Department of Biochemistry

Sample collection

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LEARNING OBJECTIVES

- Understand the Types of Blood Samples
- Learn Blood Collection Techniques.
- Blood Components.
- Assess Laboratory Testing Purposes.
- Ensure Safe Practices.

Clinical biochemistry definition

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Clinical Biochemistry is a branch of laboratory medicine and pathology that involves the measurement of chemical substances in body fluids to support the diagnosis, treatment, and monitoring of disease.

Types of Samples in Clinical Chemistry Lab

1. Whole Blood.
2. Serum
3. plasma
4. Urine.
5. cerebrospinal fluid (CSF).
6. Synovial fluid
7. Amniotic fluid
8. Others like saliva, pleural, and seminal fluid

Main Purposes of Laboratory Tests

1. Diagnosis of Disease
2. Monitoring Disease Progression
3. Evaluating Treatment Effectiveness
4. Screening for epidemiological study
5. Guiding Clinical Decisions
6. Research and Public Health

Phlebotomy

Blood collection is a medical procedure that involves drawing blood from a patient, typically for laboratory testing, transfusion, or donation. This process is also called **phlebotomy**.

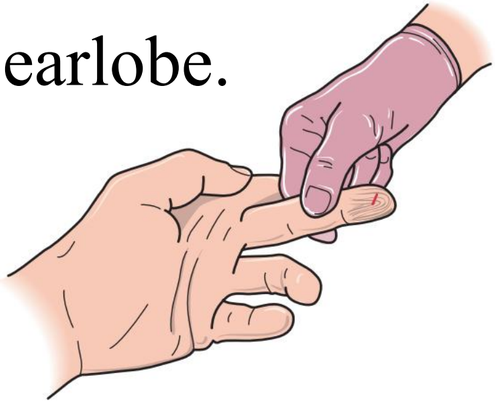
Blood can be obtained from:

1. Capillary
2. Veins
3. Arteries

Capillary sample

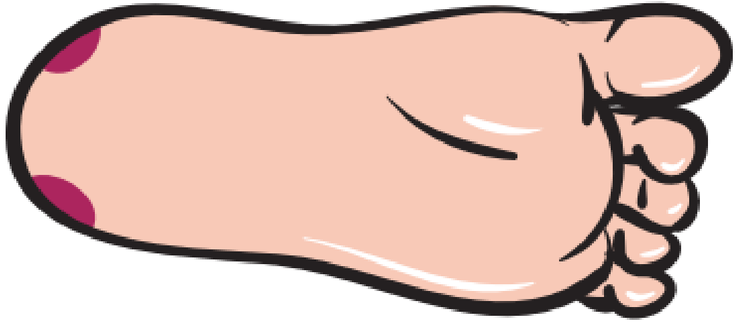
A capillary sample is collected by a process called **skin puncture.**

Skin puncture is an invasive blood collection technique in which blood is obtained by puncturing the skin, usually from the fingertip, heel, or earlobe.



When to Take a Capillary Sample?

1. **Infants and young children.**
   - Their veins are too small or fragile for venipuncture.
   - Heel puncture is commonly used in newborns due to too little tissue available in any of the fingers. this process is called **heel prick**
2. **Elderly or severely ill patients**
   - When veins are difficult to access or very fragile
3. **Need for a small volume of blood**
4. **Point-of-care testing (POCT)**
5. **Patients with severe burns or obesity**

