

Chapter - 3

Size Separation

↳ A process in which particles of desired size are separated from other fractions.

[DEPTH OF BIOLOGY]



Objective :-

① Separation :- After reduction separate out the particles into different sizes.

[DEPTH OF BIOLOGY]

② Suspension :- In suspension we have to take very fine powder and separate out the fine drug particles into mixtures.

③ Granulation:— Just before step for making tablets.

- So, drug particles should be separate out for better making of tablets.

[DEPTH OF BIOLOGY]

④ Improve mixing:—

- Important for mixing same size particles.

[DEPTH OF BIOLOGY]

- Same size particles mix well as compared to different size particles.

⑤ Physiochemical properties:—

- Size separation helps in physiochemical properties of drug molecules.

eg:— Solubility Surface tensions etc.

[DEPTH OF BIOLOGY]

► Applications :-

↳ Helpful in making of tablet because it helps in granulation.

[DEPTH OF BIOLOGY]

↳ Capsule :-

↳ Fill powder inside the capsule

↳ That powder separate out through size separation.

↳ Suspension :- The powder used is separate out through size separation.

[DEPTH OF BIOLOGY]

↳ Emulsion :- Helpful in making emulsion.

↳ Syrup :- Helpful in size separation for making syrup.

[DEPTH OF BIOLOGY]

► Mechanism :-

- Important thing for size separation

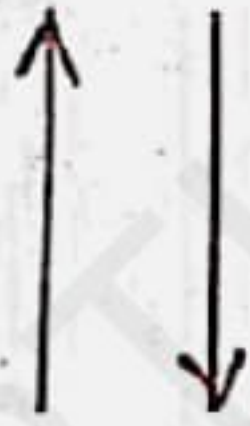


Sieve

① Agitation :- Take drug particle into sieve with specific size then start to shake it.

(1) Oscillation —

— Movement of sieve is upward & downward.

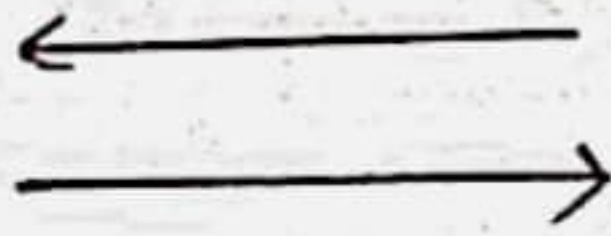


[DEPTH OF BIOLOGY]

[DEPTH OF BIOLOGY]

(2) Vibration —

— Movement is sideways.



(3) Rotation —

— Movement is clockwise & anticlockwise.



② Brushing :- [DEPTH OF BIOLOGY]

↳ Sieve is fixed

↳ Put drug molecules in sieve.

↳ Then start to shake the drug molecules with the help of brush.

② Centrifugation :-

↳ A technique used for separation on the basis of shape, size, density & weight of substances.

[DEPTH OF BIOLOGY]

↳ It should be separated out with the help of medium & rotor speed.

↳ On revolving substance with high speed, heavy stuff falls near & light stuff falls too far.

[DEPTH OF BIOLOGY]

Size Separation

* Official Standards of powders :-

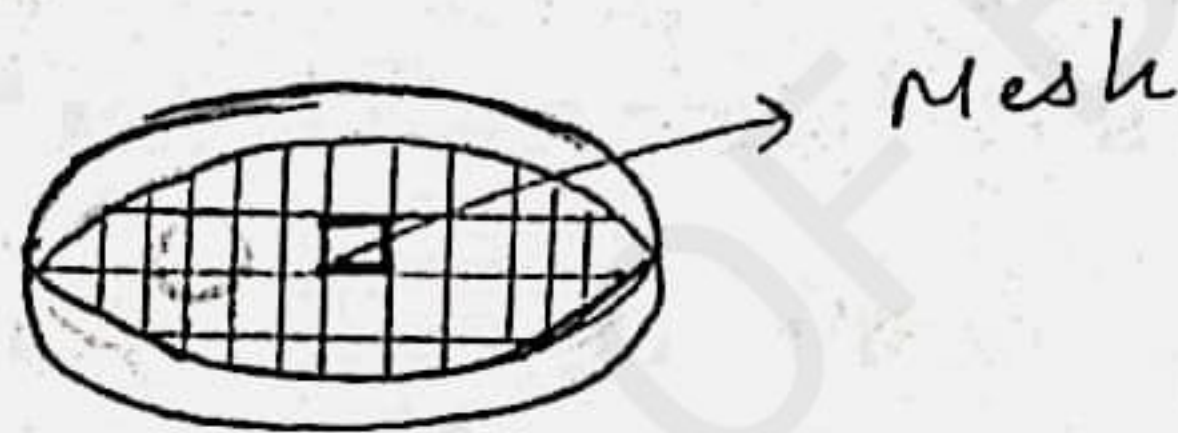
	Sieve no.	
① Very Coarse	⑧ ↓ 100%	⑥0 ↓ 20%
② Coarse	②0 ↓ 100%	⑥0 ↓ 40%
③ Moderately Coarse	④0 ↓ 100%	⑧0 ↓ 40%
④ Fine powder	⑥0 ↓ 100%	①00 ↓ 40%

