

VU BIO MATES

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**Virtual University of Pakistan**

**BIO204**

**Biochemical Engineering**

**Final Terms Past Papers**

**Created by Team VU BIO MATES**

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1. Requirements to run a fermenter?
2. Batch and continuous ?
3. Parts of fermenter?
4. How sterilized product exhaust air.. Aisa he tha..
5. Richard sterilization cycle..
6. What is Chemostat?
7. Write any Two Risks described by Collins?
8. What is Sterilization?
9. Requirements to run a fermenter?
10. How sterilized product exhaust air?
11. Factors consider when designing a fermenter?
12. Richards' RAPID METHOD FOR DESIGNING OF STERILIZATION CYCLES?
13. Discuss Oxygen delivery system and Form control system?
14. Discuss batch and continuous sterlization process, filter Sterilization of Media, Sterilization of the Fermenter, Feeds and of Liquid Wastes?
15. Oxygen delivery in foam control system?
16. Recovery and purification?
17. Factors consider when designing a fermenter?
18. What is sterilization?
19. How does sterilize the fermenter exhaust air?
20. What is batch and continuous culture?
21. Richards method of integration?
22. Parts of fermenter?
23. Factors required for fermentation?
24. Write the equation of overall del factor?
25. Batch and continues culture in detail?

26. Explain  $d$  and  $y$  from equation?
27. Relatio of  $q_p$  and  $M$  (  $m_{ew}$ ) in fedbatch culture ?
28. What is Sterlization?
29. What is the parts of fermenter?
30. What are the requirement to run fermenter?
31. How sterlized the exhust air?
32. Richards rapid method for designing of sterlization cycles?
33. What is the first stage recovery of fermentation?
34. Del equation?
35.  $X_t/x_0 = e^{-kt}$
36. industrial waste treatment syatem factore?
37. Characteristics of fermenter seal?
38. Batch fermentation and contineou fermentation?
39. Techniques for the fermentation of in-situ fermentation products recover by Roffler et al 1984?
40. factors consider when designing a fermenter?
41. requirements for fermentation ?
42. Components of fermenter ?

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1. Write any Two Risks described by Collins? 2

**Risk such as those given by Collins (1992):**

1. The known pathogenicity of the micro-organism.
2. The virulence or level of pathogenicity of the microorganism are the diseases it causes mild or serious?
3. The number of organisms required to initiate an infection.
4. The routes of infection.
5. The known incidence of infection in the community and the existence locally of vectors and potential reserves.
6. The amounts or volumes of organisms used in the fermentation process.
7. The techniques or processes used.
8. Ease of prophylaxis and treatment



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2. What is Sterilization? 2
3. Requirements to run a fermenter? 2
4. How sterilized product exhaust air? 3

### **Sterilization OF FERMENTER EXHAUST AIR**

In many traditional fermentations the exhaust gas from the fermenter was vented without sterilization or vented through relatively inefficient depth filters. With the advent of the use of recombinant organisms and a greater awareness of safety and emission levels of allergic compounds the containment of exhaust air is more common (and in the case of recombinant organisms, compulsory). Fixed pore membrane modules are also used for this application but the system must be able to cope with the sterilization of water saturated air, at a relatively high temperature and carrying a large contamination level. Also, foam may overflow from the fermenter into the air exhaust line.

Thus, some form of pretreatment of the exhaust gas is necessary before it enters the absolute filter. This pretreatment may be a hydrophobic prefilter or a mechanical separator to remove water, aerosol particles and foam.

The pretreated air is then fed to a 0.2 $\mu$ m hydrophobic filter. Again, it is important to appreciate that the filtration system must be steam sterilizable. Figures in next slides illustrate the prefilter and mechanical separator systems respectively

5. Factors consider when designing a fermenter? 5
6. Richards' RAPID METHOD FOR DESIGNING OF STERILIZATION CYCLES? 5

### **Sterilization: Richards' RAPID METHOD FOR DESIGNING OF STERILIZATION CYCLES**

Richards (1968) proposed a rapid method for the design of sterilization cycles avoiding the time consuming graphical integrations. The method assumes that all spore destruction occurs at temperatures above 100°C and that those parts of the heating and cooling cycle above 100°C are linear. Both these assumptions reasonably valid and the technique loses very little in accuracy and gains considerably in simplicity.

Furthermore, based on these assumptions, Richards has presented a table of Del factors for *B. stearothermophilus* spores which would be obtained in heating and cooling a broth up to (and down from) holding temperatures of 101-130°C, based on a temperature change of 1°C per minute. This information is presented in Table (on next slide), together with the specific death rates for *B. stearothermophilus* spores over the temperature range.

7. Discuss Oxygen delivery system and Form control system? 10

The oxygen delivery system consists of: a compressor, an inlet air sterilization system, an air sparger exit air sterilization system.

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### **Fermenter Design: Oxygen Delivery System-Air Sterilization System-1**

Sterilization of the inlet air is undertaken to prevent contaminating organisms from entering the reactor.

### **Fermenter Design: Oxygen Delivery System-Air Sterilization System-2**

- Sterilization of the inlet and exit air in large bioreactors (>10,000 liters) can present a major design problem. Large scale membrane filtration is a very expensive process. The filters are expensive as they are difficult to make and the energy required to pass air through a filter can be quite considerable.

### **Fermenter Design: Oxygen Delivery System-Air Sterilization System-3**

- ✓ During sterilization the concept of "maintaining positive pressure" is often used.
- ✓ Maintaining positive pressure means that during sterilization, cooling and filling and if appropriate, the fermentation process, air must be pumped into the reactor.
- ✓ In this way the reactor is always pressurized and thus aerial contaminants will not be "sucked" into the reactor.
- ✓ It is very important that positive pressure is maintained when the bioreactor is cooled following sterilization. Without air being continuously pumped into the reactor, a vacuum will form and contaminants will tend to be drawn into the reactor

8. Discuss batch and continuous sterilization process, filter Sterilization of Media, Sterilization of the Fermenter, Feeds and of Liquid Wastes. 10

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Requirements to run a fermenter

Batch and continuous.

Parts of fermenter.

Factors consider when designing a fermenter..

Richard sterilization cycle

Chemostat

The growth of the cells in a continuous culture of this type is controlled by the availability of the growth limiting chemical component of the medium and, thus, the system is described as a **chemostat**.

Long 10 marks

Recovery and purification..

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Part of fermenter

Requirements to run fermenter

How to sterilize fermenter exhaust air?

Oxygen delivery system (10)

Recovery and purification of fermenter product

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