

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE HONOURS DEGREE EXAMINATIONS

DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

THEORY: FOOD TECHNOLOGY LSBB 4106

DECEMBER 2001

3 HOURS (100 marks)

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INSTRUCTIONS

Answer Four (4) Questions. Two questions should be from Section A and two from Section B. Each question carries 25 marks. Where a question contains subdivisions, the mark value for each subdivision is given in brackets. Illustrate your answer where appropriate with large, clearly labelled diagrams.

SECTION A

- a) Discuss briefly the value of the following operations in food processing:
cleaning, sorting, mixing, size reduction (12 marks)
- b) Whole milk is being concentrated from 13 per cent total solids to a final concentrate containing 32 percent total solids. This concentration is done by taking a portion of the whole milk, concentrating it to 50 percent total solids and mixing it with the remainder of the whole milk to obtain the final product. In producing 5000 kg h⁻¹ of the concentrate:-
- i) How much water is removed each hour? (3 marks)
- ii) How much of the raw and concentrated streams enter the mixer each hour? (5 marks)
- c) List any three mechanical separation techniques, and describe the separation principles of any two of the listed techniques. (5 marks)
- 2.a) Discuss the general effects of heat processing on the nutritional and sensory properties of food, and on microorganisms. (20 marks)
- b) A tubular heat exchanger is being used to cool 1200 kg h⁻¹ of a viscous mix (soup) from 79°C to 10°C, using chilled water in a counter-current process. The chilled water enters at 1°C and leaves at 5°C. Use the data below to answer the following questions.
- i) What is the overall heat transfer coefficient for the heat exchanger and which is the limiting resistance to heat transfer? (3 marks)
- ii) What is the surface area of the heat exchanger? (2 marks)

DATA

Specific heat of soup = 3.8 kJ kg⁻¹ K⁻¹

Heat film coefficient for mix = 200 Wm⁻² K⁻¹

Heat film coefficient for water = 500 Wm⁻² K⁻¹

Thermal conductivity of the heat exchanger tube = 16 Wm⁻¹ K⁻¹

Tube thickness = 2mm

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Give an outline of the steps involved in the preparation of grain for milling. Draw simple sketch diagrams to aid in explaining each preparation step. (14 marks)

- b) During the milling of wheat, a factory produces 10 000kg of flour and 950kg of non-flour material per day.
- i) Calculate the extraction rate of the flour produced and comment on the value obtained. (3 marks)
 - ii) What are the nutritional implications of high and low extraction rate flours. Comment on the shelf life of the flour and bakery goods produced using these two types of flour. Why is aging necessary in the production of white flour. (8 marks)

END OF EXAMINATION PAPER

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