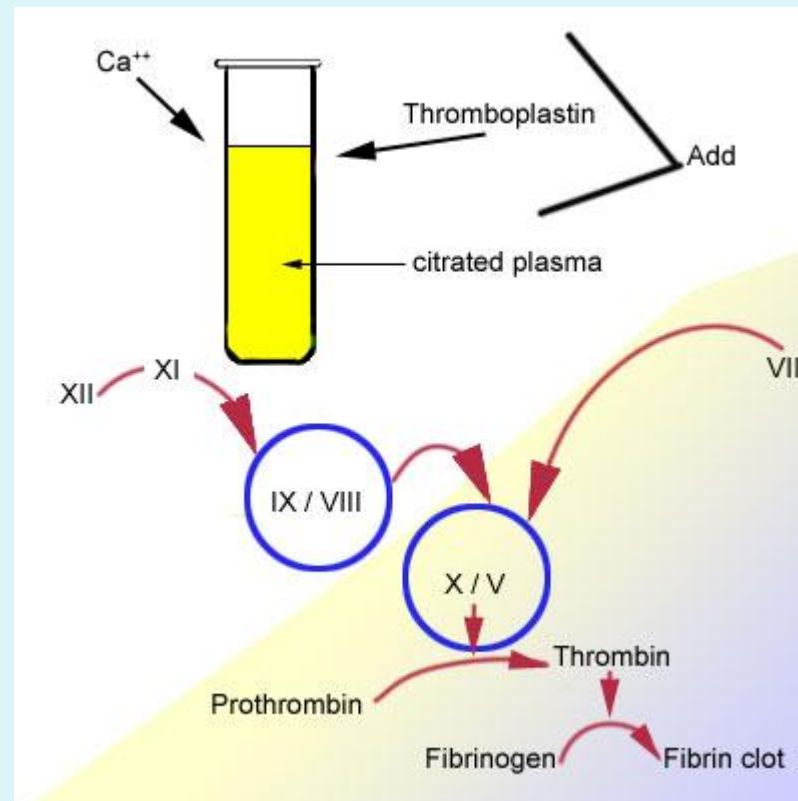
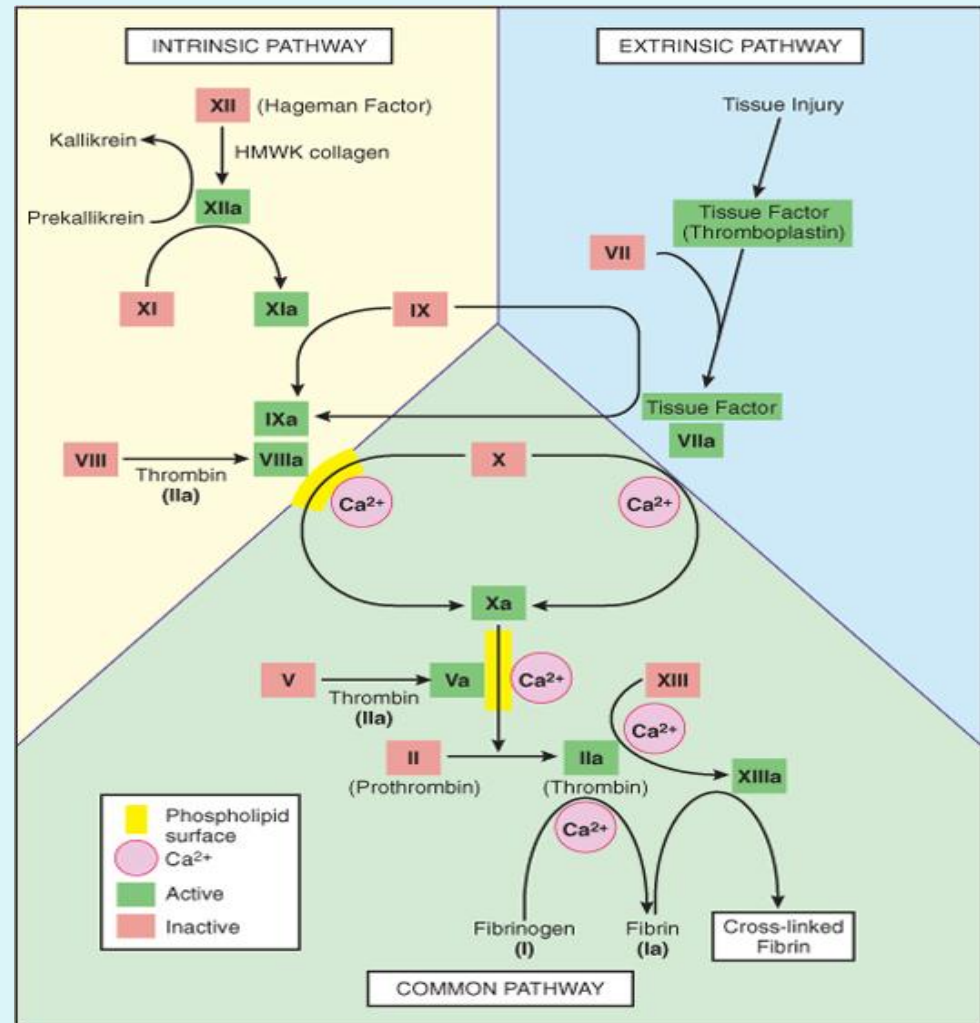


