm3 in female

->Total leukocytic count 4,000-11,000/mm3



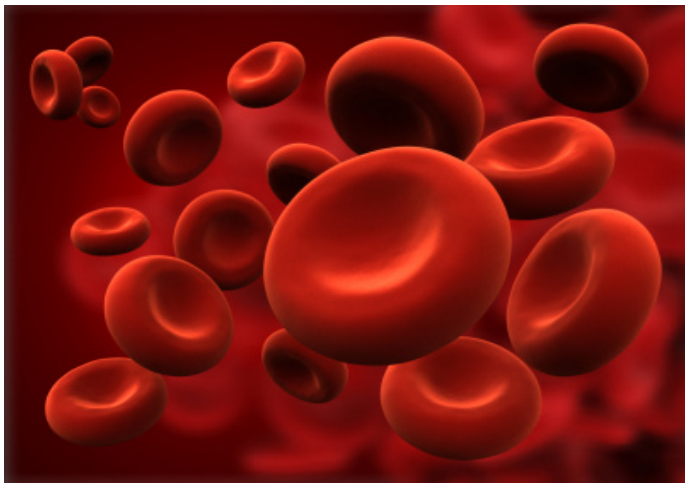
->Platelet count 250,000- 350,000/mm3

->Differential leukocytic count
=Examination of blood film
-Each subtype has its percentage compared to the total number of WBC



Histology Licture (8) Blood:
Slide (11):

Red Blood corpuscles =Erythro/cytes
Blood cell:
1-Total or Differential count
2-Shape & size
3-Structure (nucleus + granules)
4-Function
5-Life span
6-Abnormalities



Histology Licture (8) Blood:
Slide (12):

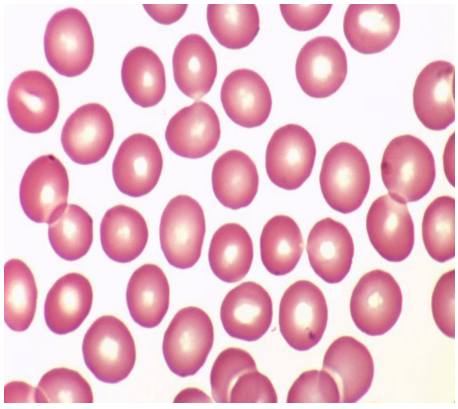
Red Blood corpuscles Erythrocytes

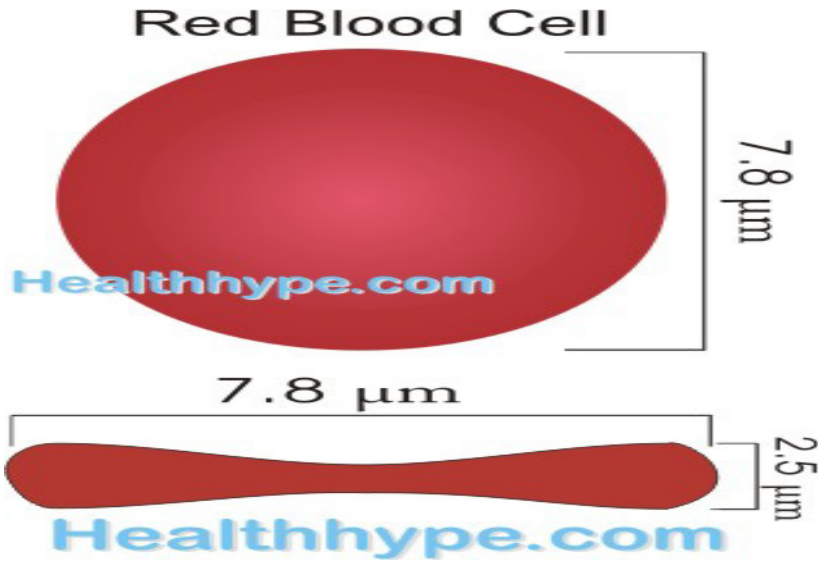
Normal RBCs total count:

-In males -> 5- 5.5 millions / mm3 blood
-in females -> 4.5-5 millions / mm3 blood

