

# Department of Biochemical Engineering & Biotechnology

BEL 720 (Biotechnol. in Food Processing)

Major Test II, Semester - II

Date : 02.05.2008

Time : 8 AM - 10 AM

Venue : I - 313

Marks : 50

1. a) Describe any processed meat product available in the market. How size reduction is important in preparation of meat product? .....(5)

b) The characteristics of the composite waste and the plant capacities of several food industries are given below. Evaluate the population equivalent of the waste waters as given in the table.

(20)

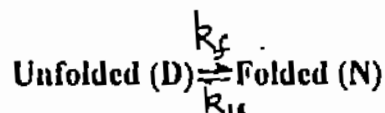
Food Industry	Waste Water	Meat processing		Citrus Cannery	Potato Processing
		Slaughter	Stock yard		
Capacity, day <sup>-1</sup>		1000 hog	3000 acres	100 tons	10,000 lbs
Vol., gals		200/hog	23,000/acre	1000/ton	2/lb
BOD 5(20°C), ppm		900	64	2100	1250
Total Suspended Solids (TSS), ppm		645	173	7200	1650
Volatile Suspended Solids (VSS), ppm		580	132	-	-
Organic N <sub>2</sub> , ppm		113	11	-	-
Ammonia N <sub>2</sub> , ppm		-	8	-	-
Population Equivalent		? per hog	? per acre	? per ton	? per 1000 lbs

2. Describe the preparation of the following processed foods for preservation.

.....(5x5=25)

- Canned Cauliflower
- Fermented Cabbage
- Canned 'Rasogullas'
- Freeze dried peas.
- Maggi Noodles.

3. *Staphylococcus aureus* is a pathogen in food and environment. It has B domain of protein A (BdpA) which is said to be a factor responsible for its pathogenesis. Its native (N) and denatured (D) forms were examined. Consider equilibrium condition, proteins are distributed between (N) or folded and denatured D (or unfolded) forms.



For two-state folding proteins like BdpA from *Staphylococcus aureus*, only N and D states are significantly populated under all experimental conditions. For BdpA, the equilibrium constant for folding ( $K_{eq,f}$ ) can be as high as 3000 under native conditions. Urea is a naturally occurring osmolyte and can denature proteins by stabilizing the D state relative to N state. The process of denaturation occurs by perturbing the folding ( $k_f$ ) and unfolding ( $k_u$ ) rate constants. Protein denaturation in the presence of urea lowers  $K_{eq,f}$  to a value that is proportional to the concentration of the osmolyte under the conditions of experiment. Calculate the following for BdpA under native ( $K_{eq,f} = 3000$  in OM urea) and denaturing conditions ( $K_{eq,f} = 26$  in the presence of 2 M urea).

- Concentration of N and D if starting protein concentration is 1 m M (5)
- Free energies of folding and unfolding (37°C) (5)
- Unfolding rate constants if folding rate constants (5)
  - . in OM urea  $k_f = 160000 \text{ sec}^{-1}$
  - . in 2 M urea  $k_f = 22000 \text{ sec}^{-1}$
- Unfolding and folding rates (5)
- Time required to unfold and fold the protein (5)

(Value of  $R = 1.987 \text{ Cal } ^\circ\text{K}^{-1} \text{ mol}^{-1}$ )

4. Distinguish between (5x2=10)
- Proximate principles and ultimate principles of food.
  - Roll crusher and ball mill in cereal food milling
  - Processing and preservation of food.
  - Damping oscillation and overshoot.
  - Saliva and pancreatic juice.