Prothrombin time and coagulation time

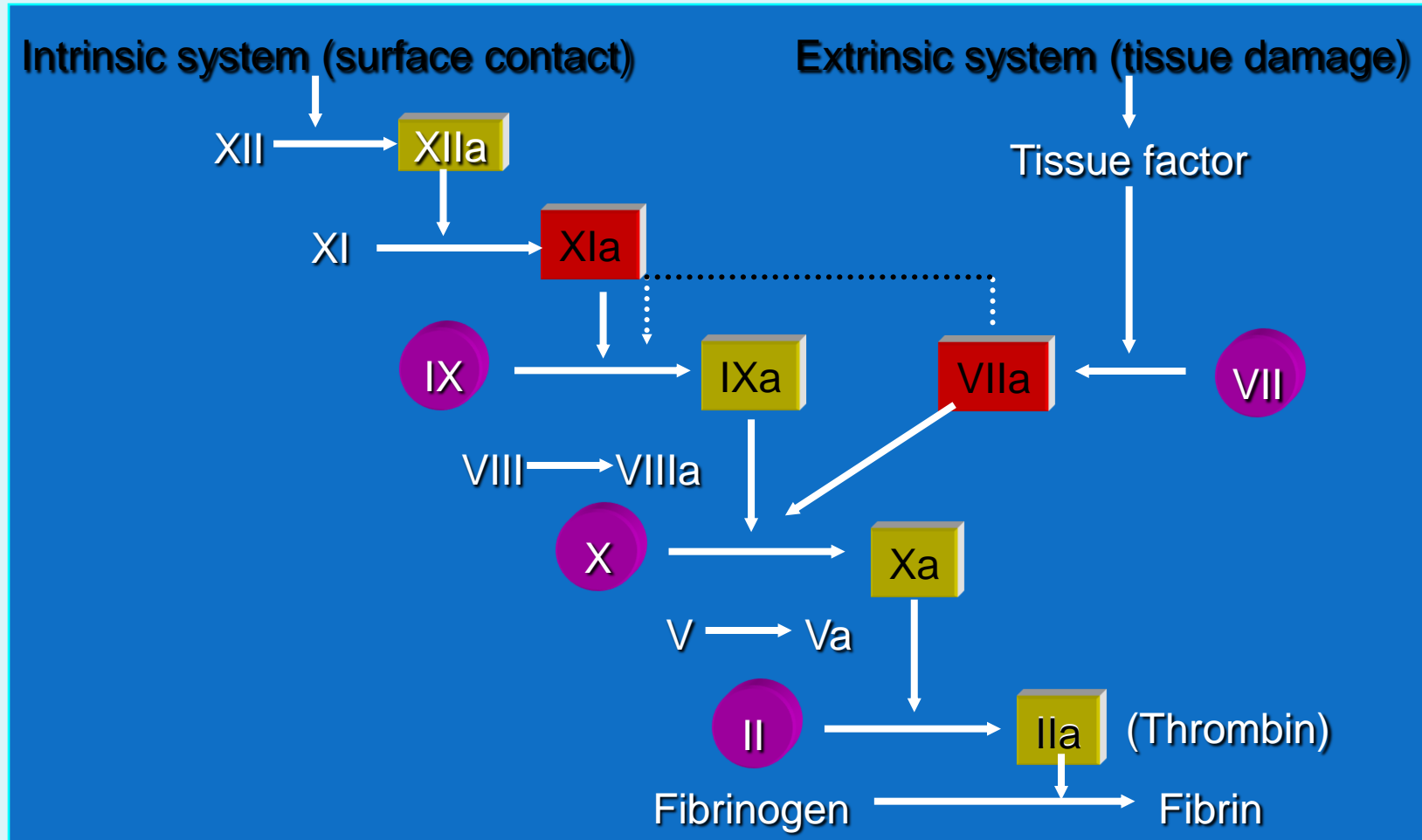


Coagulation Cascade

- Intrinsic pathway
- Extrinsic pathway
- Common pathway
- The extrinsic pathway was required the addition of an exogenous trigger (originally provided by tissue extracts).
- the intrinsic pathway required only exposing factor XII (Hageman factor) to a thrombogenic surface (even glass would suffice).