LM of RBCs:

->Shape: - Biconcave discs.
Mature RBCs are membrane- bound corpuscle. (Bag filled with hemoglobin)
->Size:
-Diameter 7.5 µm
-Thickness 1 µm
->Nucleus:Anucleate. No nucleus.
->Cytoplasm 33% of the corpuscular volume is Hemoglobin = heme "Fe"+ Globin 'protein'





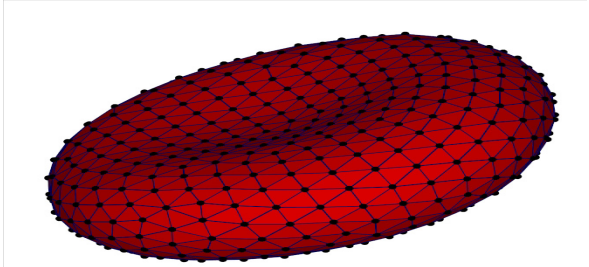
Histology Licture (8) Blood:

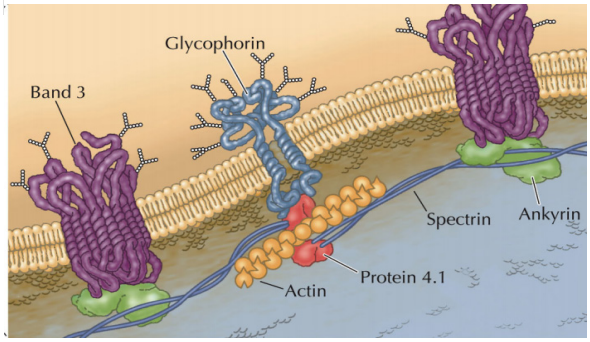
Slide (13):

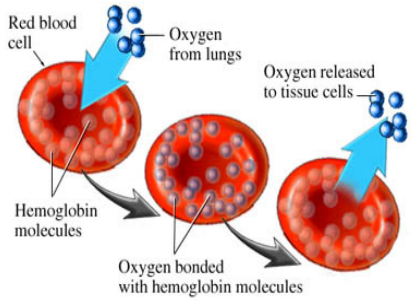
-RBC has organelles when it was immature.
While maturation the cell extrude the organelles outside the cell to fill the cyto-plasm with hemoglobin and keeps a few mitochondria -> energy.

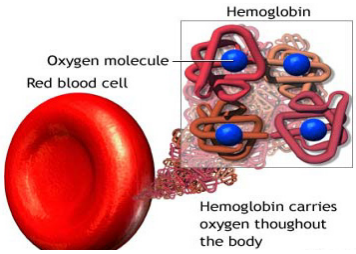
EM picture of RBCs:

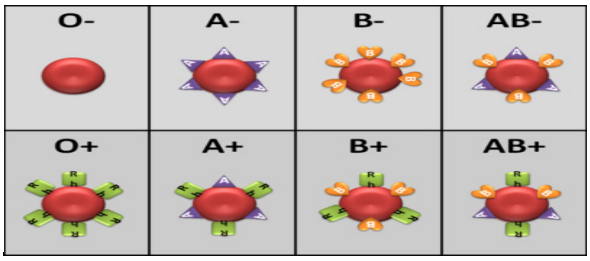
-No nucleus, No typical organelles.
-Only few mitochondria
-subplasmalemmal cytoskeleton (actin, spectrin & ankyrin) responsible for the flexibility of RBCs. (To change it's shape when it passes through.
Capillary that is smaller than the cell size.
-Glycocalyx (Well developed cell coat) responsible for the ABO/ Rh blood group.
-Function of RBCs
Carry O2& CO2