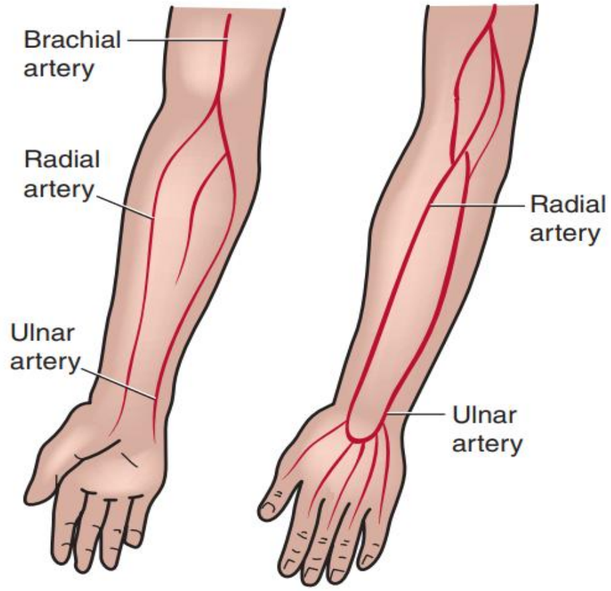


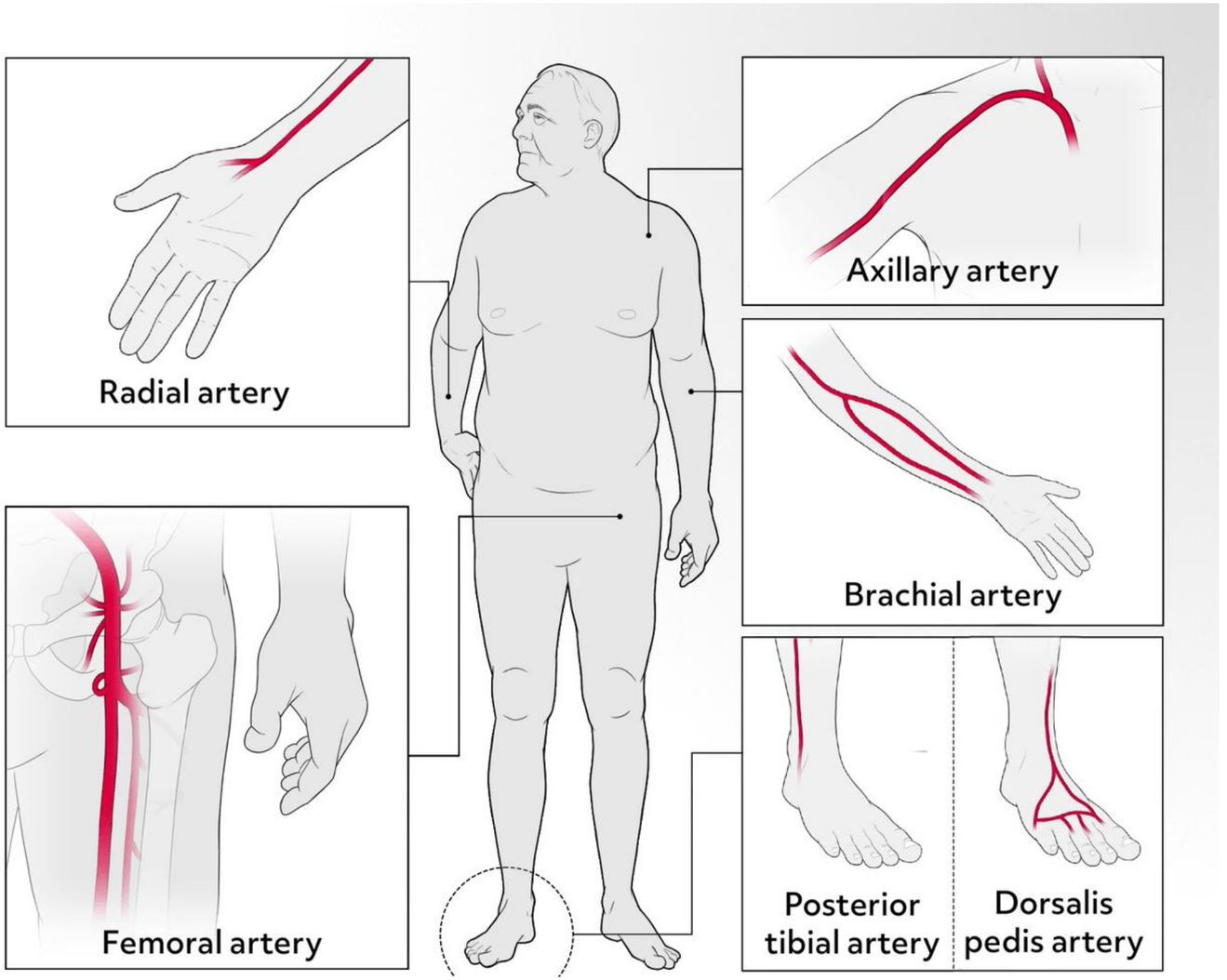
Arterial blood sample

Arterial blood sampling is a medical procedure in which blood is drawn directly from an artery rather than a vein..