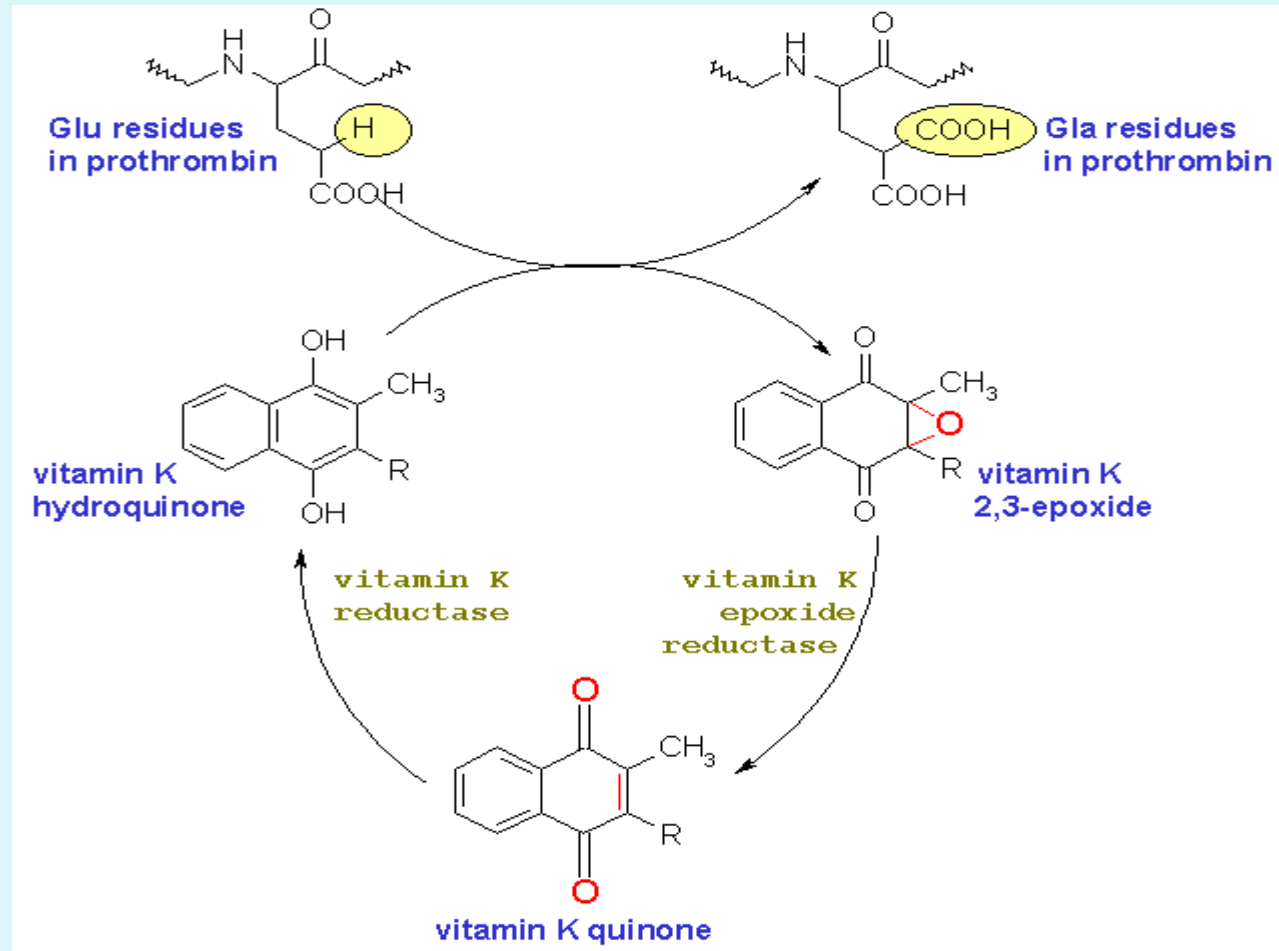


Coagulation cascade



● Vitamin K dependant factors

Role of Vitamin K in Coagulation



Coagulation factors

FACTOR NUMBER	NAME	FUNCTIONS
I	Fibrinogen	Protein synthesized in liver; converted into fibrin in Stage 3
II	Prothrombin	Protein synthesized in liver (requires vitamin K); converted into thrombin in Stage 2
III	Tissue thromboplastin	Released from damaged tissue; required in extrinsic Stage 1
IV	Calcium ions	Required throughout entire clotting sequence
V	Proaccelerin (labile factor)	Protein synthesized in liver; required to form prothrombin activator in both intrinsic and extrinsic Stage 1
VII	Serum prothrombin conversion accelerator (stable factor, proconvertin)	Protein synthesized in liver (requires vitamin K); functions in extrinsic Stage 1
VIII	Antihemophilic factor (antihemophilic globulin)	Protein synthesized in liver; required for intrinsic Stage 1
IX	Plasma thromboplastin component	Protein synthesized in liver (requires vitamin K); required for intrinsic Stage 1
X	Stuart factor (Stuart-Prower factor)	Protein synthesized in liver (requires vitamin K); required to form prothrombin activator in both intrinsic and extrinsic Stage 1
XI	Plasma thromboplastin antecedent	Protein synthesized in liver; required for intrinsic Stage 1
XII	Hageman factor	Protein required for intrinsic Stage 1
XIII	Fibrin-stabilizing factor	Protein required to stabilize the fibrin strands in Stage 3