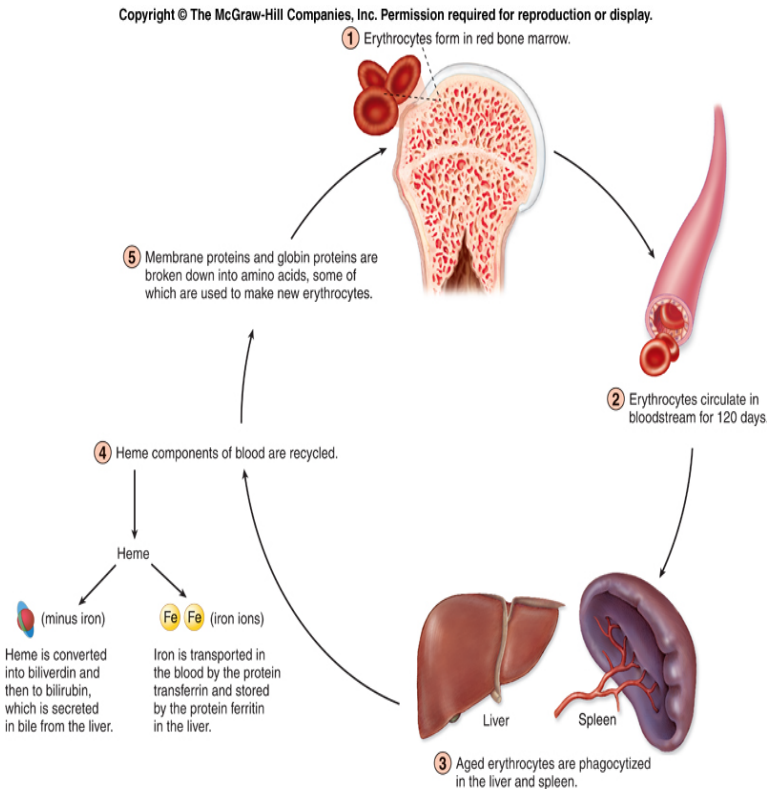




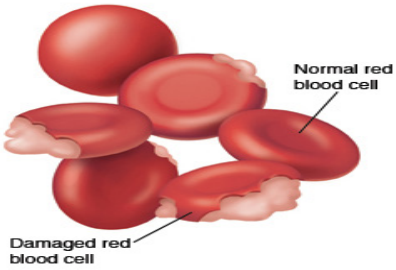


Histology Licture (8) Blood:
Slide (14):

2- life span:
-100-120 days
-Then removed by Macrophages of spleen and liver sinusoids.
-Through phagocytosis then the (iron) is used by the bone marrow to produce new RBC.



Adaptation to function
1- surface area.
2- amount of HB
(no nucleus/ organelles)
3- HB at the periphery
4- selective permeability (Take O2 and Reduce CO2)
5- carbonic anhydrase
6- flexibility to squeeze without damage
7- Glycocalyx (Well developed cell coat)



Histology Licture (8) Blood:
Slide (15):

Abnormalities of RBCs

Abnormalities of RBCs in number

-Anaemia:
decrease in the total number of RBCs.
-Polycythaemia:
increase in the total number of RBCs.
Causes: (decreased oxygen tension)
Physiological: newborns ,high altitude (Few O2 which leads to an increase in the number of RBC.)
Pathological: chronic lung and heart diseases.

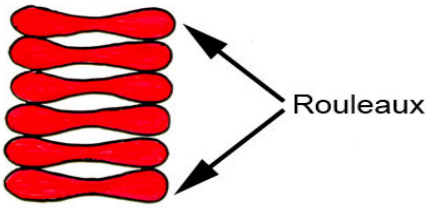
Abnormalities of RBCs in size

-Microcytosis:
diameter of RBCs is less than 6μm. (Microcytic anaemia)
-Macrocytosis:
diameter of RBCs is more than 9μm. (Macrocytic anaemia)
-Anisocytosis?? Variable size

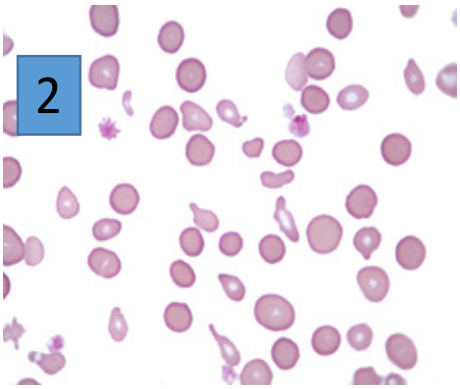
Histology Licture (8) Blood:
Slide (16):

