FACULTY OF ENGINEERING &TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY

BLOOD

Blood is a special type of fluid connective tissue derived from mesoderm.

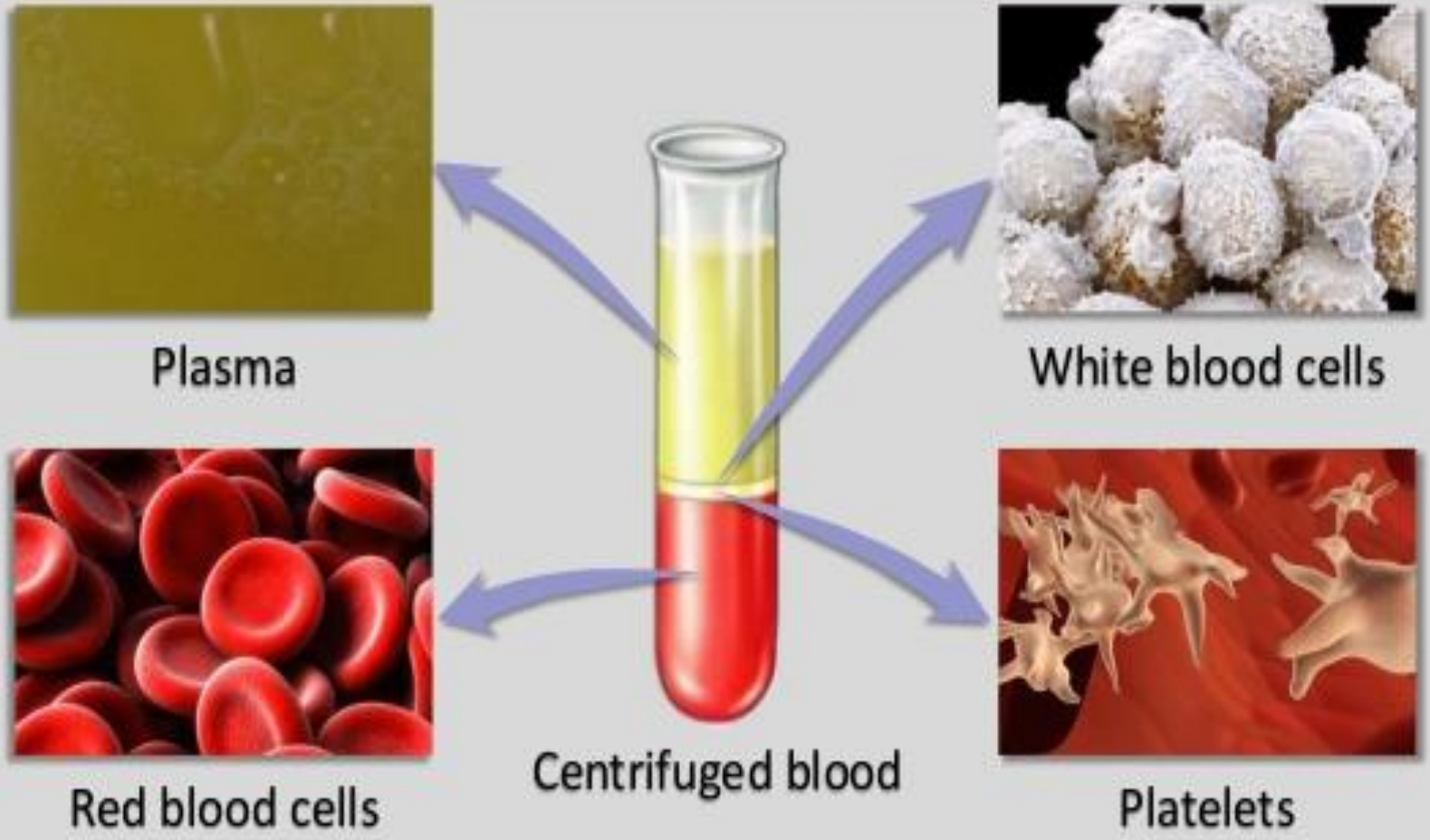
The branch of science concerned with the study of blood, blood-forming tissues, and the disorders associated with them is called **haematology.**