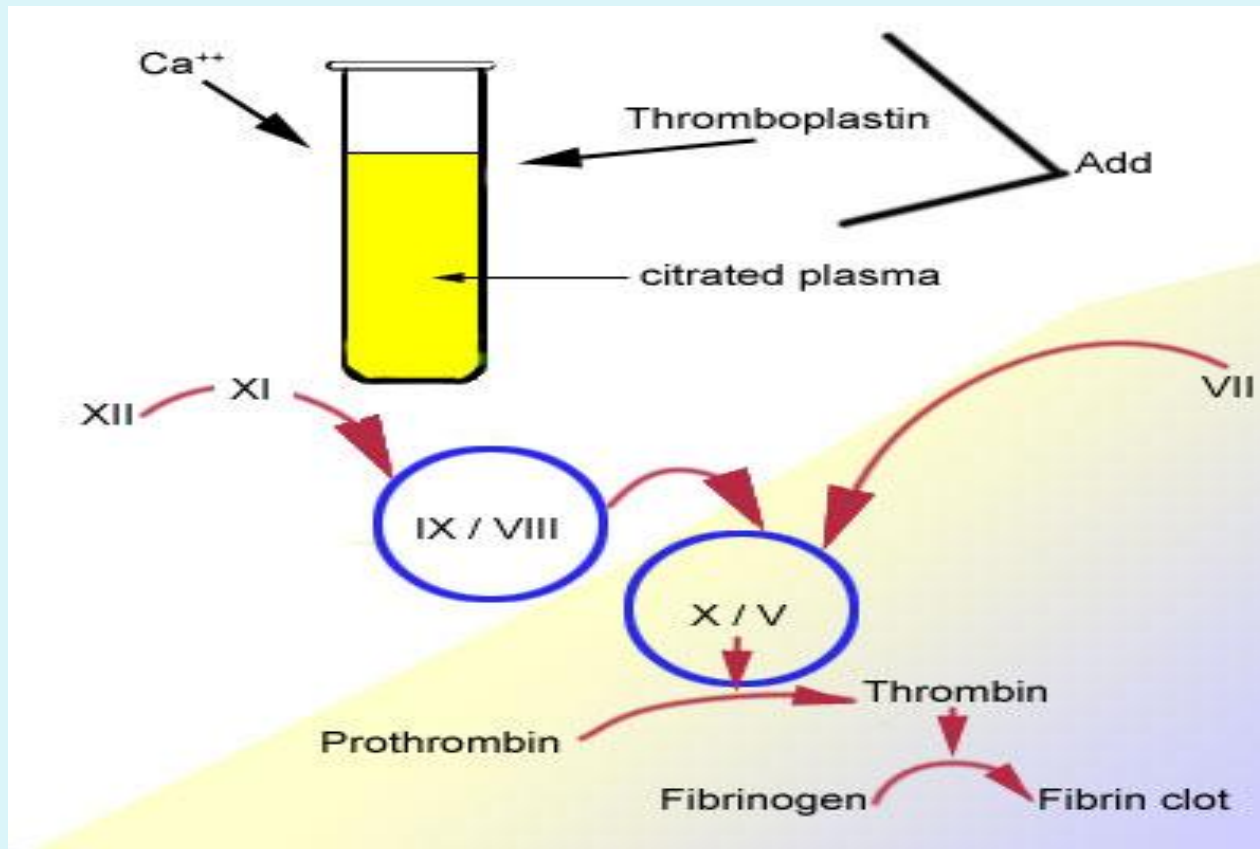
Blood Coagulation Tests

Prothrombin time



- **Prothrombin time (PT)** is a blood test that measures how long it takes blood to clot.
- A prothrombin time test can be used to check for bleeding problems. PT is also used to check whether medicine to prevent blood clots is working.
- **The PT assay screens** for the activity of the proteins in the extrinsic pathway (factors VII, X, II, V, and fibrinogen) by adding phospholipids and tissue factor to a patient's citrated plasma (sodium citrate chelates any calcium present and prevents spontaneous clotting).
- **The clotting reaction** is started by adding exogenous calcium, and the time to fibrin clot formation (usually 11-13 seconds) is recorded.

Prothrombin time





BLOOD

THROMBO-
PLASTIN



CALCIUM




[- 12 SECONDS]



PT

The common causes of a long one-stage time are:

- Liver disease.
- Heparin therapy.
- Loss of clotting proteins from blood by the kidneys in renal disease (nephritic syndromes).
- Congenital deficiency of one or more of factors II, V, VII, or X.
- Fibrinogen deficiency.
- Malabsorption states(vitamin K deficiency)

- 
- A number of common artefactual causes which should be considered if a long time is not expected. These include the following:
 - Faulty collection of the specimen, resulting in partial clotting and serum being tested instead of plasma.
 - An excess of citrate or insufficient blood.
 - An unsuitable anticoagulant such as EDTA.

Coagulation time

