



**UNIVERSITY OF
SWAZILAND**

FACULTY OF HEALTH SCIENCES

B.Sc. ENVIRONMENTAL HEALTH AND FOOD SCIENCE

SUPPLEMENTARY EXAMINATIONS

TITLE OF PAPER: FOOD PROCESSING

COURSE CODE: EHM323

DURATION: 2 HOURS

DATE: JUNE/JULY 2014

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. BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER

SPECIAL REQUIREMENTS: CALCULATOR

DO NOT OPEN THE QUESTION PAPER UNTIL INSTRUCTED TO DO SO BY THE INVIGILATOR.

QUESTION 1

- The thermal efficiency of spray drying is improved by increasing the inlet air temperature. Discuss this statement. Use equations where necessary. [10]
- Discuss the benefits of energy conservation in food processing. Use examples to illustrate your answer. [15]

[25]

QUESTION 2

- Explain the difference between Newtonian and non-Newtonian fluids. [10]
- Skim milk is prepared by the removal 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, assuming that fat only was removed to make the skim milk and that there are no losses in processing. [5]
- Milk and rape seed oil are flowing along pipelines of the same diameter (5cm) at 20°C and at the same flow velocity of 3m s⁻¹. Determine whether the flow is streamline or turbulent in each fluid. [Milk: $\mu=2.10 \times 10^{-3} \text{ N s m}^{-2}$, $\rho = 1030 \text{ kg m}^{-3}$; Rape seed oil: $\mu = 118 \times 10^{-3} \text{ N s m}^{-2}$, $\rho = 900 \text{ kg m}^{-3}$]. [10]

[25]

QUESTION 3

Briefly discuss the following phenomena associated with the transfer of fluids:

- Boundary layer. [5]
- Streamline and turbulent flow. [10]
- Newtonian fluids. [10]

[25]

QUESTION 4

Discuss factors affecting rate of heat transfer under the following headings:

- Specific heat capacity. [5]
- Heat film coefficient. [10]
- Turbulent and streamline flow. [10]

[25]

QUESTION 5

- a. Using the psychrometric chart attached, calculate the following:
- i. The relative humidity of air having a wet bulb temperature of 20°C and a dry bulb temperature of 30°C . [2]
 - ii. The humidity ratio of air that has RH of 40% and dry bulb temperature 60°C . [2]
- b. Discuss the mechanism of drying food under the following headings:
- i. Constant rate period. [5]
 - ii. Falling rate period. [10]
- c. Briefly describe the reactions that take place during the drying of food. [6]

[25]

THE END

Psychrometric Chart

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