Common Sites for arterial blood sample:

1. **Radial artery** (wrist) – most common site
2. **Brachial artery** (arm)
3. **Femoral artery** (groin) – used in emergencies





Arterial blood sample

Why take an arterial blood sample?

1. Assess **oxygenation (PO_2)** and **carbon dioxide levels (PCO_2)** in the blood
2. Determine **blood pH** and acid-base status

Note during the collection of an arterial blood sample.

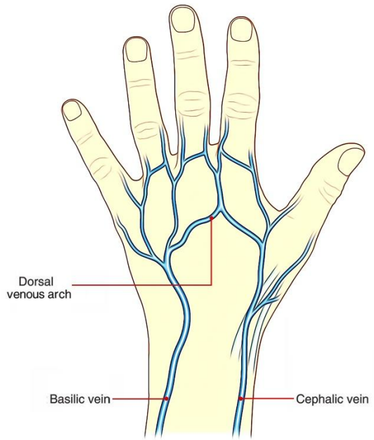
1. More painful and risky than venipuncture or capillary sampling
2. Requires proper technique to avoid arterial spasm, bleeding, or hematoma
3. Usually performed by trained healthcare professionals

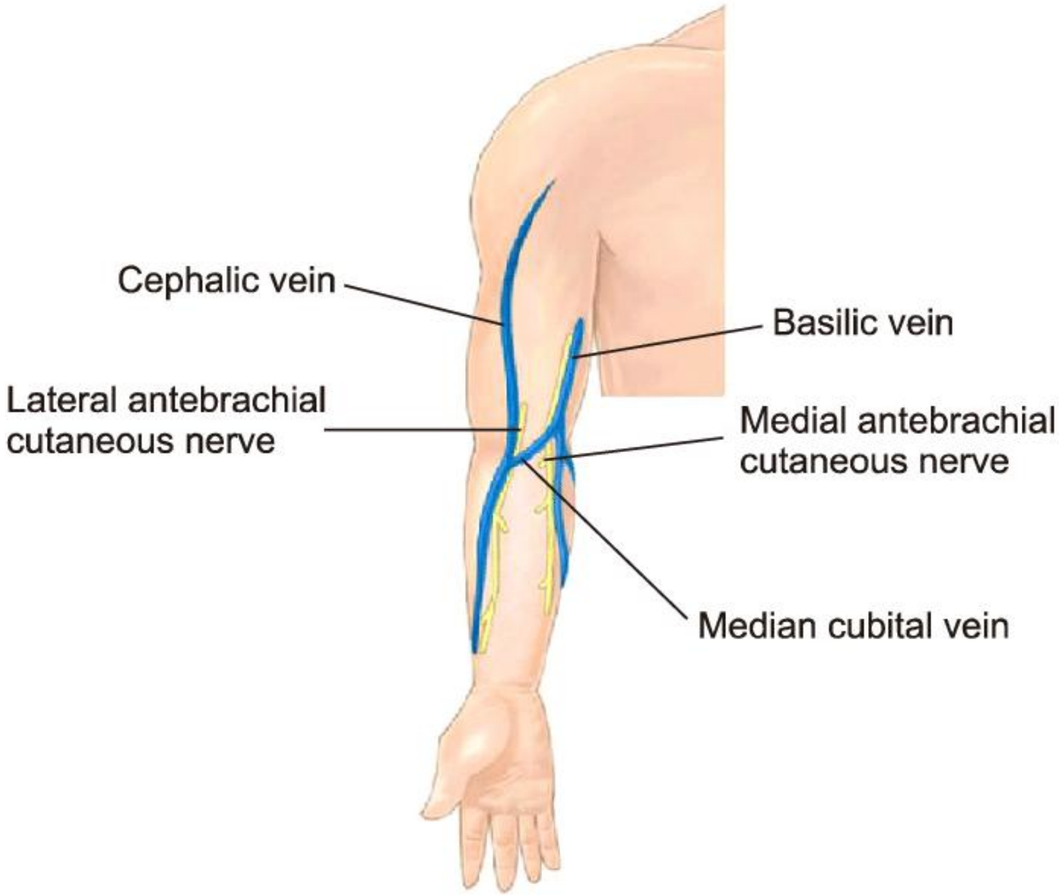
Venous blood sample

Venous blood sampling is a procedure in which blood is drawn from a vein, usually for laboratory testing, transfusion, or research purposes. It is the most common method of blood collection.