- The most commonly used is the collect blood in a clean glass test tube and then to tip the tube back and forth about every 30 seconds until the blood has clotted.
- By this method the normal clotting time is about 6- 10 min.
- A typical condition that causes a prolonged clotting time is a deficiency of any of the factors in **the intrinsic pathway**.

Coagulation time

- Put the four glass tubes of 10 mm external bore into a 37 °C water bath.
- 5 ml of venous blood taken from the subject. Timing is started.
- 1 ml of blood is put into each of the tubes. The tubes remain in the water bath.
- Every minute, the tubes in rotation are gently tilted until one can be tilted through an angle greater than 90° without spilling the blood.
- The tilting must be done in the same way each time end in the same tube order.
- When the contents of one tube coagulates, the time is recorded.
- The process is continued for the remaining tubes, the time being recorded when the contents of each coagulate.
- The mean of the results is the coagulation time.
- If the coagulation is greatly prolonged, as in haemophilia, (e.g. it may take one hour or more) then the mean is taken of the time taken for coagulation in at least two of the tubes.

Bleeding Time

- When a sharp knife is used to pierce the tip of the finger bleeding lasts for 1-6 min.
- Lack of several factors can prolong the bleeding time but this is especially prolonged by lack of platelets.
- it is an overall test of platelete function.