Abnormalities of RBCs in shape

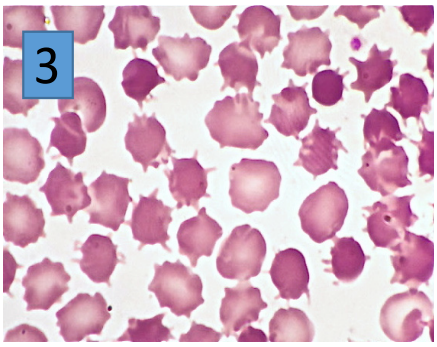
1- Rouleaux formation
In slow circulation
(Stagnation)



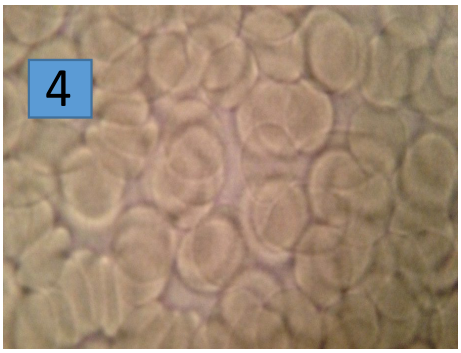
2- Poikilocytosis
Variable in shape



3- In hypertonic solution
echinocytes(crenation)
(Shrinkage).

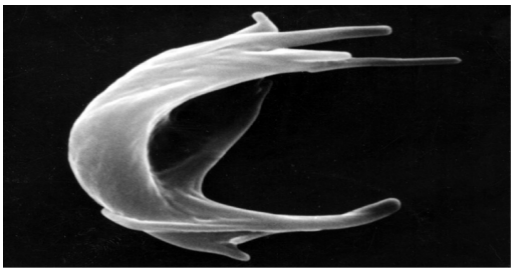


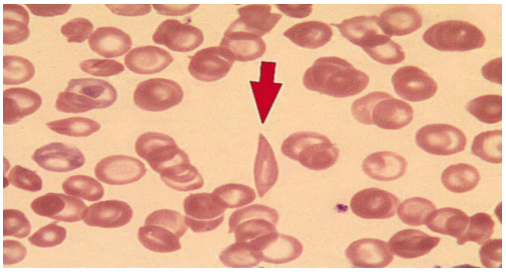
4- In hypotonic solution
Ghosts
(Rupture).

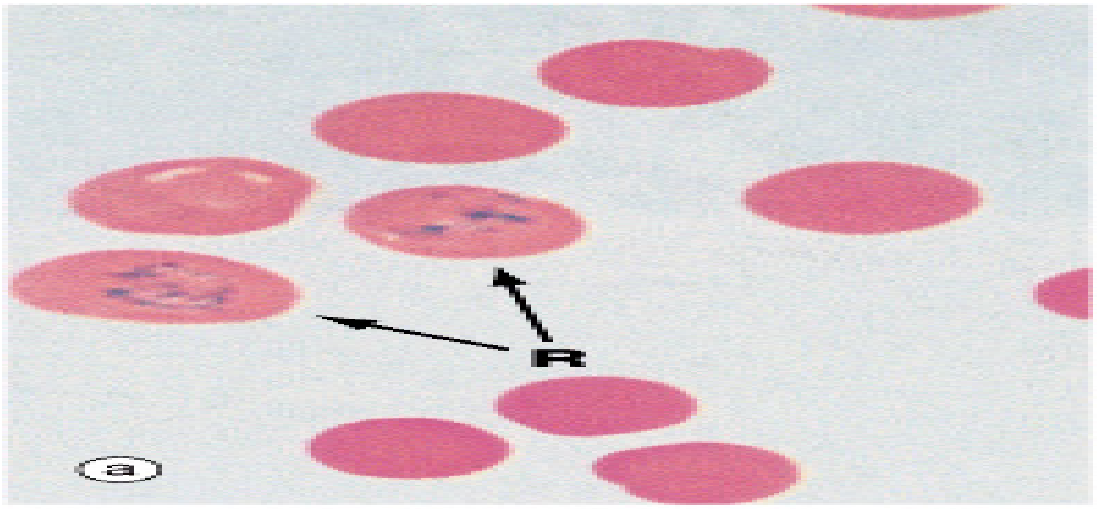


Histology Licture (8) Blood:
Slide (17):