[DEPTH OF BIOLOGY]

⑤ very fine powder

(80)
↓
100%

[DEPTH OF BIOLOGY]



Sieve no. $\Rightarrow$ No. of partition in any sieve.

[DEPTH OF BIOLOGY]

Sieve no. $\uparrow$ = Particle size $\downarrow$

► Very coarse :-

- Powders which can pass 100% from Sieve no. 8 and only 20% pass from

Sieve no. 60. [DEPTH OF BIOLOGY]

► Coarse :-

- Powder that pass 100% from sieve no. 20 and only 40% pass from sieve no. 60.

► Moderately Coarse :-

- Powder that pass 100% from sieve no. 40 and only 40% pass from sieve no. 80.

► Fine powder :- [DEPTH OF BIOLOGY]

- Powder that pass 100% from sieve no. 60 and only 40% from sieve no. 100.

Sieve Shaker

Principle → Based on the principle of agitation.

- Sieve will be shaken in this.

Construction →

[DEPTH OF BIOLOGY]

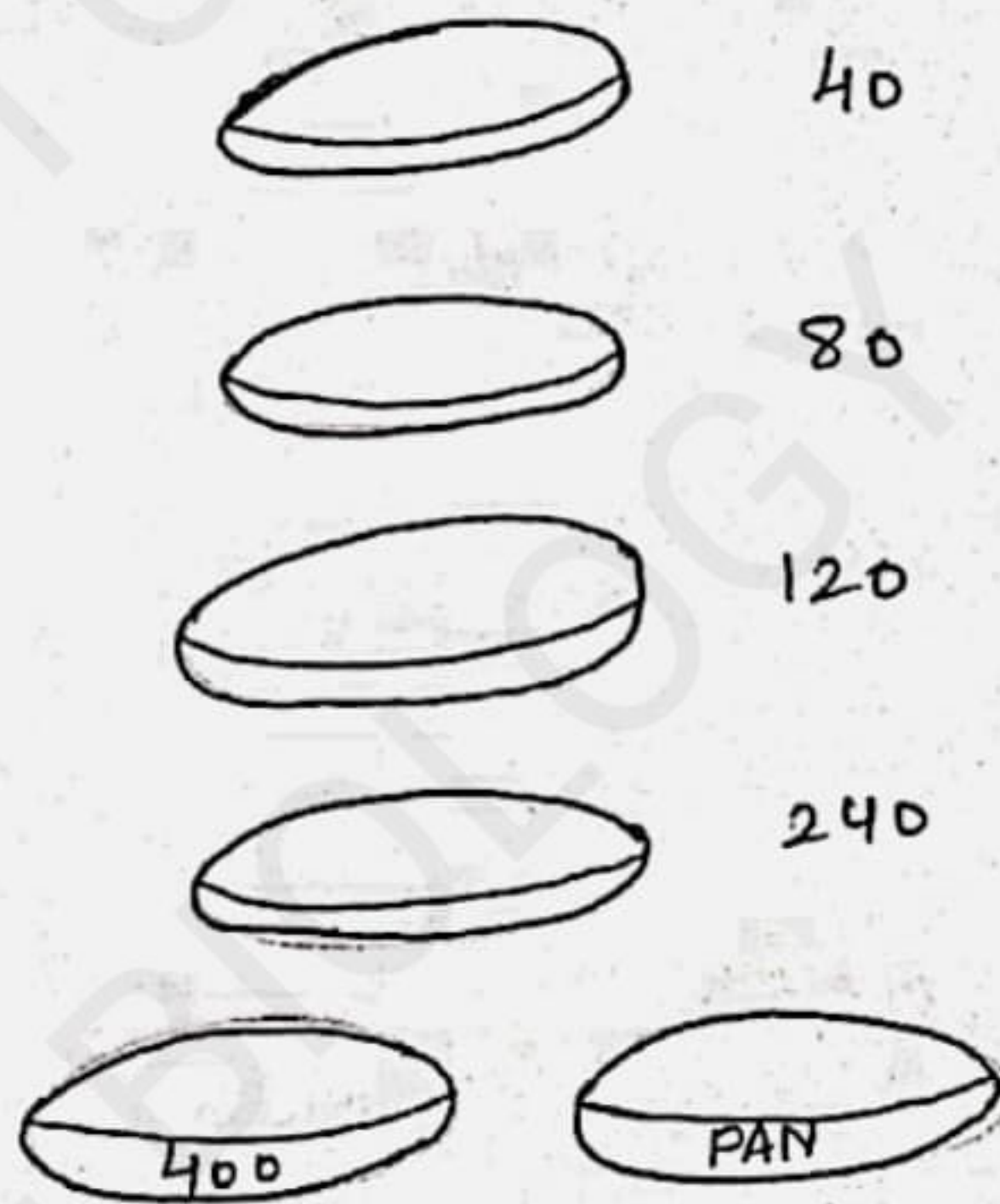
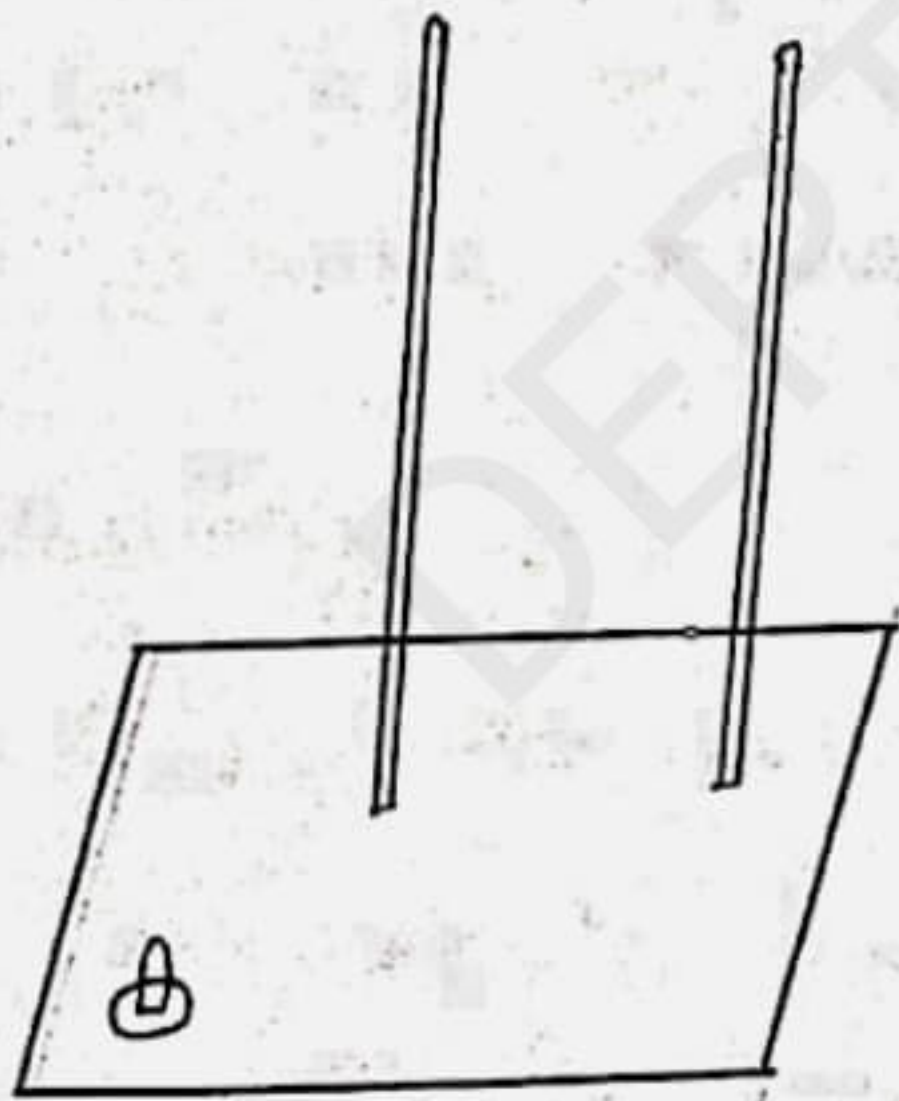
↳ Consist of a machine with different sieve no.

→ In PAN (receiver) we get very fine powder or product.

