53 (FPT 812) CADH

2015

CONCENTRATION AND DEHYDRATION OF FOODS

Paper : FPT 812

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(i)* What is dehydration ? Write some advantages of dehydration. 1+5=6

   (ii) Explain the drying rate curve with proper diagram. 6

   (iii) What are the factors influencing the dehydration of foods ? 4

(iv) Write ***true*** or ***false*** : 4

(a) When a food attains a moisture content in equilibrium with its surroundings and there is no moisture transfer between the food and its surroundings is called Equilibrium moisture content.

(b) The drying rate in grains is mainly limited by the diffusion of moisture from inside the product to surface.

(c) Faster drying can be achieved in hot air oven than tray dryer at 80°C.

(d) Unbound moisture cannot be removed from any food product.

2. (i) 300 *kg* of paddy is dried from 22% *(wb)* to 12% *(db)* moisture content. Calculate the following after 70% of original moisture content has been removed from the initial sample paddy — 10

(a) Amount of water loss

(b) Final weight of the product

(c) Moisture content of the final product

(d) Composition of the final product.

(ii) Write the principle of drum drying. Explain its working and construction diagramatically. 1+5=6

(iii) Derive the relationship between wet weight basis and dry weight basis moisture content. 4

3. (i) A continuous single-effect evaporator is to be fed with 5000 kg/h of solution containing 1wt% solute. The feed is at temperature of 303k. It is to be concentrated to a solution of 2wt% solute. The evaporation is at atmospheric pressure (101·3kPa) and the area of evaporator is 69.7m^2. Saturated steam supplied at 143·3 kPa for healing. Calculate the amount of vapour and liquid product and the overall heat transfer coefficient. 10

(ii) What is boiling point Elevation ? How is it calculated ? Give example. 1+3=4

(iii) Explain the working principle of rising film evaporator with proper diagram. Write one advantage and one disadvantage of rising film evaporator. 4+2=6

4. (i) Define Psychrometry. Discuss the properties of moist air. 1+6=7

(ii) The ambient air at 50°C dry bulb temperature has 15% *RH* at atmospheric pressure. Find the following : 7

(a) Partial pressure of water vapour

(b) Relative humidity

(c) Specific humidity

(d) Degree of saturation

(e) Enthalpy of moist air

(f) Humid volume of moist air.

(iii) Distinguish between : 2×3=6

(a) Relative humidity and specific humidity.

(b) Moist air and saturated air

(c) Dew point temperature and wet bulb temperature.

5. *(i)* Define Concentration. How many types of concentration process are there ? Describe briefly. 1+6=7

(ii) What is a membrane separation process ? Classify membrane separation process based on their molecular size and explain. 1+8=9

(iii) Calculate the osmotic pressure of apple juice that contains 15% total solids at $18°C$. Assume that the density of the juice is $1350\,kg\,m^{-3}$, the predominant sugar affecting the osmotic pressure is glucose ($180\,kg/mol$) and the universal gas constant $8{\cdot}314 m^3\ kPa/mol k$. 4

6. *(i)* What do you know by freeze concentration ? Describe the working principle of freeze concentration. 1+4=5

(ii) What is the function of separators in freeze concentration ? Write about the various types of separators. 1+9=10

(iii) Give reason : 1×5=5

(a) High bulk supercooling decreases the nucleation rate.

(b) Aroma loss occur during direct method of crystallization.

(c) Freeze concentration cannot proceed beyond eutectic concentration.

(d) Concentration polarization decreases the efficiency of electrodialysis process.

(e) Fouling decreases the processing capacity of evaporator.

7. (i) Draw the phase diagram of water and explain the freeze drying process based on it. 5

(ii) Write short notes : 4×3=12

(a) Heat and mass transfer in freeze drying

(b) Types of atomizers

(c) Vapor recompression

(iii) Write some applications of freeze dryer. 3