- **Sickle Cell Anemia (abnormal Hemoglobin)**



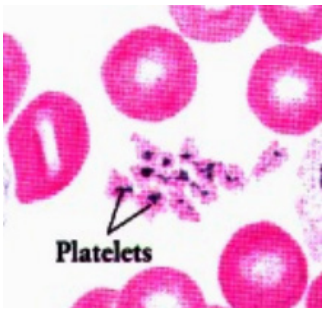


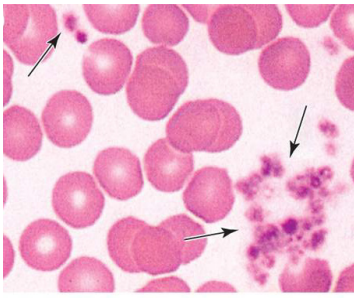


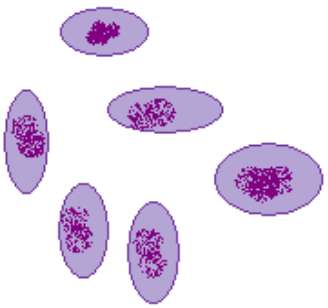
Reticulocytes
->immature RBCs
->Reticulocytes represent 1% of all RBCs in normal blood film.
->Nucleated
->differ than mature RBCs
-slightly larger (8μm).
-Cytoplasm contains remnants of ribosomes.
-On staining with cresyl blue form a reticulate pattern.
->Clinical significance:
An increase in this percentage (reticulocytosis) indicates an
-accelerated rate of erythropoiesis (Formation of the RBC). and produce immature RBC.
-compensate for anemia or hemorrhage.

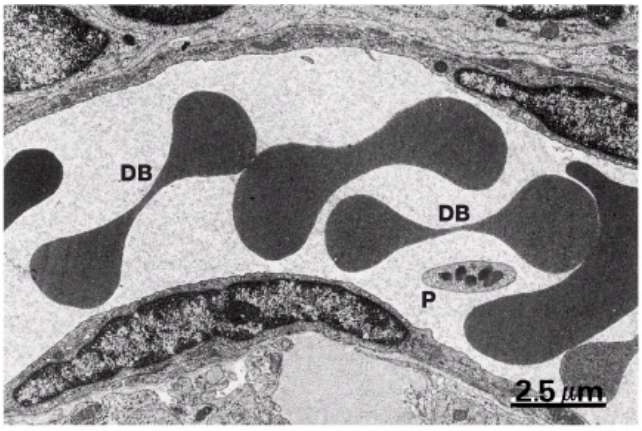
Histology Licture (8) Blood:
Slide (18):
BLOOD PLATELETS
->Cell fragments of megakaryocyte.
-Note: The fragmenation happens to the process of megakaryocyte (not the cell itself) produce the platelets.
->Thrombocytes.
->Thromboplastids
->Origin: from megakaryocyte in the bone marrow.
-Normal Platelet Count
250,000-350,000/ mm3
200-400,000
->Structure (L. M) :
-Non-nucleated bodies,
-2-4microns,central granular portion (granulomere) &peripheral clear zone (hyalomere)
-->LM picture
->Shape: Anucleate, biconvex discs.
->Diameter :2-3 μm.

Histology Licture (8) Blood:
Slide (19):
BLOOD PLATELETS
->LM picture
-Granulomere,granular central region
(Dark)
-Hyalomere at the periphery, there is a pale basophilic zone
(Light)









Histology Licture (8) Blood:
Slide (20):

❖**EM:**

➢**Shape:**

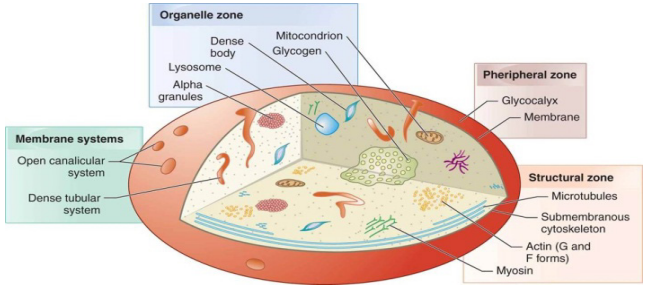
- **Irregular.**
- **Pseudopodia.**

➢**Platelet membrane:**

▲▲glycoprotein coat for:

- **Adhesion**
- **Aggregation**
- **Hyalomere & granulome**

-Well developed cell coat.