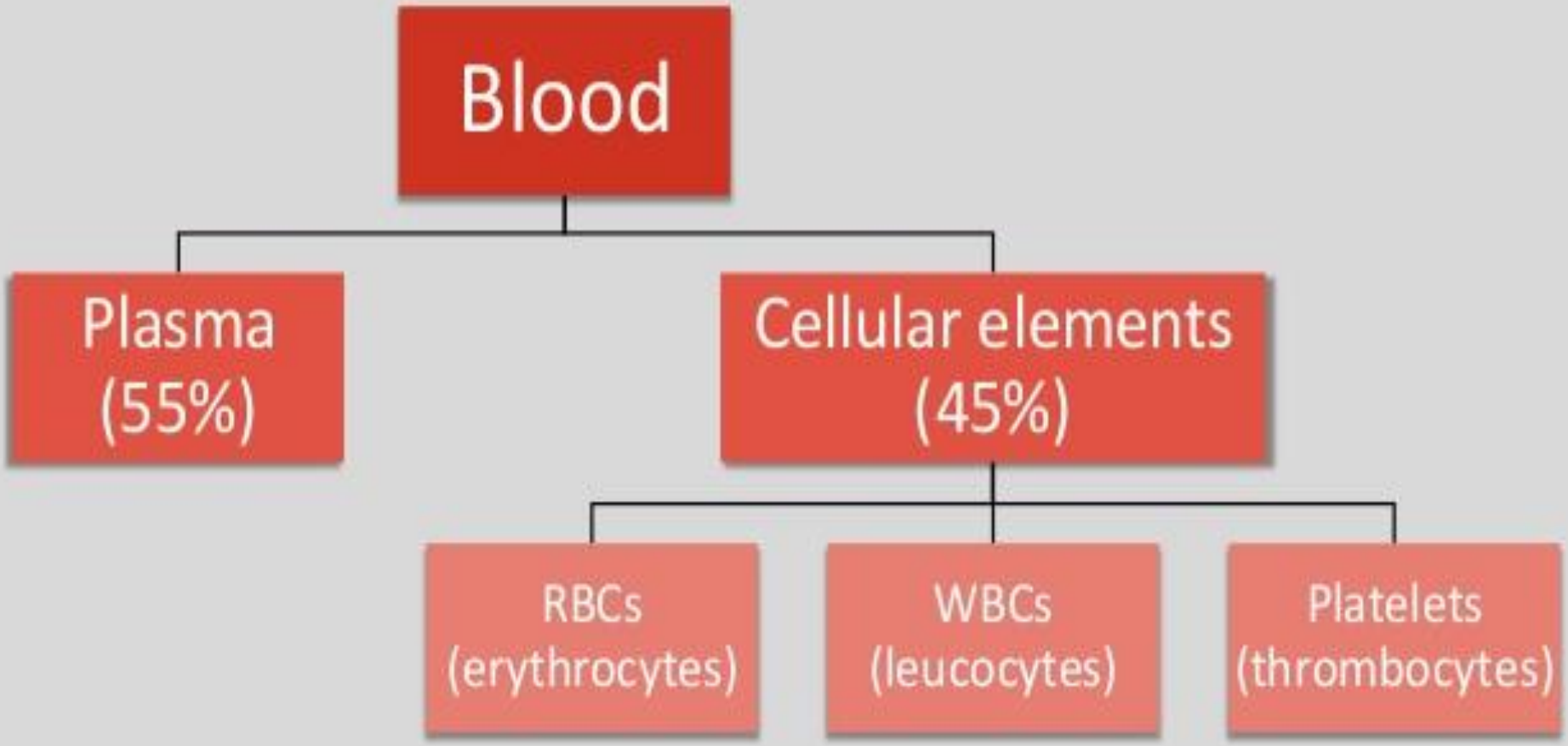
(Gk: *haeme* – blood and *logos* - study)

PROPERTIES OF BLOOD

Colour	Bright red in arteries & dark red in veins
Mass	8 % of the body mass
pH	Slightly alkaline (pH = 7.35 – 7.45)
Taste	Salty
Temperature	38° C (100.4° F)
Viscosity	3 – 4 times more viscous than water
Volume	5 – 6 litre

