



UNIVERSITY OF SWAZILAND

FACULTY OF HEALTH SCIENCES

B.Sc. ENVIRONMENTAL HEALTH SCIENCE AND
FOOD SCIENCE

SEMESTER I

FINAL EXAMINATION PAPER - DECEMBER 2016

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: CALCULATOR

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

QUESTION 1

- a. Explain how moisture content of food affects size reduction. [5]
- a. Explain the differences between the following pairs of terms:
 - i. Streamline flow and turbulent flow of fluids. [5]
 - ii. Newtonian and pseudoplastic liquids. [5]
 - iii. Sorting and grading. [5]
- b. Using wheat as an example, briefly explain why sorting may be needed and how this is achieved. [5]

[25 Marks]

QUESTION 2

- a. Discuss the mechanism of drying food under the following headings:
 - i. Drying using hot air. [12]
 - ii. Freeze-drying. [7]
- b. Using the **psychrometric chart attached**, estimate the following:
 - i. The relative humidity (RH) of air having a wet bulb temperature of 20°C and a dry bulb temperature of 30°C. [2]
 - ii. The wet bulb temperature when RH is 40% and dry bulb temperature 55°C. [2]
 - iii. The moisture content of air when the RH is 10%, and dry bulb temperature is 65°C. [2]

[25 Marks]

QUESTION 3

- a. Name the three mechanisms of heat transfer in food. [3]
- b. List the factors that influence the rate of heat transfer during heat treatment of food. [6]
- c. Describe the process and discuss benefits of using multiple effect evaporators in food processing. Use examples to illustrate your answer. [9]
- d. List the changes that take place during extrusion cooking of food. [7]

[25 Marks]

QUESTION 4

- a. Define Lethality. [2]
- b. Discuss the effects of irradiation on food. [7]
- c. Calculate the temperature increase during irradiation when a Dose of 20 kGray is used on 1kg of food with a specific heat capacity of $4^{\circ}/\text{kg}$. [4]
- d. Use a schematic diagram to illustrate the law of conservation of mass (mass balances). [3]
- e. Skim milk is prepared by the removal of some of the fat from whole milk. This skim milk is found to contain 90.5% water, 3.5% protein, 5.1% carbohydrate, 0.1% fat and 0.8% ash. If the original milk contained 4.5% fat, calculate its composition (i.e. mass of protein, fat, carbohydrate, fat and ash) assuming that fat only was removed to make the skim milk and that there are no losses in processing. Assume the amount of skim milk produced is 100kg. [9]

[25 Marks]

QUESTION 5

- a. Using Bernoulli's equation for fluid flow, briefly explain the principle of energy conservation. [5]
- b. Bernoulli's equation has practical application in liquid pumping during food processing. Describe factors that influence the energy required to pump liquid from one part of the plant to another. [5]
- c. Distinguish between pasteurization and sterilization. [5]
- d. Use a diagram to explain why freezing food is quicker than thawing. [5]
- e. Use a diagram to illustrate the concept of thermal death time (TDT) and state its uses. [5]

[25 Marks]

END OF EXAMINATION PAPER

