Intermediate Food Dehydration and Drying

Assignment 1: (Worth a total of ___ marks)

Based on “Chapter 1: Getting Started” and “Chapter 2: Thermal Properties of Food Materials” in the Intermediate Course in Food Dehydration and Drying manual.

1. A store operator has a refrigerated storage room into which she places fresh local fruits and vegetables that are bought from area farms. One hot afternoon, a delivery truck brings the following produce to her store:

   300 pounds of bananas
   250 pounds of apples
   150 pounds of okra

   The temperature of the produce has risen to 26°C while being transported.

   How much heat must be removed from this shipment to cool it down to 10°C in the refrigerated storage room? ___ (marks)

   Please note: The weights of the materials are given in pounds. You will need to convert them to kg for this calculation. You will need to search through Chapter 2 to find the specific heat capacities for the bananas, apples, and okra.

2. Firm ripe tomatoes have a moisture content of approximately 94% on a wet basis. Using the appropriate equation, calculate the specific heat capacity of the tomatoes to three decimal places. ___ (marks)

   Hint: Assume the solids that are present are “ash”.


3. Calculate the values of "X" in the following diagrams. (2 marks each for a total of 6 marks).

Part a:

X kg of water

100 kg at 84% moisture → 70 kg product at 77.1% moisture

Part b:

100 kg of water

250 kg at 88% moisture → X kg of product

Part c:

400 kg of water

X kg at 92% moisture → 350 kg of product
4. Prepare a process flow diagram (PFD) to show the steps involved in preparing yams (or potatoes) for serving at a meal. Start your diagram with a square labelled “Digging of yams” or “Harvesting of Yams”. Be sure to include each key step in the entire process. Just to make things more interesting, we will also add a sauce to the cooked yams just before eating. The last square in your diagram should probably be labelled “Eating” or “Consumption”. Do not worry about how the sauce is prepared. ( marks)

5. From your own personal experience, describe the differences (if any) between a fresh fruit or vegetable and the same material which has been dried and then rehydrated in water before you eat it. Feel free to select any fruit or vegetable to use in your answer. ( marks)

6. Calculate the amount of heat that must be removed from 35 kg of banana paste (purée) to freeze it. The paste is processed from fresh bananas at 30°C and must be cooled to -18°C in a freezer. The relevant data about bananas can be found in Table 2-1. ( marks)

7. Students in my class often calculate specific heat capacities (Cp values) for various food products and get results that I consider to be too large. I tell them that the maximum Cp value that you can have for any food material is 4.187 kJ/kg C°. Why is this true? ( marks)

Hint: You will need to know what the specific heat capacity of 4.187 kJ/kg C° represents. I’m looking for a word explanation here that is based on equation 2-1.