COMPOSITION OF BLOOD

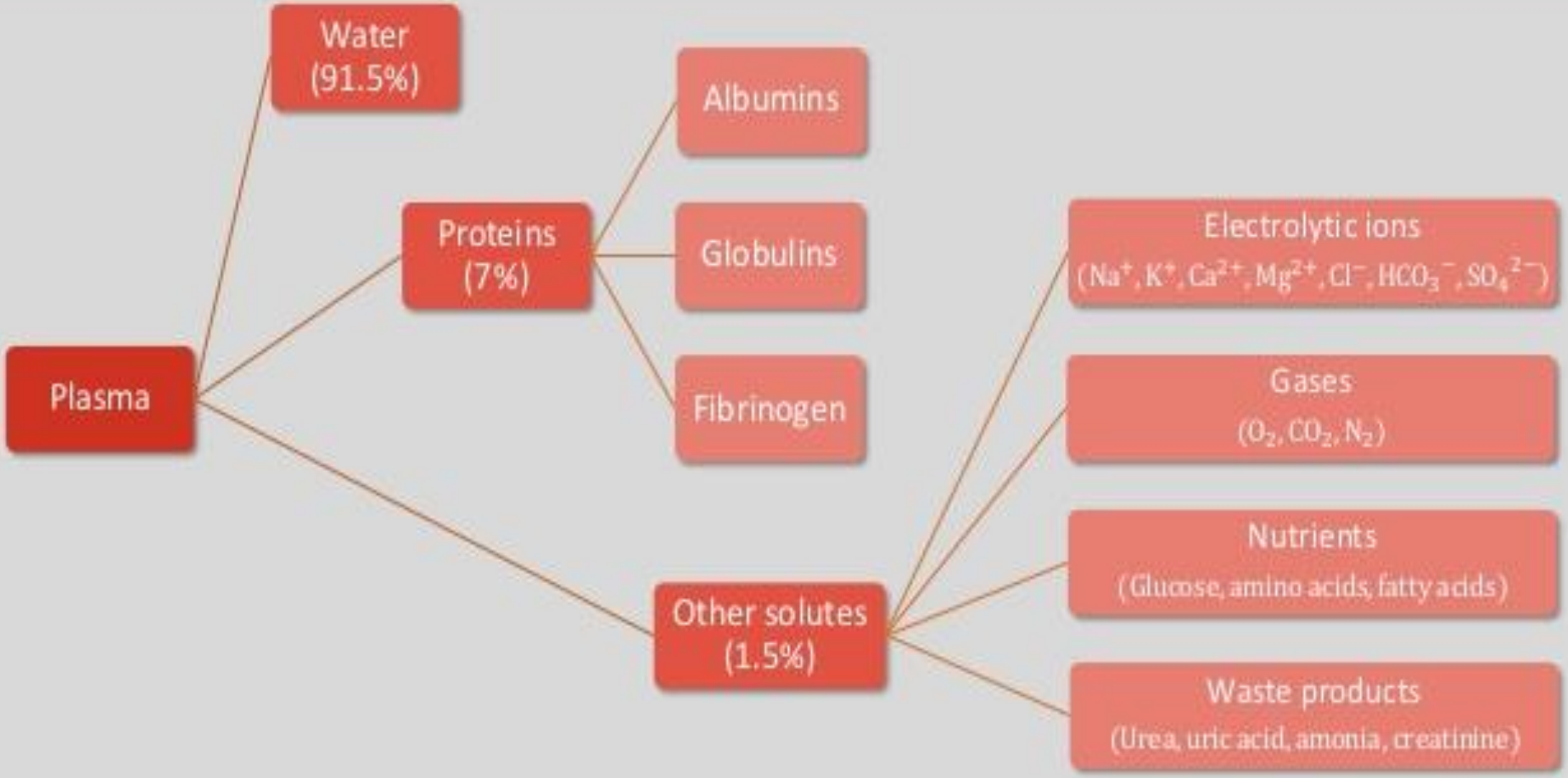



Blood
Plasma (55%)
Cellular elements (45%)
RBCs (erythrocytes)
WBCs (leucocytes)
Platelets (thrombocytes)

Plasma

Plasma is a pale yellow coloured liquid component of a blood that holds the cellular elements of blood in suspension.

Constituents of plasma



Functions of plasma

Constituent	Function
Water	Absorbs, transports and releases heat
Albumins	Osmotic balance
Globulins	Defense mechanism
Fibrinogen	Blood clotting
Electrolytic ions	pH buffering

Red blood cells

Shape	Circular biconcave non-nucleated
Size	Diameter = 7 – 8 µm Thickness = 2.5 µm
Colour	Red (haemoglobin pigment)
Count	Adult male = 5.4 million RBCs/µL Adult female = 4.8 million RBCs/µL
Life span	120 days

Erythropoiesis

The production of RBCs is known as erythropoiesis.