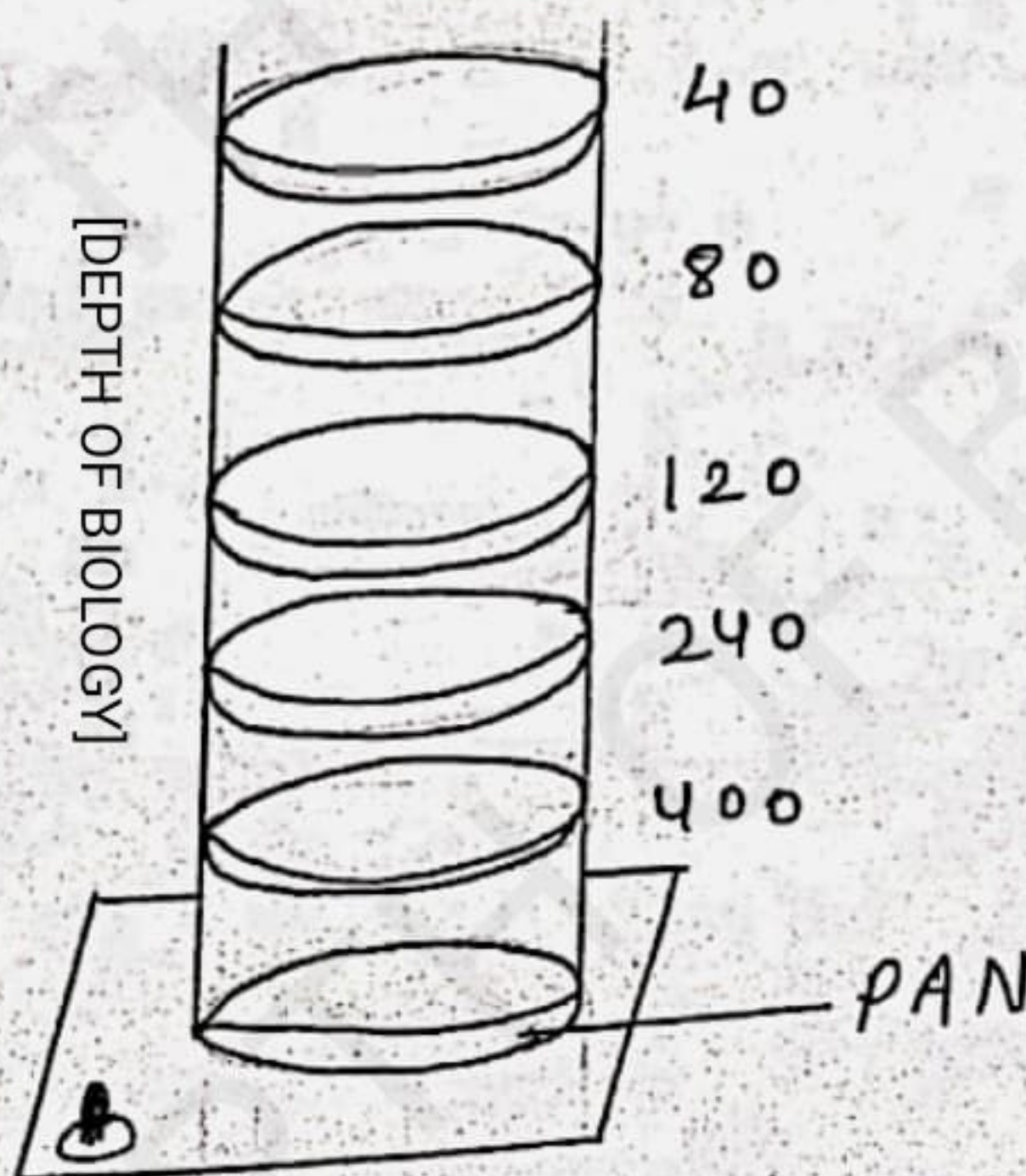
→ One switch start it for vibrating and device is mounted with surface.

In two long rod sieve will be fixed.
Sieve no.

[DEPTH OF BIOLOGY]



[DEPTH OF BIOLOGY]



[DEPTH OF BIOLOGY]

Working :-

↳ Fix all the sieve into device according to need. [DEPTH OF BIOLOGY]

↳ On starting the machine powder will be automatically separated out according to their sieve sizes.

↳ After then collect & use it.

Uses :- To separate out many sizes at same time. [DEPTH OF BIOLOGY]

Advantage :-

↳ Easy to use.

↳ Separate out many sizes drug particles at same time.

Disadvantage :-

↳ Very big amount cannot be separate out.

[DEPTH OF BIOLOGY]

↳ Used only as a small scales.

