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Centrifugation

→ A unit operation

→ Used for separation of two phases

Condition when particle size is less than 5 micron meter or sample has both liquid phases of different types ^{having very less density diff} or ^{polymeric soln} viscous i.e. in those samples where filtration & sedimentation is not possible.

→ Equipment → Centrifuge

→ force used → Centrifugal force

* Applications of centrifugation

① Production of Bulk drugs →

For separation of antibiotics from their culture media the antibiotic being lighter floats up whereas the culture media settles down.

② Production of Biologicals → Biologicals are those obtained from biotechnology for eg: DNA extraction from the enzymes DNA settles down & remaining enzymes forms pellet
→ Ultra Centrifuges are used that have additional cooling accessory to

prevent the biologicals from getting denatured

- ③ Biopharmaceutical Analysis of drugs & Drugs are separated from blood, i.e. plasma is to be extracted because the drug is present in the plasma. So centrifugation of blood is performed. The other cells being heavier settle down whereas the plasma being lighter is extracted & then analysed for drug content at respective times by UV.

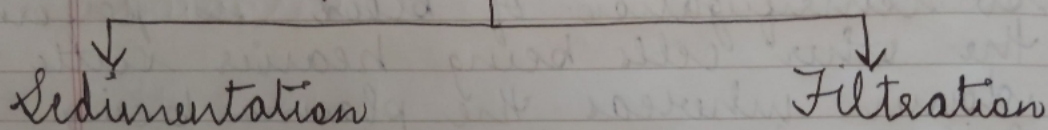
- (200-300 rpm) ④ Evaluation of suspensions & emulsion & Centrifugation is used as a stress testing (exposed to harsh conditions) for emulsion. Even after centrifuge if the emulsion remains stable then it is considered stable i.e. the emulsifying agent is appropriate.

- ⑤ Determination of molecular wt. of colloids & for hormonal preparations like insulin to check whether it is mono or polydisperse. Centrifugation is used also for polymer separated preparation.

Centrifuge

Apparatus used for centrifugation by the help of centrifugal force.

Types of Centrifuge on their principles



(a) Sedimentation → Uses centrifugal force alongwith sedimentation for separation. The lighter liq component forms supernatant whereas the heavier components settle down. for solid-sol, liq-liq.

(b) Filtration → Centrifugal force + separation alongwith filtration with the help of filter media (perforated sheets can also be used). The solid particles retain & the liquid moves out for seprⁿ of solid from liq.

(c) Ultra Centrifuge → (2000 - 10,000 rpm) for particles having lower molecular wt but high speed ^{sensⁿ} works generally on the principle of sedimentation. They have an additional cooling apparatus to nullify the heat.

Perforated Basket Centrifuge

Principle → Centrifugation + filtration
filtration with the help of
filter media

↓
Solid retained on the walls of
basket

↓
Liq in the form of filtrate

→ Construction ↴

→ Basket with perforations or filter cloth

resistant to corrosion & capable
to withstand high strain (choice
of metal) eg: stainless steel

Types of centrifuge → updriven, underdriven
depending on motor location

updriven the basket is connected
to a shaft which is further
connected to a motor on top.

Working ↓

load the sample (keeping in mind the loading capacity)



sample should be properly balanced for proper centrifugation



lid is closed & allowed to rotate at proper revolutions



solid retained on walls



liq. collected through the filtrate pipes



let the centrifuge be in motion for sometime to absorb any moisture



after complete drying the drug is scraped off.

Skimmer
tube
(to collect
the liq.)