Common Sites to obtain an arterial blood sample

1. **Median cubital vein** – most preferred (inside of the elbow)
2. **Cephalic vein** – outer side of the arm
3. **Basilic vein** – inner side of the arm
4. **Dorsal hand veins** – if antecubital veins are not accessible





Venous blood sample

Indications of the vein sample

•Routine laboratory tests (e.g., complete blood count, chemistry panels, coagulation tests)

Advantages of the venous blood sample

- Less pain than an arterial puncture
- Provides large volumes of blood
- Lower risk of contamination compared to capillary sampling
- Suitable for most laboratory tests

Tools and material of phlebotomy

Gloves

Tourniquet

Cotton

Syringes & needles

Marker pen

Test-tubes

Instruction for proper blood collection

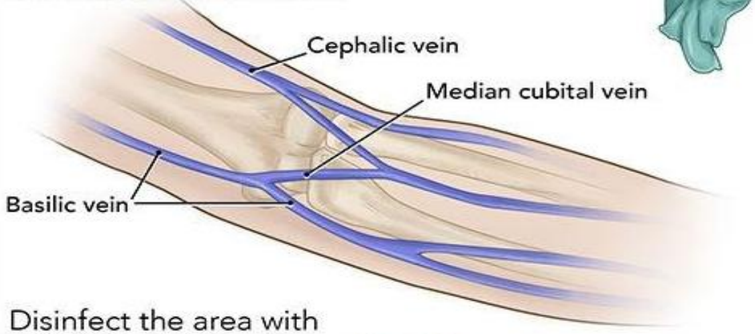
1. Identify the patient correctly (name, ID, date of birth)
2. Wash hands and wear gloves.
3. The patient should be seated or lying comfortably.
4. Arm to be extended straight from wrist to shoulder.
5. The tourniquet should be applied 3 to 4 inches above the puncture site
6. Clean the site with 70% alcohol in a circular motion → allow to air dry.
7. Examine the working of a syringe

Venipuncture

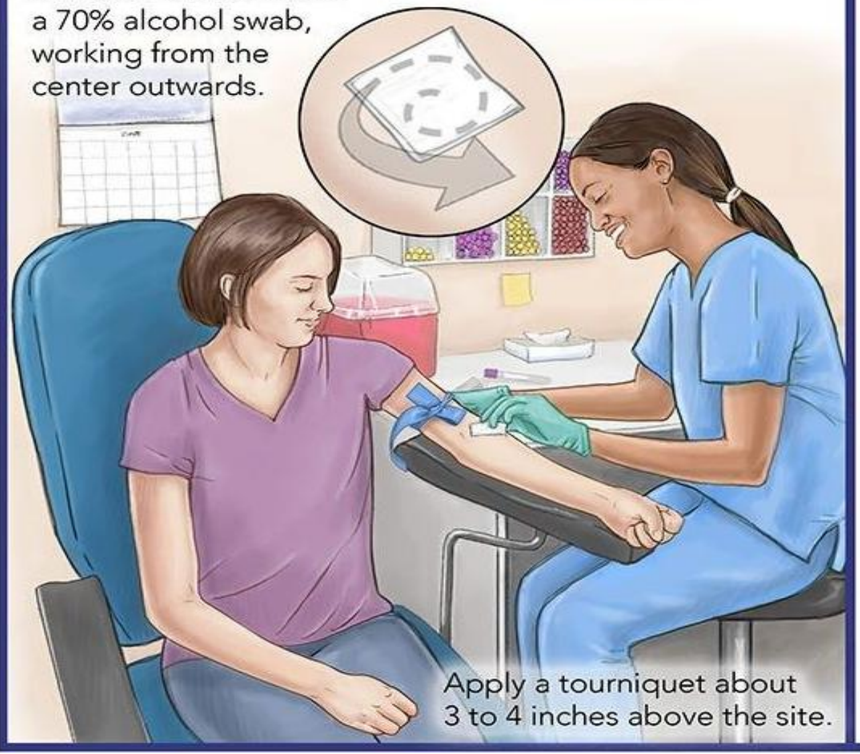
Blood collection procedure guide

Gather all equipment, wash hands, and put on sterile gloves.