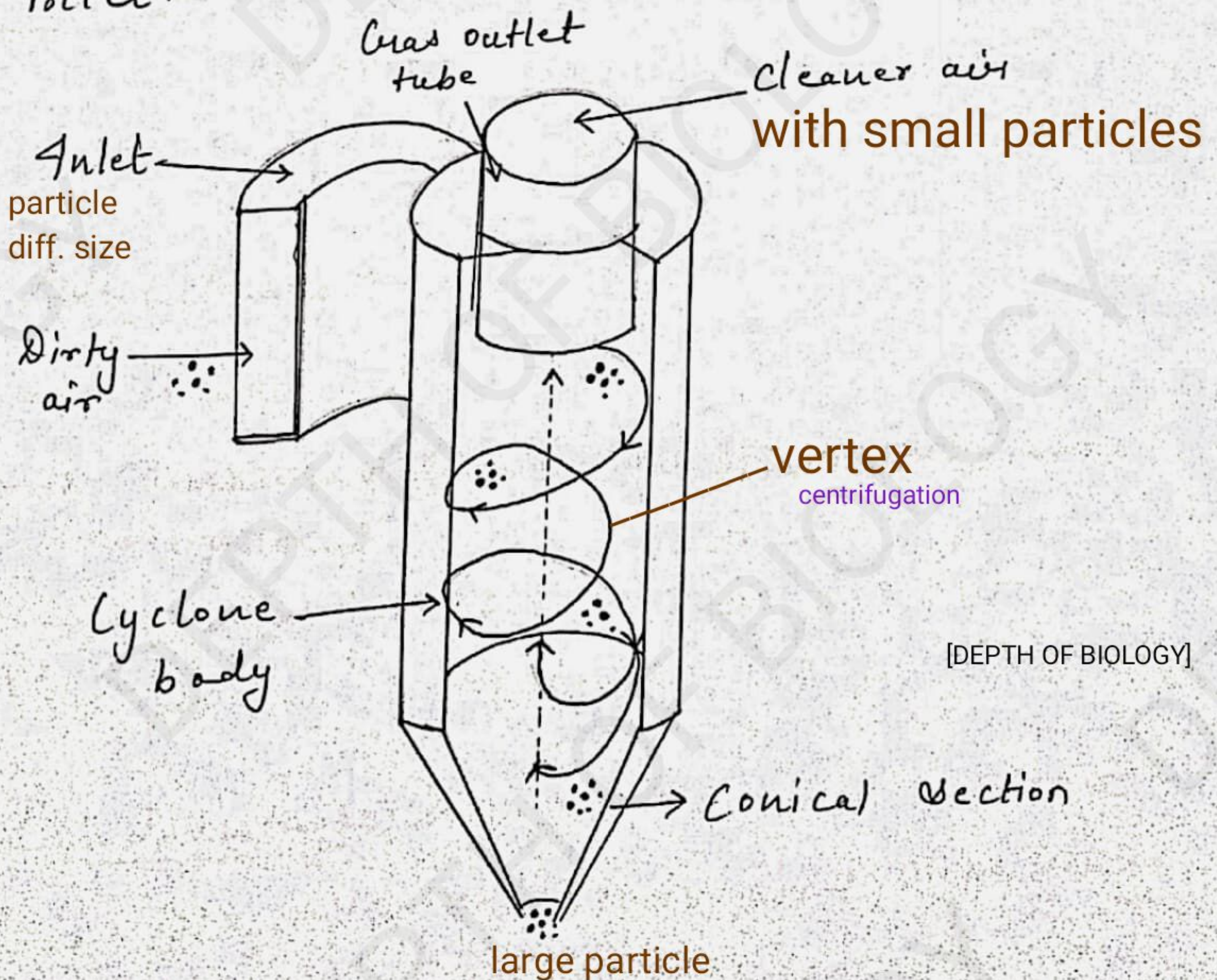
Cyclone Separator

Principle :- Based on the principle of Centrifugation.

Construction :- [DEPTH OF BIOLOGY]

↳ Consists as container in which one inlet is present.

↳ Two outlet is present in which small particles receive from upper outlet and large particles get from lower inlet.



Working :-

- ↳ Insert particles of different sizes with some air pressure.
- ↳ Air create centrifugation force inside it and due to this large particles fallen down and get from downside outlet. [DEPTH OF BIOLOGY]
- ↳ Fine powder expell out from the outlet with air.

Uses :- An economical device for removing particulates & solids from a fluid system.

Advantages :-

- ↳ Cheap [DEPTH OF BIOLOGY]
- ↳ Small & relative to other separation equipment.
- ↳ Static parts.
- ↳ Operate pressure.

Disadvantages :- [DEPTH OF BIOLOGY]

- ↳ Difficult to obtain good separation of substance of similar densities.

↳ Unable to tackle sticky material.

[DEPTH OF BIOLOGY]

Air Separator

Principle:- Based on the principle of Centrifugation.

Construction:-

↳ Consists of a cylindrical vessel with a conical base.

