

Centrifuge

The Centrifuge:

Is a device for separating two or more substances from each other by using centrifugal force.

Centrifugation: is a mechanical process that involves the use of the centrifugal force to separate particles from a solution depending on their size, shape, density, the viscosity of the medium, and the rotor speed.

- ❖ A centrifuge is a device used in science to separate suspensions by density.
- ❖ The denser particles separate out and migrate to the bottom of the test tube, while the lighter particles move toward the top.
- ❖ The remaining solution is called the "supernatant".
- ❖ The machine is round and has holes into which test tubes can be placed.
- ❖ A lid covers the top of the machine, and it can spin using its motor at a very high speed.



Centrifuge

Types of centrifuges:

1. Ordinary / Laboratory centrifuge:

Are used in chemistry, biology, and biochemistry for isolating and separating solids from liquids in a suspension. The solids can be insoluble compounds, biomolecules, cell organelles, or whole cells.

2. Micro-centrifuge (Hematocrit centrifuge):

It uses capillary tubes containing blood to measure the volume of packed cells (PCV) at a speed of about 10,000 rounds per minute (RPM).

- ❖ Both have a speed not exceeding (10,000-12,000 or 15,000) rounds per minute (RPM).

3. Ultra-centrifuge:

Use high centrifugal force for studying the properties of biological particles. Ultra-centrifuges can isolate much smaller particles, including ribosomes, proteins, and viruses. Ultra-centrifuges can also be used in the study of membrane fractionation. This occurs because ultra-centrifuges can reach maximum angular velocities more than 70,000 RPM.

4. Refrigerated centrifuges:

Cooling is an important added feature to any laboratory centrifuge, with temperature ranges as wide as (-20°C – - 40°C), making them perfect for DNA, RNA, PCR, or antibody analysis. Cold centrifuge can obtain rotational speeds of over 30,000 rpm.



Laboratory centrifuge



Micro-centrifuge



Ultra-centrifuge

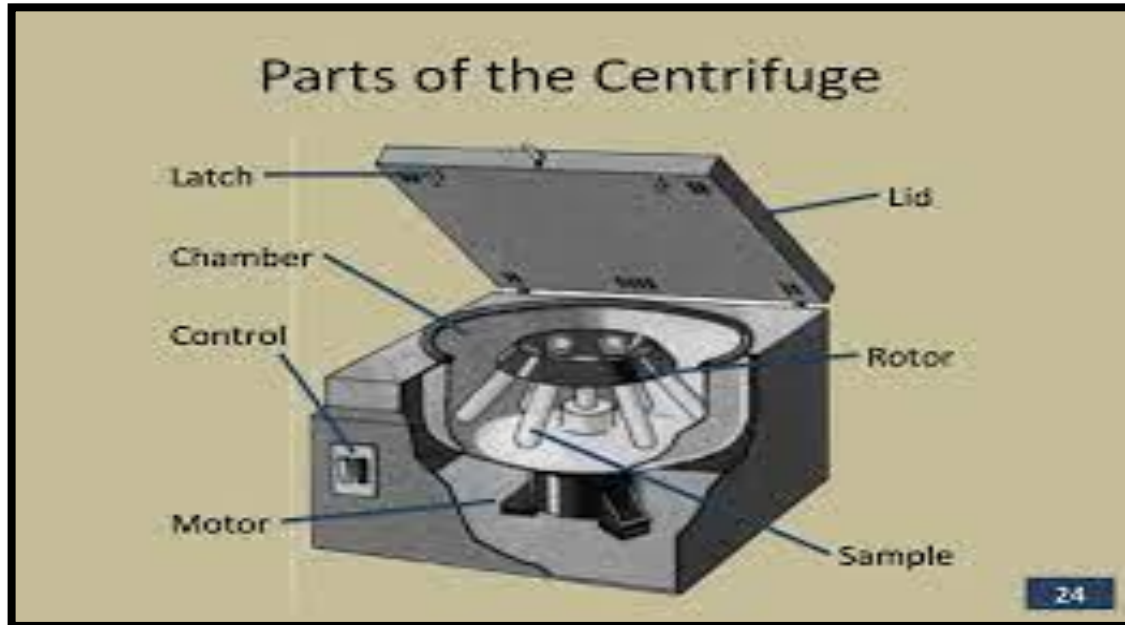
Principle work:

The centrifuge works using the sedimentation principle, where the dense substance separates out and becomes at the bottom of the tube.

Main parts of laboratory centrifuge:

- 1) Electrical supply.
- 2) lid.
- 3) Chamber (inner room).
- 4) Rotor hold tubes.

- 5) Control Panel: It serves the purpose of controlling different parameters such as temperature, rotational speed, time, on/off ... etc.
- 6) Motor.



Parts of the centrifuge

Operation of laboratory centrifuge:

Note: The work surface must be level, firm and away from sunlight.

1. Switch at on.
2. Balance the sample that needs to separate with the same amount of water in the same size and quality of tubes.

