



**KERALA AGRICULTURAL UNIVERSITY**  
**B.Tech.(Food Technology) 2021 Admission**  
**IV Semester Final Examination – August 2023**

Pafe.2220

**Unit Operations in Food Processing- II (2+1)**

**Marks: 50**  
**Time: 2 hours**

**I Fill in the blanks (10x1=10)**

1. The decimal reduction time is the time required to destroy ..... % of the microorganisms.
2. Economy of multiple effect evaporator is .....
3. .... is defined as condition in which pure water can exists in all three states i.e. solid, liquid and vapor.
4. The unit of thermal conductivity in SI unit is .....
5. The value of universal gas constant R is ..... J/K-mol.

**State True or False**

6. Sterilization destroys only gram negative bacteria not the gram positive bacteria.
7. Evaporators are more efficient compared to dryers.
8. By reducing the pressure, the boiling point of the liquid can be increased.
9. UHT processing is also known as aseptic processing.
10. TDT curve is drawn between temperature v/s log (survivors).

**II Write short notes on ANY FIVE of the following (5x2=10)**

1. Explain the working principal of single effect evaporator.
2. What is freezing point depression?
3. During freeze drying process, which factors control the water vapour pressure gradient?
4. How the boiling point rise can be calculated for real solutions?
5. What is commercial sterilization?
6. Explain any two chemical reactions taking place during frying, which may affect the quality of oil.
7. What is the purpose of blanching in fruit and vegetables processing?

**III Answer ANY FIVE of the following (5x4=20)**

1. Describe the freezing curve of water and food.
2. What are the advantages and disadvantages of roasting?
3. Describe any two types of crystallization equipment's used in food industry.
4. A solution needs to be concentrated using single effect evaporator from 10% solid to 30% solid at the rate of 250 kg/h. If the pressure in the evaporator is 77 kPa absolute, and if steam is available at 200 kPa gauge, calculate the quantity of steam required per hour and the area of heat transfer surface if the overall heat transfer coefficient is  $1700 \text{ J m}^{-2} \text{ s}^{-1} \text{ }^\circ\text{C}^{-1}$ .  
Assume that the temperature of the feed is  $18^\circ\text{C}$  and that the boiling point of the solution under the pressure of 77 kPa absolute is  $91^\circ\text{C}$ . Assume, also, that the specific heat of the solution is the same as for water, that is  $4.186 \times 10^3 \text{ J kg}^{-1} \text{ }^\circ\text{C}^{-1}$ , and the latent heat of vaporization of the solution is the same as that for water under the same conditions.  
Given Data: The condensing temperature of steam at 200 kPa (gauge)[300 kPa absolute] is  $134^\circ\text{C}$  and latent heat  $2164 \text{ kJ kg}^{-1}$ ; the condensing temperature at 77 kPa (abs.) is  $91^\circ\text{C}$  and latent heat is  $2281 \text{ kJ kg}^{-1}$ .
5. Describe the various parameters considered for designing freezing systems.

6. The decimal reduction times  $D$  for a spore suspension were measured at several temperatures, as follows:

Temperature (°C)	D (min)
104	27.5
107	14.5
110	7.5
113	4.0
116	2.2

Determine the thermal resistance constant  $z$  for the spores.

7. Draw schematic diagram of vacuum frying system and explain the working principle, advantages and applications of vacuum frying system.

**IV Write an essay on ANY ONE of the following**

**(1x10=10)**

1. Briefly describe the evaporation equipment's used in food industry.
2. Briefly describe aseptic processing and packaging process.

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