Adult	Red bone marrow of long bones (hip bone, breast bone & ribs)
Child (upto 5 year)	Bone marrow of all the bones
Foetus	Liver & spleen

- Increase in number of RBCs is known as polycythemia
- Decrease in number of RBCs is known as erythropenia

Functions of RBCs

- Transport O_2 from lungs to tissues
- Transport CO_2 from tissues to lungs

- Normal blood contains 13 – 15 g of Hb per 100 ml of blood
- One RBC contains about 250 million molecules of Hb
- Each molecule of Hb carries four molecules of oxygen

White blood cells

Shape	Amoeboid nucleated
Size	12 – 15 µm
Colour	Colourless & translucent
Count	5000 – 10000 WBCs/µL
Life span	10 – 13 days

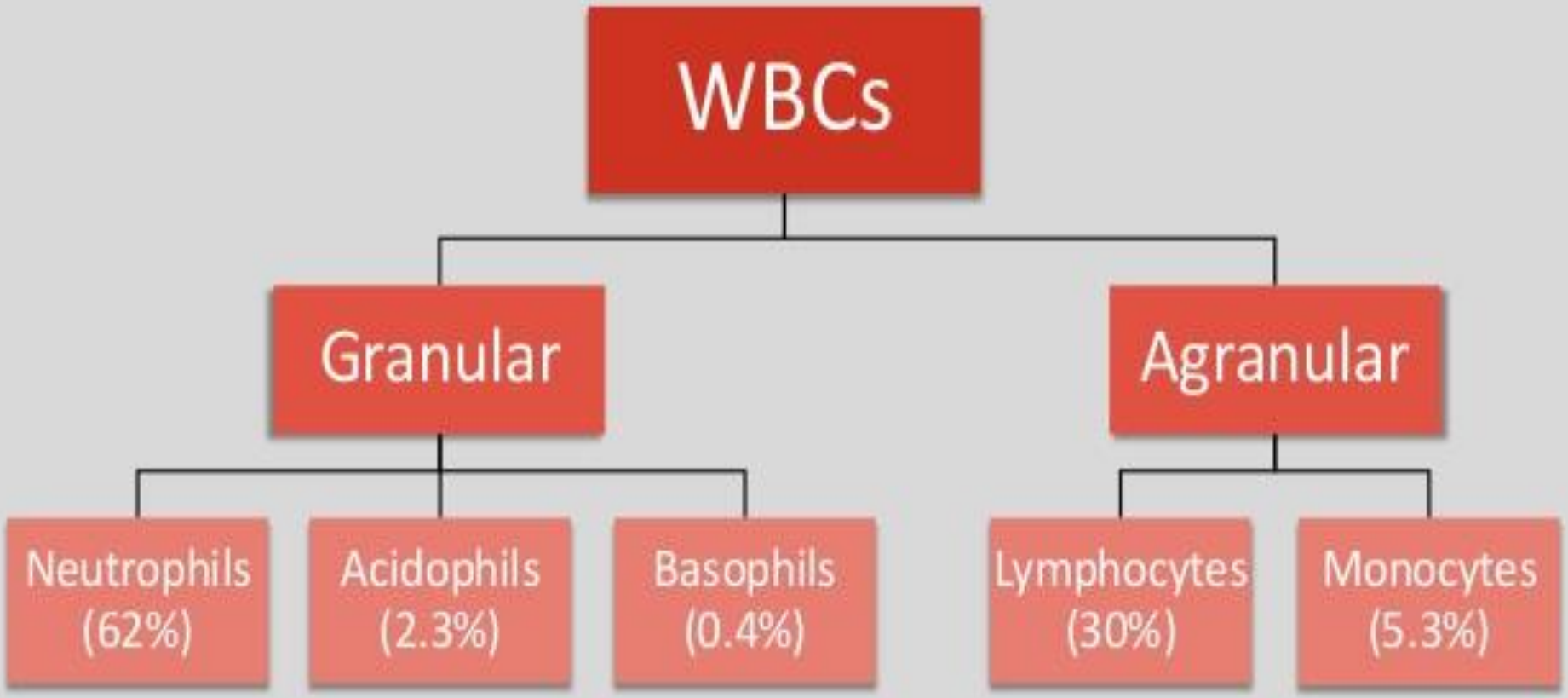
Leucopoiesis

The production of WBCs is known as leucopoiesis.