Ask the patient to make a fist and select the venipuncture site in the antecubital fossa.



Disinfect the area with a 70% alcohol swab, working from the center outwards.

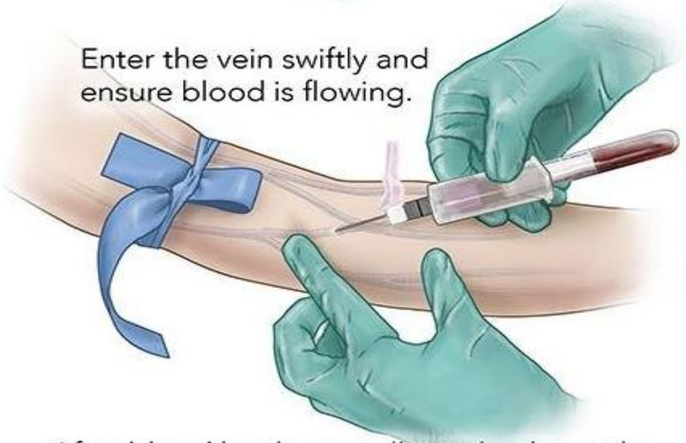


Apply a tourniquet about 3 to 4 inches above the site.

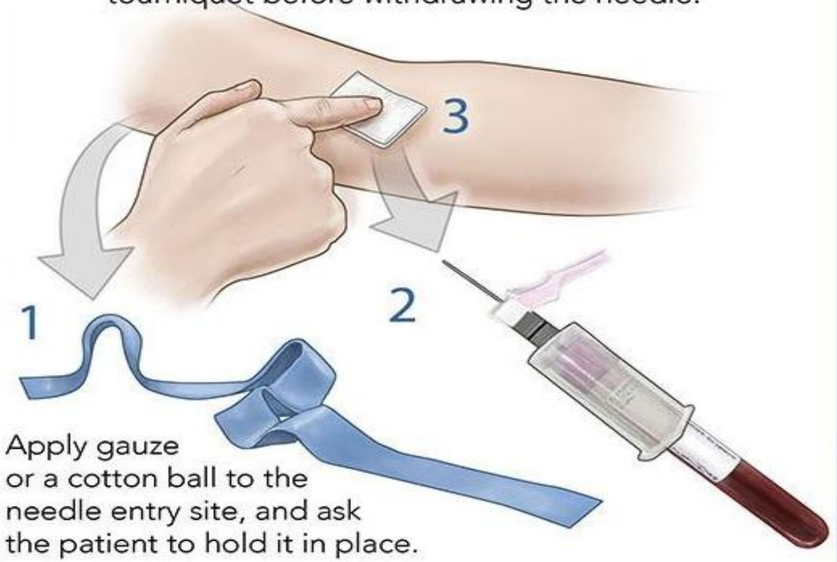
Anchor the selected vein with thumb and index finger.

Position the needle at a 30° angle.

Enter the vein swiftly and ensure blood is flowing.



After blood has been collected, release the tourniquet *before* withdrawing the needle.



Apply gauze or a cotton ball to the needle entry site, and ask the patient to hold it in place.

Remove and immediately invert the tube 8 to 10 times to mix the sample with the tube additives.

Discard the used needle in the sharps container.

Remove gloves and wash hands with soap and water.

Label the tube for transport to the lab, indicating:

- Patient's full name
- Patient ID
- Birth date
- Date of sample.

For more information, visit:
World Health Organization Guidelines on Drawing Blood: Best Practices in Phlebotomy

Component of whole blood

1. Liquid part

Plasma (≈ 55%)

The liquid portion of blood represents ~90% water

Contains:

