FINAL EXAMINATION

FERMENTATION AND DOWN STREAM PROCESSING

Time : Three hours

Answer ALL questions.

PART A

1. Name one cationic and anionic detergent used for cell disruption.

Anionic Detergent:

- Sodium dodecyl sulfate
- Sodium deoxycholate
- Sarkosyl – (sarcosyl or sodium lauroyl sarcosinate)

Cationic Detergent:

- CTAB (Cetyl trimethylammonium bromide)
- ETAB (ethyl trimethylammonium bromide)

2. What is filter aid?

- Filter aid is a group of inert materials consisting of solid particles (as of diatomite) that improves filtering efficiency (as by increasing the permeability of the filter cake) and that is either added to the suspension to be filtered or placed on the filter as a layer through which the liquid must pass.
- The common filter aids are diatomaceous earth (DE), perlite, cellulose and others.
- There are several other special materials used as filter aids, including asbestos, cellulose, agricultural fibers, saw dust, rice hull ash, paper fibers etc.

3. Define buoyant force.

Buoyancy refers to a force that arises from the pressure exerted on an object by a fluid (a liquid or a gas). Since it's a force, we call it the buoyant force.

Buoyant Force, $F_{buoyant} = F_{up} - F_{down}$

F_{up} - Fluid on the top of the particle is pushing down

F_{down} - Fluid on the bottom of the particle is pushing up

4. Define isopycnic sedimentation.

Upon centrifugation, particles of a specific density sediment until they reach the point where their density is the same as the gradient media (i.e., the equilibrium position). The gradient is then said to be isopycnic and the particles are separated according to their buoyancy.

In isopycnic separation, also called buoyant or equilibrium separation, particles are separated solely on the basis of their density. Particle size only affects the rate at which particles move until their density is the same as the surrounding gradient medium. The density of the gradient medium must be greater than the density of the particles to be separated. By this method, the particles will never sediment to the bottom of the tube, no matter how long the centrifugation time

5. Define adsorption.

Adsorption is the phenomenon of accumulation of large number of molecular species at the surface of liquid or solid phase in comparison to the bulk.

On the basis of type of forces of attraction existing between adsorbate and adsorbent, adsorption can be classified into two types: Physical Adsorption or Chemical Adsorption.

- Charcoal is used as a decoloriser as it adsorbs the coloring matter from the coloured solution of sugar.
- Silica and alumina gels are used as adsorbents for removing moisture and for controlling humidity of rooms.
- Activated charcoal is used in gas masks as it adsorbs all the toxic gases and vapours and purifies the air for breathing. Adsorption processes are useful in carrying out heterogeneous catalysis.

6. Give the Freundlich equation.

An adsorption isotherm, is an empirical relation between the concentration of a solute on the surface of an adsorbent to the concentration of the solute in the liquid with which it is in contact.

$$\frac{x}{m} = kP^{\frac{1}{n}}$$

Where x is the mass of the gas adsorbed on mass m of the adsorbent at pressure p and k, n are constants whose values depend upon adsorbent and gas at particular temperature.

7. Define retention ratio.

Ratio of the distance that a compound moves to the distance that the eluent front moves.

In chromatography, it is the fraction of an analyte in the mobile phase of a chromatographic system.

$$R = \frac{\text{quantity of substance in the mobile phase}}{\text{total quantity of substance in the system}}$$

In planar chromatography,

$$R_f = \frac{\text{migration distance of substance}}{\text{migration distance of solvent front}}$$

8. Define Partition co-efficient.

The ratio of the concentrations of a solute in two immiscible or slightly miscible liquids, or in two solids, when it is in equilibrium across the interface between them.

The partition coefficient is defined as the ratio of unionized drug distributed between organic phase and aqueous phase at equilibrium.

9. What is lyophilisation?

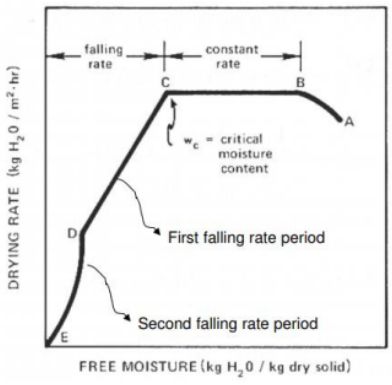
Free drying - A method of drying food or blood plasma or pharmaceuticals or tissue without destroying their physical structure; material is frozen and then warmed in a vacuum so that the ice sublimes.

It is a dehydration process typically used to preserve a perishable material or make the material more convenient for transport. Freeze-drying works by freezing the material and then reducing the surrounding pressure to allow the frozen water in the material to sublime directly from the solid phase to the gas phase.

10. Define first falling-rate period.

In the final stages of drying, known as the falling-rate period, the temperature of the product increases, causing water to move from the interior to the surface for evaporation.

A first falling drying rate occurs when wetted spots in the surface continually diminish until the surface is dried (Point D).



PART B

Multiple Choice Questions

Q.1: Which of the following is an upstream process

A. Media formulation
B. Product recovery
C. Product purification
D. Cell lysis

Q.2: Which of the following is a downstream process

A. Screening
B. Product recovery
C. sterilization of media
D. Inoculum preparation

Q.3: Cell lysis becomes an important operation if the product is

A. Extra cellular
B. Heat labile
C. Toxic
D. Intracellular

Q.4: Which of the following is true in case of extraction of any fermentation product

A. it should occupy less steps and take less time
B. it should occupy more steps and take long time
C. it should occupy less steps and take long time
D. it should occupy more steps and less time

Q.5: Which of the following factor increase the difficulties of products recovery

A. pH of the medium
B. only cell fragments,
C. Cell fragments, soluble and insoluble medium components
D. only insoluble medium components

Q.6: Many operations which are standard in the laboratory become

A. uneconomic at production level
B. always economic at production level
C. mostly economic at production level
D. time consuming at production level

Q.7: What is the percent range of variation in recovery costs of microbial products with respect to the total manufacturing costs?

A. 50%- 55%
B. 0%- 20%
C. 5%- 7%
D. 15%- 75%

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C. 5%- 7%
D. **15%- 75%**

Q.9: Precipitation is done by

A. PEG(polyethylene glycol)
B. Triazine dyes
C. Ammonium and sodium sulphate
D. All of the above

Q.10: If the product formed is extracellular then the method which is not used is

A. Reverse osmosis
B. Ultra filtration
C. Chromatography
D. Freeze thawing