



**UNIVERSITY OF SWAZILAND**

**FACULTY OF HEALTH SCIENCES**

**B.Sc. ENVIRONMENTAL HEALTH SCIENCE AND  
FOOD SCIENCE**

**SEMESTER I**

**SUPPLEMENTARY EXAMINATION PAPER–JULY  
2018**

**TITLE OF PAPER:** FOOD PROCESSING

**COURSE CODE:** EHM323

**DURATION:** 2 HOURS

**INSTRUCTIONS:**

1. READ THE QUESTIONS CAREFULLY.
2. ANSWER ANY 4 QUESTIONS.
3. EACH QUESTION CARRIES 25 MARKS. WHERE A QUESTION IS SUBDIVIDED INTO PARTS, THE MARK FOR EACH PART IS SHOWN IN BRACKETS.
4. NO PAPER SHOULD BE BROUGHT INTO THE EXAMINATION ROOM.
5. WRITE NEATLY AND CLEARLY
6. BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.

**SPECIAL REQUIREMENTS:** NONE

**DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE  
INVIGILATOR.**

**QUESTION 1**

- a. Using the psychrometric chart attached at the end of the exam paper, estimate the following:
- The relative humidity of air having a wet bulb temperature of 20°C and a dry bulb temperature of 30°C. [2 marks]
  - The absolute humidity of air that has RH of 40% and dry bulb temperature 47°C. [2 marks]
  - The RH when the dry bulb temperature is 33°C and wet bulb temperature is 20°C. [2 marks]
- b. Using a diagram to illustrate, describe the mechanisms involved in the drying of food using heated air. [10 marks]
- c. Describe the process of freeze drying. [9 marks]

**[TOTAL: 25 MARKS]**

**QUESTION 2**

- a. Define the following terms:
- Foam. [2 marks]
  - Emulsion. [2 marks]
  - Surface tension. [2 marks]
  - Specific heat. [2 marks]
  - Latent heat. [2 marks]
- b. State Kick's Law. [2 marks]
- c. List the factors that influence extent of size reduction. [4 marks]
- d. Discuss the benefits of size reduction in food processing. [9 marks]

**[TOTAL: 25 MARKS]**

**QUESTION 3**

- a. With the aid of a diagram, discuss the relationship between thermal death time (D-value) and heating temperature. [5 marks]
- b. State the factors that influence the rate of heat transfer during the heat treatment of food. Use an equation to show this relationship. [7 marks]
- c. Discuss the importance of the boundary film during heat transfer. [5 marks]

- d. What are the benefits of blanching during processing of fruits and vegetables? [8 marks]

[TOTAL: 25 MARKS]

#### QUESTION 4

- a. A liquid ( $100 \text{ kg h}^{-1}$ ) containing 12% solids is to be concentrated to produce a liquid containing 32% solids.
- Use a diagram to show the mass flow. [5 marks]
  - Write equations to show the total balance and solids balance given that the mass of water to be removed is  $m$ , and mass of concentrate produced is  $C$ . [2 marks]
  - How much water is removed per hour? [5 marks]
- b. Discuss the concept of streamline and turbulent flow of fluids with respect to:
- Flow rate. [3]
  - Reynold's number. [5]
  - Viscosity and density. [5]

[TOTAL: 25 MARKS]

#### QUESTION 5

- a. Distinguish between the following terms:
- Pasteurization and sterilization. [4 marks]
  - Direct heating and indirect heating. [6 marks]
  - Sorting and grading. [4 marks]
  - Chilling and freezing. [4 marks]
- b. Discuss the application of irradiation in food under the following headings:
- Sterilization of food. [4 marks]
  - Control of sprouting. [3 marks]

[TOTAL: 25 MARKS]

# Psychrometric Chart

SI (metric) units  
Barometric Pressure 101.325 kPa (Sea level)  
based on data from  
Carrier Corporation Cat. No. 794-001, dated 1975