That mean: If you want to run a tube with 10 mL of liquid, put another tube with 10 mL of water in the opposing hole on the rotor. If the liquid has a higher or lower density than water, you must balance the tubes by mass, not volume.

3. Make sure that the test tubes are closed.
4. Open the cover.
5. Put the test tubes in the head as in symmetrical position
6. Close the cover.
7. Choose the time which you need it.

8. Choose R.P.M which you need it.
9. Operate the centrifuge “Start”
10. Ensure that the centrifuge has completely stopped before opening the lid.
11. Open the centrifuge cover and pick up the samples.

If you found any alarm (shaking or loud voice):

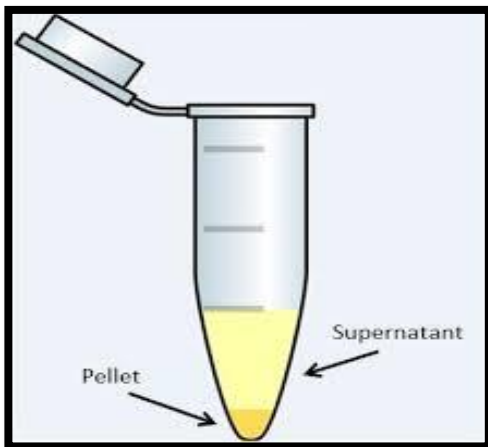
1. Use stop.
2. Open the cover.
3. Examiner the sample.

What you will never do?

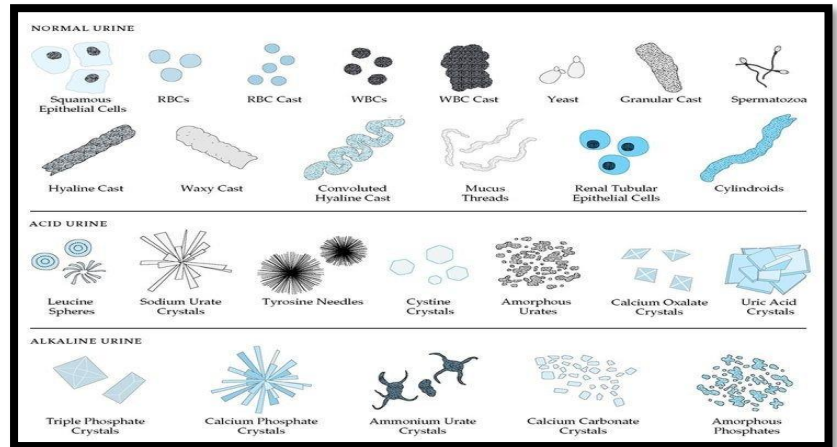
- Do not open the lid while the rotor is moving.
- Do not try to stop a rotor with your hands or with a tool.
- Do not use tubes that are not fit-sized for the rotor.
- Do not bump, jar, or move the centrifuge while the rotor is spinning.
- Do not shake or invert the tube after separating.

Uses:

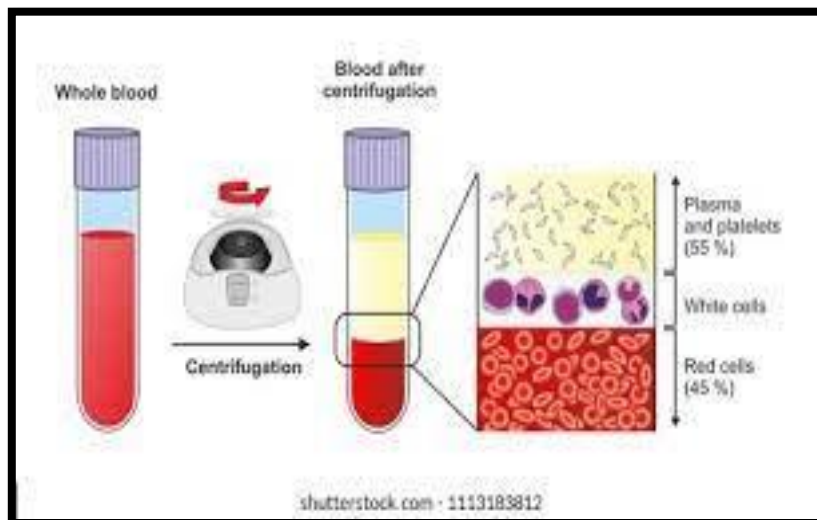
- 1- Is used in the separation of a solid material from a liquid.
- 2- Blood chemistry analyzes to separate serum or plasma from red blood cells.
- 3- General urinalysis to separate suspended particles in urine.
- 4- Separation insoluble particles (e.g., insoluble proteins in a protein solution).
- 5- Separate lipid components .
- 6- Isotope Separation.



Urine after separation



Urine Sediment



Blood separation

Care of Centrifuge:

- Should clean your centrifuge daily, or at least weekly.
 - a) Clean the motor.
 - b) Clean the test tube holders.
 - c) Lubricate motor.
- The device must be covered when not in use.