Adult	Liver, spleen, tonsils, bone marrow
Foetus	Liver, spleen

- Increase in number of WBCs is known as **leucocytosis**
- Decrease in number of WBCs is known as **leucopenia**
- Pathological increase in number of WBCs is known as leukemia (blood cancer)

Types of WBCs



Granular WBCs

Type	Appearance	Features	Functions	Location produced
Neutrophils		• Nucleus with 3-4 lobes • Stain with neutral dye (hematoxylin)	Destroy bacteria by phagocytosis	Bone marrow
Acidophils (eosinophils)		• Nucleus with 2 lobes • Stain with acidic dye (eosin)	Combat the effect of histamine in allergic reactions	Bone marrow
Basophils		• Nucleus with indistinct lobes • Stain with basic dye (methylene blue)	Liberate heparin and histamine in allergic reactions to intensify inflammatory response	Bone marrow

Agranular WBCs

Type	Appearance	Features	Functions	Location produced
Lymphocyte		• Smallest of WBCs • Large round nucleus	Produce antibodies	Bone marrow, spleen, tonsils
Monocyte		• Largest of WBCs • Large kidney shaped nucleus	Ingest microorganisms	Bone marrow

Platelets

Shape	Circular biconvex non-nucleated
Size	2 – 4 µm
Count	1,50,000 – 4,00,000 platelets/µL
Life span	5 – 9 days
Function	Blood clotting

Thrombopoiesis

The production of platelets is known as thrombopoiesis.

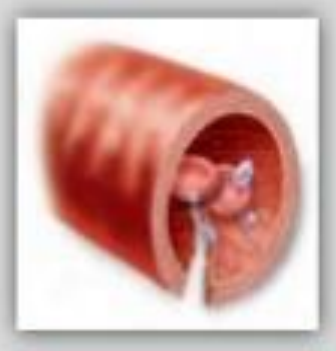
Platelets are the fragments of large cells called megakaryocytes that remain in the bone marrow.

- Increase in number of platelets is known as thrombocytosis
- Decrease in number of platelets is known as thrombocytopenia

Blood clotting

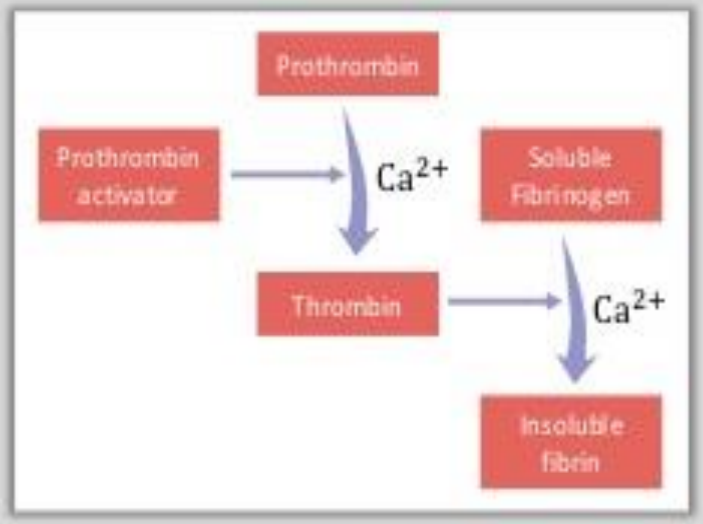
Blood clotting is the process in which blood looses its fluidity and becomes a jelly like mass few minutes after it is shed out.

Process of blood clotting



1. Blood vessel is punctured

2. Platelets form a plug



3. Platelets & damaged tissue cells release prothrombin activator, which initiates a cascade of enzymatic reactions

4. Fibrin thread forms & trap red blood cells

Anticoagulant

A substance which prevents the coagulation of blood is called as anticoagulant.

Heparin is a natural anticoagulant present in the blood.

- If blood clots too easily, the result can be **thrombosis –** clotting in an undamaged blood vessel.
- If the blood takes too long to clot, **haemorrhage** can occur.