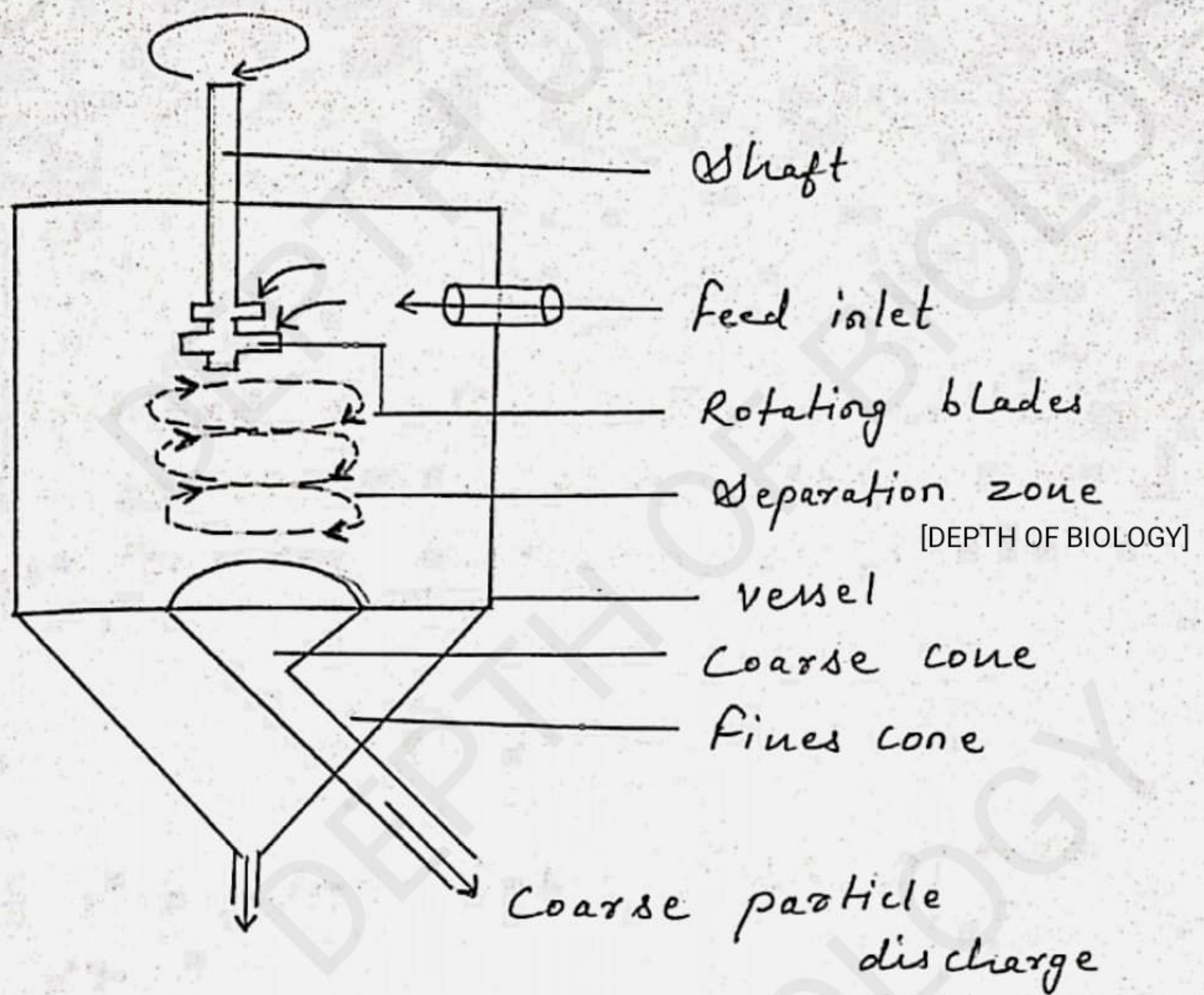
↳ Feed inlet is present in the upper part. [DEPTH OF BIOLOGY]

↳ There are two outlet at base one for fine particles and one for heavy particles.

↳ Air movement is obtained by means of rotating disc and blades.

The stationary blades are used to improve the separation.

↳ It is possible to vary the size at which separation occurs by controlling these blades and the speed of rotation. [DEPTH OF BIOLOGY]



Working:-

- The fine particles which pass through the feed inlet falls on the rotating disc.
- Rotating blades are attached to the same shaft which produce current of air. [DEPTH OF BIOLOGY]
- Particle starts revolving as it produce a centrifugal force.
- Fine particles are dropped at some distance and accumulated at an outlet meant for fine particles.

- The heavy particle falls downward, removed at an outlet meant for heavy particles.

Uses :- [DEPTH OF BIOLOGY]

- ↳ Attached to the ball mill or hammer mill to separate and return oversized particles for further size reduction.

Bag filter

- ↳ Separation takes place in two steps -

▶ First of all pass the dirty air through a bag made of cloth by applying suction on the opposite side of feed entry which facilitates the separation.