➢ Granulomere

few mitochondria & ribosomes.

➢scattered glycogen particles.

➢3 types of granules:

➢ Alpha (α)granules:

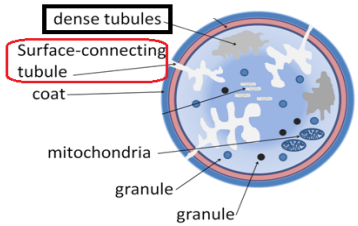
- Large.
- Abundant.
- PD-GF, **coagulation factors.**

➢ Delta granules:

- Medium (size, no.)
- **ATP, ADP, serotonin.**

➢ Lambda(λ) granules:

hydrolytic enzymes.



• Hyalomere

- Electron- lucent.
- Lacks organelles.
- It contains:

➢ **circumferential bundle of 10-15 microtubules ► ► discoid shape**

➢ **Actin & myosin ► ► motility + clot retraction** → -Contraction for movement.

➢ **Canalicular system + tubular system.** (Secreting the contens outside the cell wall.

Thrombus Formation

-Platelet de-rived-growth factor

(Dissolve the Clot and the thrombus disappear.

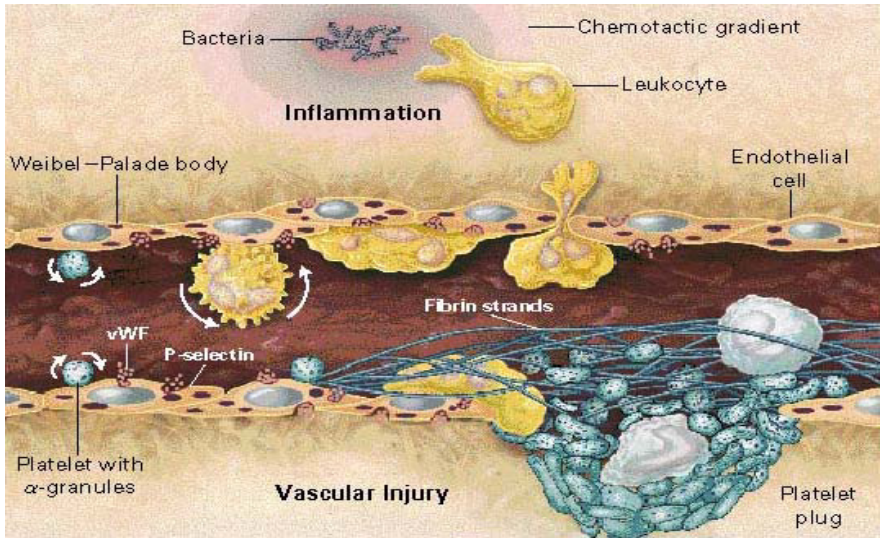
Note: The Actin & Myosin help the RBC to move to the location of bleeding to make thrombus, then the Hydrolytic enzyme dissolve the clot after the clot retraction.