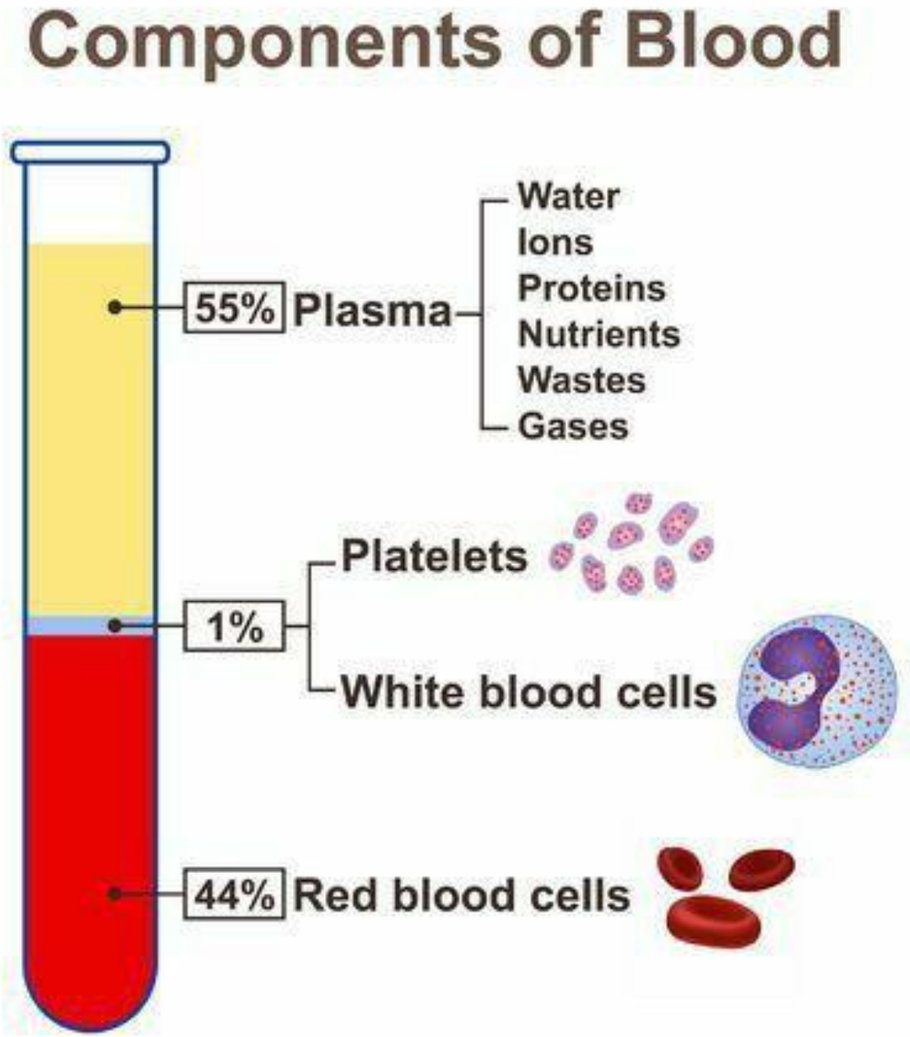
- Proteins Electrolytes
- Nutrients
- Hormones
- Metabolic waste products
- Dissolved gases
- Clotting factors

2. The cellular components of blood:

Red blood cells (Erythrocytes)

White blood cells (Leukocytes)

Platelets (Thrombocytes)



Serum & Plasma

Serum: the liquid portion of blood obtained after the blood has clotted, it is a clear, yellowish liquid on top of the tube

How Serum is Obtained:

1. Blood is collected in a tube without an **anticoagulant**.
2. The blood is allowed to clot naturally (usually 30–60 minutes at room temperature).
3. The sample is centrifuged, separating the clot from the liquid. (4500 rpm for 15 min)
4. The clear yellowish liquid on top is the serum.

Serum = Plasma – Clotting factors (fibrinogen)

Serum & Plasma

Clotting can be prevented by placing the blood into tubes containing an anticoagulant. Centrifuging then separates the red cells from the supernatant, and the result is **plasma**.

Plasma differs from serum in containing fibrinogen and coagulant factors

Serum = Plasma – Clotting factors (fibrinogen)

Serum & Plasma

Summary

- Clinical biochemistry is the study of chemical substances in body fluids
- Serum, plasma, and urine are the most common types of samples
- Main Purposes of Laboratory Tests
- Vein blood samples are the most common sample for routine tests
- Arterial blood sample used for a special test
- A heel prick is used to obtain a capillary sample in a newborn
- Plasma differs from serum in containing fibrinogen and coagulant factors

Thank you for listening

Department of Biochemistry