[DEPTH OF BIOLOGY]

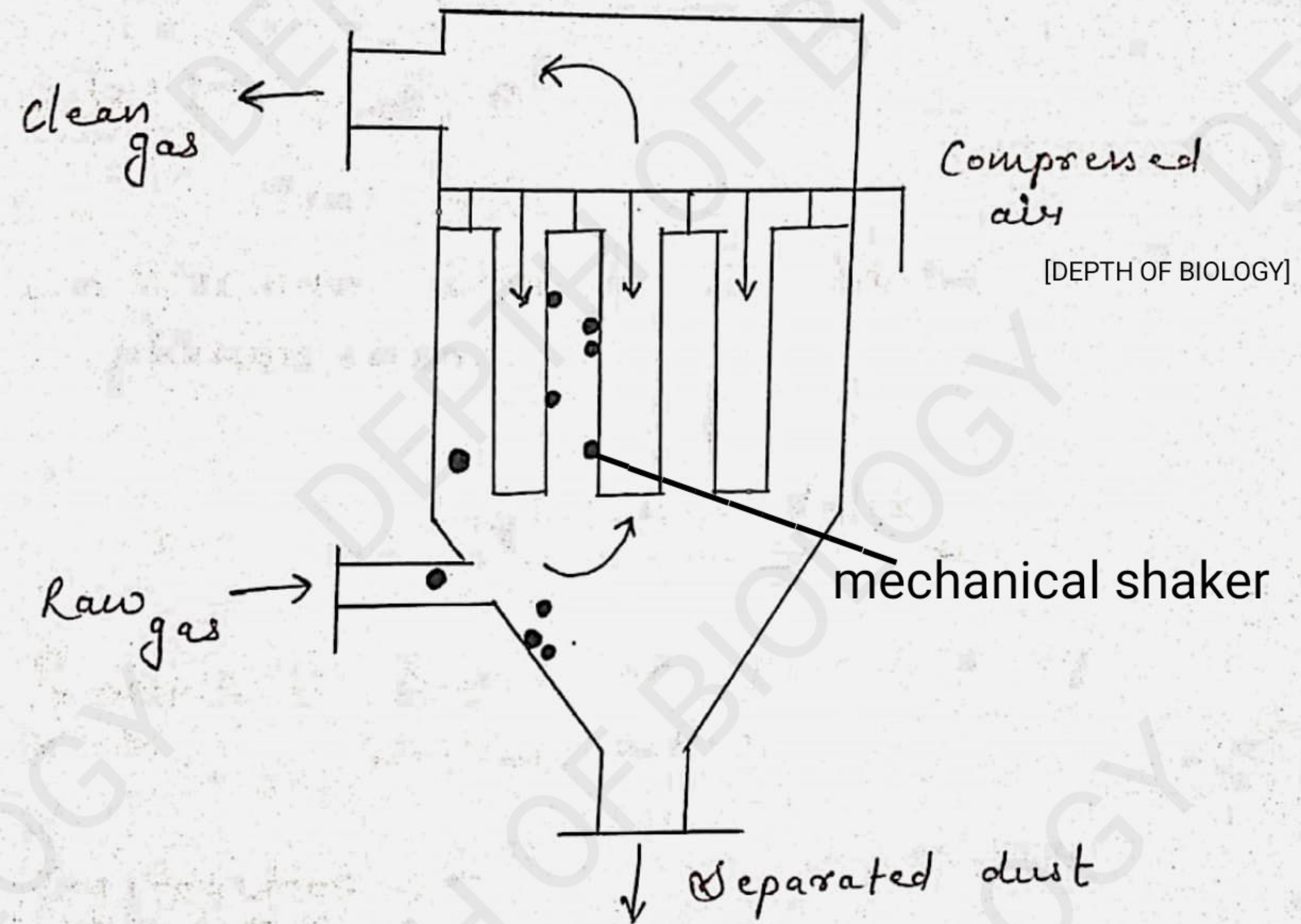
▶ Now, pressure is applied on bag so adhesive powder fallen down gets collected from the conical base.

Construction :- [DEPTH OF BIOLOGY]

- ↳ Consists of a number of bags made of cotton or wool fabric fixed in a metal container.

- One inlet in which feed enters.
- We get solid particles or fine powder from one outlet at downside.

[DEPTH OF BIOLOGY]



Working :-

- Material passed through bags and because of this particles are retained within the bags because particle size is not small than bag. Thus, is retained in bag. [DEPTH OF BIOLOGY]

- After passing air we get clean air with the help of mechanical shaker. Bag is shaken and then attached particles fallen down and we get particles.

