

BITS PILANI , DUBAI CAMPUS
First Semester 2013-14
BIOT C441 / CHE C421 / CHE F421 Biochemical Engineering

Comprehensive Examination [Closed Book]

Max.Marks:40

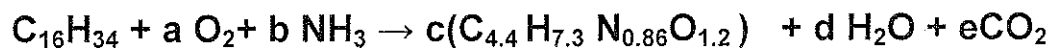
Date: 5-1-2014

Weightage: 40 %

Duration: 3h

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1. Give two points comparing the internal structure of prokaryotes with eucaryotes(1)
 2. Cite any two biological functions of Lipids(1)
 3. Contrast the similarities and difference between starch and glycogen(1)
 4. Contrast the advantage and disadvantage of the immobilization of enzyme(1)
 5. Explain the role of precursor in media formulation with suitable example(1)
 6. What is the potential importance of clavulanic acid in penicillin therapy?(1)
 7. Is it proper to use penicillin G orally? Why not?(1)
 8. What are (i)apoenzymes (ii) haloenzymes (iii)cofactors? (1.5)
 9. Write a note on irreversible inhibition using suitable example (1.5)
 10. How the following support material is activated by covalent attachment method (i) polysaccharides (ii) aromatic amino derivatives?(2)
 11. Explain how the pH of the microenvironment is affected by immobilization of enzymes.(2)
 12. Name the enzyme used in (i) meat tenderizing (ii)cheese preparation (iii) Penicillin G conversion to 6-aminopenicillanic acid (iv) converts cellobiose to glucose(2)
 13. Describe the growth pattern of microorganism in a batch culture and discuss its kinetics.(2)
 14. Write a note on the enzymatic hydrolysis of starch to glucose (2)

15. Give any four important criteria when choosing an organism for inoculation in a biochemical processes.(2)
16. In a chemostat with cell recycle, the feed flow rate and culture volume are $F=100\text{ml/h}$ and $V=1000\text{ml}$ respectively. If the system is operated under glucose limitation, find the specific growth rate if $C=1.5$ and $\alpha=0.7$ (2)
17. Drive an expression for the growth rate in a chemostat at steady state.(2)
18. Outline the product recovery strategy followed for any one commercially important product produced through biochemical route.(2)
19. Show that the rate of an enzyme-catalyzed reaction following Michaelis-Menten model is proportional to the amount of enzyme? How the rate will change at very high and very low substrate concentration?(4)
20. Calculate the stoichiometric coefficient for the following reaction if two third of the substrate carbon is converted to biomass. Also calculate the yield coefficient $Y_{x/s}$ and Y_{x/o_2} , and the respiratory quotient(4)



21. A medium containing a vitamin is to be sterilized at 121°C . Assume the number of spores initially present is 10^5 /L and the initial concentration of vitamin is 30mg/L . Find the concentration of vitamin in the sterilized medium for 10L and $10,000\text{L}$ fermenters, if the risk of contamination is 1 in 1000. For the spores E_{act} and Arrhenius constant is 273kJ/g mol and 10^{36}min^{-1} respectively while that for vitamin is 41.9kJ/g mol and 10^4min^{-1} . Ignore the effect of the heat up and cool down periods.(4)

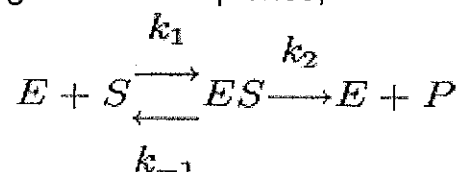
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Test 1 [Closed Book]

Max.Marks:25
Weightage: 25 %

Date: 2-10-2013
Time: 50min

1. Mention any two reasons which make DNA less reactive than RNA (2)
2. Give any two examples of carbohydrate with β -glycosidic linkages (1)
3. Give two examples of homo polymeric carbohydrate.(1)
4. Write a note on the structure of protein(3)
5. Give any two advantages and disadvantages of enzymes over chemical catalysts (2)
6. Explain irreversible inhibition using a suitable example(2)
7. Which is the rate determining step in Michaelis-Menten kinetics? (2)
8. Consider the following reaction sequence,



Develop a suitable rate expression for the product formation by using the quasi steady state approach.(6)

9. An inhibitor Y is added to an enzymatic reaction at a level of 1.2g/L .
Line weaver Burke equation and the plot for the reaction are given as follows,

$$\frac{1}{V} = \frac{K_m}{V_{max}[S]} \left(1 + \frac{[I]}{K_i} \right) + 1/V_{max}.$$

Given $K_m = 10\text{g/L}$, V_{max} is 1.818 and the slope is 2.34. Find (a) K_i (b) Identify the type of inhibition and justify the answer. Suggest a way to overcome this inhibition (6)