BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
FIRST SEMESTER 2023-24
BIOT F424 Food Biotechnology
COMPREHENSIVE EXAMINATION (Open/ Close Book)

Max. Marks: 80M **Time: 3hrs** **Date: 08/12/2023**

Note: Don't jumble up the subparts of a question. Attempt all the subparts together. Support your answer with proper justification and diagrams.

PART- A (Closed Book)

Maximum Marks: 55M **Maximum Duration: 120 min**

Q1.

a) What are the three "R" in solid waste management? Which is most preferred and which one is least preferred? **3M**

b) What do you understand by Filter cake? Describe various factors which affect the filtration process? **4M**

Q2.

a) Which is more advantageous: Fast freezing or slow freezing? Why? **3M**

b) What is freeze drying? Explain the principle behind the technique (Draw a labelled graph). In what kind of food items this is used. Give an example of same. **4M**

Q3.

a) How does radiation help in the preservation of food? Explain the direct and the indirect effect of radiation on the food product. What are the benefits and drawbacks of using radiation for food preservation instead of thermal processes? **5M**

b) How the moisture content in the food affect its preservation by the process of irradiation? Explain in detail. How it can be known if the food has been irradiated? **2M**

Q4.

a) Differentiate between red and white wine in terms of their raw material, their processing and packaging? **4M**

b) What is the role of hop in beer making? Why beer fermentation is carried out in cold conditions? **3M**

Q5.

a) How does fermentation modify the nutraceutical profile of foods? Mention a few specific points. **2M**

b) According to Nutraceutical Bioavailability Classification Scheme (NuBACS), what are the major factors that determine or affect the bioavailability of nutraceuticals? Mention briefly. **3M**

Q6.

a) Explain the role of withering in the processing of tea. How instant tea packs are made for black tea? **3M**

b) Explain the mechanism of degumming. In the processing of which food material, it is used and what is its role? **3M**

c) What do you understand by dye reduction test? With the help of an example describe the same. **3M**

Q7.

a) Explain the following diagram (both A and B) in terms of process of emulsification **3M**

A B

b) Describe the structure of an emulsifier. Explain its mode of action in oil/ water emulsion **3M**

Q8.

a) Explain the process of milk coagulation in detail for the production of cheese. **4M**

b) Describe the mechanism of action of probiotics. How they prevent the colonization of pathogenic or harmful bacteria? **3M**

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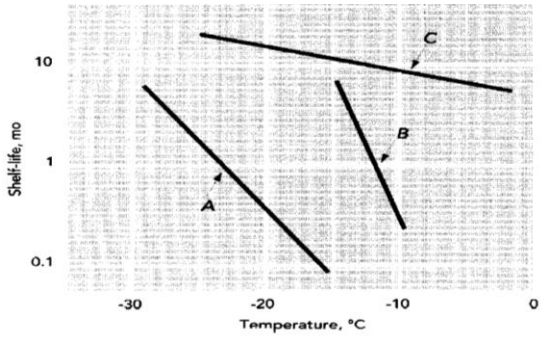
PART- B (Open Book)

Maximum Marks: 25M **Maximum Duration: 60 min**

Q1. List the three common hazards encountered in processing of alcoholic beverages like beer. What are the critical control points and the critical limits in the processing of same? **4M**

Q2. In the given graph, showing the shelf life of different frozen food products (A, B and C) as influenced by the storage temperature, which is the most desirable situation for freezing? Justify your choice. **3M**

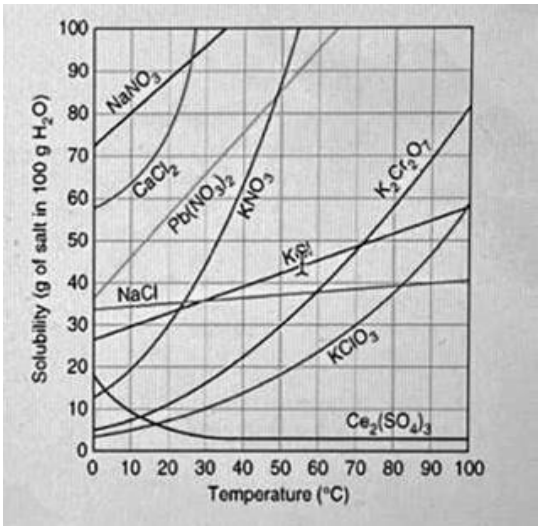


Q3. a) You are working in a company which deals with corn and maple syrups. You need to increase the shelf life of these syrup solutions. What different preservation method and the specific equipment will be used for the same? **2M**

b) Compare the coffee grown in shade and sun in term of their benefits and drawbacks. **2M**

Q4. The adjacent figure shows the solubility curve for different compounds. Answer the following questions based on this graph: **3M**

a) Which substance is most soluble at 10° C?
b) If 60g of KCl is dissolved in 100 g of water at 70°C, would the solution be unsaturated, saturated, or super-saturated?
c) How many grams of $Pb(NO_2)_2$ at 10°C must be added to 100 g of water to form a saturated solution?



Q5. a) The D10-values for E. coli 0157:H7 (in ground beef patties) and for Salmonella spp. (in turkey breast meat) at 5°C is 0.27 and 0.71 kGy, respectively. What dose would be required for a 5D process for each of these pathogens under those conditions? **3M**

b) To kill the *C. botulinum* spores, radiation of 200kGy is required. How then the food be sterilized by radiation? **2M**

Q6.

a) Milk is a secretion from mammary gland of female mammals. Due to its high nutritional value, it a good medium for microbial growth which could render it to be unfit for human consumption. To ensure it is safe for consumption, various preservation methods have been developed over the years. This results in production of wide range of milk products which greatly enhance its utilization and safety. Outline three important preservation steps and its purpose in the production of 10000 packages of unsweetened condensed milk that are shelf stable in ambient condition. You are given the standardized liquid milk as the raw material to start with. **3M**

b) Give an example with details where we can achieve zero discharge of agro waste. **3M**