PLATELET FUNCTION

At sites of injury of BVs:

- Platelet adhesion
- Platelet aggregation
- Thrombus formation
- Clot retraction
- Clot removal
- **Functions of platelets**
- Platelet aggregation-→white thrombus
- Local blood coagulation-→red thrombus
- Serotonin → Vaso-constristriction
- **Clot retraction** → by microfilaments

Clot removal→ by **hydrolytic enzymes.**



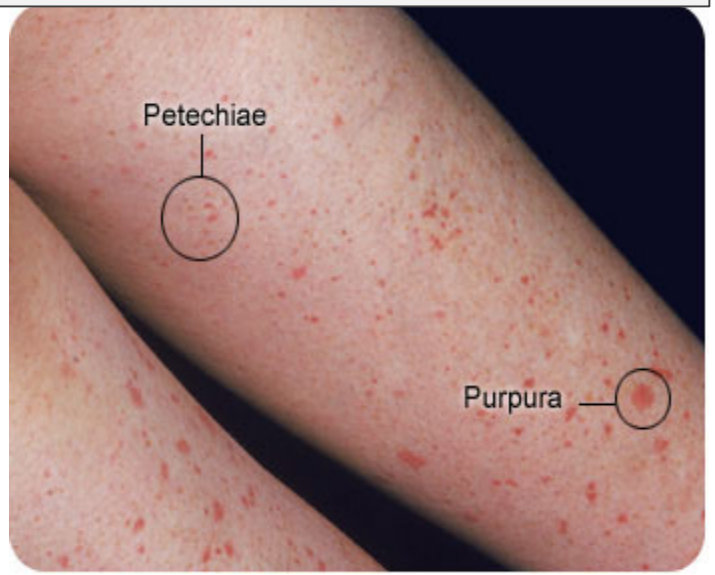
PLATELET ABNORMALITY

- **Thrombocytopenia** ▼ ▼ ▼

-The number decrease.

Thrombocytopenia (purpura)

(Bleeding) or Ecchymosis



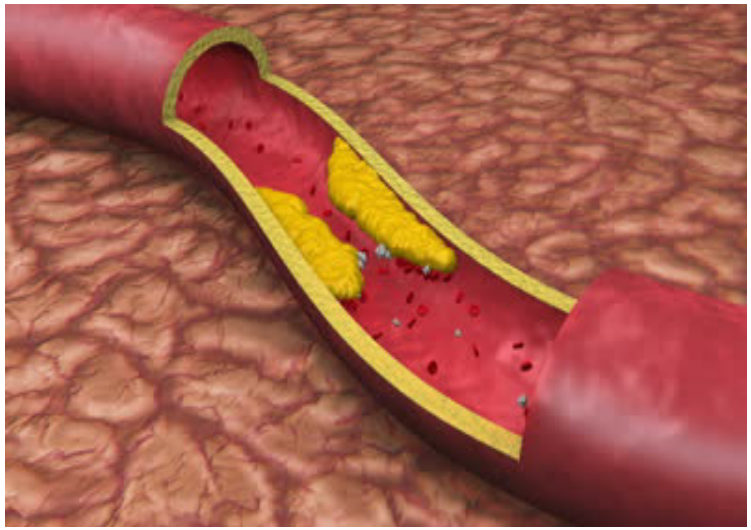
- **Thrombocythemia** ▲ ▲ ▲

-The number increase.

- **Thrombasthenia**

(Thrombosis) / Clot Formation

Leads to: Stroke/ Vein Thrombosis



Histology Licture (8) Blood:
Slide (23):

Histology Licture (8) Blood:
Slide (24):

	RBCs Red blood corpuscle Erythrocytes – Greek: "Red	Platelets Thrombocytes Thromboplastides
Number	*males* is 5 - 5.5 millions / mm^3 *females* it is 4.5-5 millions / mm^3 blood.	250,000-350,000/mm^3
Size	7.5-8.5 um Macrocytes > 9 µm, Microcytes < 6 µm Anisocytosis = variation in size	3µm 2-5 µm diameter
Shape	biconcave disc	Biconvex
Structure	no nuclei& other organelles Bag of Haemoglobin	Fragments of megakaryocyte Non-nucleated
Life span	100-120 days..	Life span around 8-12 days
Function	Carry O2 & Co2	- the process of thrombus formation (blood clotting) in response to any vascular endothelial injury to prevent excessive blood loss. - clot retraction and removal of the blood clot after healing of the vessel wall to re-establish the flow of the blood.
Abnormality	Polycythaemia: i.e. increase in the total number of R.B.Cs. Anaemia: i.e. decrease in the total number of R.B.Cs. Sickle Cell Anemia	INCREASE → Thrombosis Decrease → Bleeding