Uses :-

[DEPTH OF BIOLOGY]

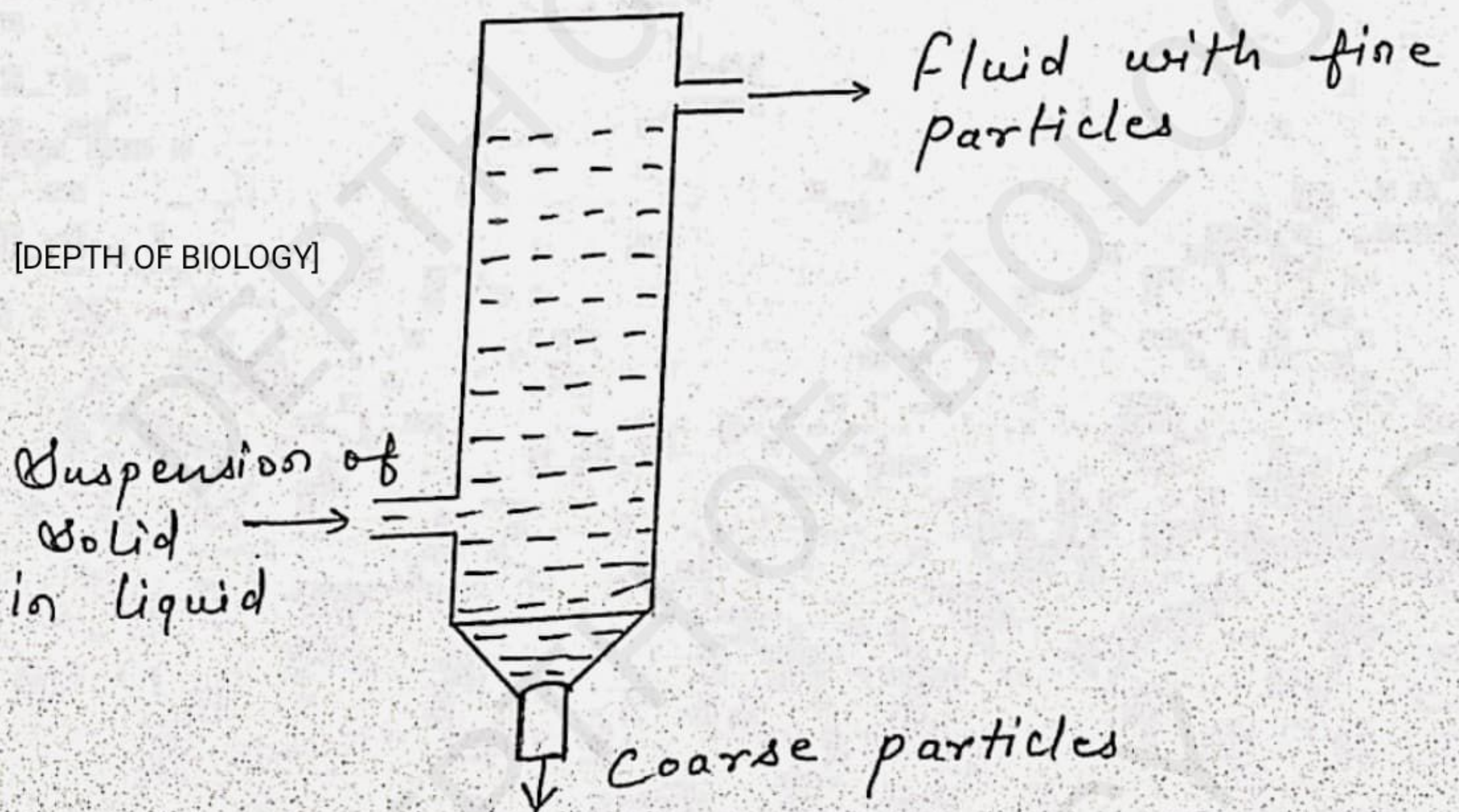
↳ To clean the air.

↳ Vacuum cleaner is based on this phenomenon.

Elutriation tank (shake & leave)

Principle :- Based on principle of sedimentation.

Construction :-



Working :-

[DEPTH OF BIOLOGY]

→ The material whose particles are to be separated is first lavigated and the paste is transferred to the elutriation tank and mixed with a large quantity of water. The solid particles are uniformly distributed in the liquid by stirring and then it is allowed to settle down. It will either settle down or remain suspended in water depending upon the density of solid particles.

→ Through the outlets sample is withdrawn at different heights. These are dried and hence the powder with various size pattern are collected.

Uses :- [DEPTH OF BIOLOGY]

- Used in separation of particles of different size.
- More separation can be obtained as it is an continuous process.

Advantage :-

- ↳ Faster as compared to other method.
- ↳ Same number of tube of different cross section area can be connected depending upon the number of fraction required.

Disadvantage :-

- ↳ The suspension has to be diluted which may sometimes be undesirable.