Register Number: ……

B.TECH DEGREE EXAMINATIONS: NOV/DEC 2010

Fifth Semester

BIOTECHNOLOGY

U07BT503: Bioprocess Principles

Time: Three Hours **Maximum marks: 100**

Answer ALL Questions

PART A (10 x 1 = 10 marks)

1. The organism used for the production of citric acid by fermentation is

   A. Aspergillus niger B. Aspergillus itaconicus C. Candida utilis D. Rhizopus arrhizus

2. Which device is used for measure the dissolved oxygen concentration in fermentation process

   A. Spectrophotometer B. DO Probe C. IR analyzer D. Conductance

3. Give an example of solidifying agents used in medium formulation

   A. Sucrose B. Nicotinic acid C. Agar D. Edamin

4. Yield coefficient is defined as

   A. Cell dry matter produced / Quantity of the carbon substrate utilized

   B. Quantity of the carbon substrate utilized / Cell dry matter produced

   C. Cell dry matter produced / Quantity of the nitrogen substrate utilized

   D. Cell dry matter produced / Quantity of the energy substrate utilized

5. The death kinetic rate constant k is similar to chemical reaction rate constant for a first order reaction and its dependence of temperature can be conveniently represented by

   A. Arrhenius equation B. Monod equation C. Growth equation D. Rate equation

6. The laboratory autoclaves used for sterilization are commonly operated at a steam pressure of about 30 psi. What is the temperature corresponding to this pressure

   A. 111^0C B. 141^0C C. 131^0C D. 121^0C

7. For chemoheterotrphs, a single substrate serves as both carbon and energy source, so that total substrate utilization may be written as

   A. $\Delta S = \Delta S_{assimilation} + \Delta S_{growth\ energy} + \Delta S_{maintance\ energy}$

   B. $\Delta S = \Delta S_{assimilation} + \Delta S_{growth\ energy}$

   C. $\Delta S = \Delta S_{growth\ energy} + \Delta S_{maintance\ energy}$

   D. $\Delta S = \Delta S_{assimilation} + \Delta S_{growth\ energy} + \Delta S_{energy}$

8. The total of all chemical reaction activities which occur in the cell is called

   A. Metabolism B. Metabolites C. Cell wall D. Chromosome

9. What is the unit for specific growth rate?

A. Hour B. Hour^{-1} C. Time D. No unit

10. How do you calculate μ_m and K_s in Monod equation?

A. By plotting 1/S Vs 1/μ B. By plotting S Vs μ

C. By plotting 1/S Vs μ D. By plotting S Vs 1/μ

PART B (10 x 2 = 20 marks)

11. What is the basic difference between fermentation and chemical reaction?
12. What are the general requirements of a fermentation process?
13. What are the essential attributes of an industrial medium in the fermentation process?
14. Differentiate complex natural media and synthetic media.
15. Define the efficiency of air filter in sterilization of air.
16. What is meant by "inactivation factor"? Give an expression for it.
17. Define yield factor.
18. How do you calculate the specific growth rate (μ)?
19. What is respiratory quotient?
20. What is Malthus law?

PART C (5 x 14 = 70 marks)

21. a) What are the different methods of controlling fermentation process conditions? Describe them briefly.

(OR)

b) Describe briefly the concept of design of a fermenter. What factors do you consider as essential for a successful design and operation of a fermenter?

22. a) (i) Describe simple and complex media with examples. (7)
(ii) Write a note on criteria of media. (7)

(OR)

b) Discuss in detail on medium requirements for fermentation process.

23. a) Explain atleast four methods of sterilization.

(OR)

b) Discuss in detail about thermal death kinetics and indicate the effect of temperature on it.

24. a) Explain the degree of reduction, available electrons and elemental balances.

(OR)

b) (i) Describe briefly the thermodynamic efficiency of growth. (7)
(ii) Write a note on oxygen requirement & heat evolution in aerobic cultures. (7)

25. a) (i) Describe the various phases of cell growth in a batch culture with a neat diagram. (7)
(ii) Describe the growth associated and non growth associated product formation in fermentation process. (7)

(OR)

b) (i) Explain the determination of μ_m and K_s in Monod model by linearizing it. (7)
(ii) Describe substrate inhibition and product inhibition on cell growth. (7)

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