



Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Food Microbiology
Program: M.Sc. Nutrition and Dietetics
Course Code: HSMB8001
Instructions:

Semester: III
Duration: 03 hrs.
Max. Marks: 100

	SECTION A (Type the answers in test box)	(20Q x1.5M= 30 Marks)	CO
	MCQs or Fill in the blanks		
Q1	Deterioration of cultures may result from a) Improper handling b) Cultivation c) Frequent transfer over long periods in an inadequate culture medium d) All the above	1.5	CO1
Q2	Addition of which acid makes milk more digestible to infants? a) Citric acid b) Gluconic acid c) Amino acid d) Lactic acid	1.5	CO1
Q3	Soil stocks are preserved by a) freeze drying b) glycerol stocks c) drying d) heat fixing	1.5	CO1
Q4	Impure mixed cultures are required for the production of a) citric acid b) lactic acid c) vinegar d) alcohol	1.5	CO1
Q5	Which of the following produces citric acid? a) Aspergillus b) Pseudomonas c) Saccharomyces d) Clostridium	1.5	CO2
Q6	Which alga can be used as food for the human being?	1.5	CO2

	<ul style="list-style-type: none"> a) Chlorella b) Polysiphonia c) Ulothrix d) Spirogyra 		
Q7	<p>Find the incorrectly matched pair</p> <ul style="list-style-type: none"> a) Serratia – Drug addiction b) Spirulina – Single cell protein c) Rhizobium – Biofertilizer d) Streptomyces – Antibiotic 	1.5	CO2
Q8	<p>The major factors involved in the spoilage of stored grains by molds include</p> <ul style="list-style-type: none"> a) Microbial content b) Moisture levels above 12% c) Physical damage d) All of the above 	1.5	CO2
Q9	<p>In bread Bacillus subtilis causes</p> <ul style="list-style-type: none"> a) Decay b) Rotting c) Ropiness d) Pigmentation 	1.5	CO3
Q10	<p>Fungal growth is inhibited in cane or sugar beet by</p> <ul style="list-style-type: none"> a) 5% CO₂ and 6% O₂ b) 6% CO and 5% O₂ c) 6% CO₂ and 5% O₂ d) 5% CO and 6% O₂ 	1.5	CO3
Q11	<p>Which of the following statements are not true for sucrose?</p> <ul style="list-style-type: none"> a) The purer the product, the poorer it becomes as a culture medium b) The more concentrated it gets, the fewer kinds of organisms can grow in it c) The purer the product, the better it becomes as a culture medium d) None of the above 	1.5	CO3
Q12	<p>Hydrocooling refers to</p> <ul style="list-style-type: none"> a) use of cold water spray b) spraying of liquid nitrogen c) ice crystal formation d) none of the above 	1.5	CO3
Q13	<p>To double the storage time of loosely packed small fresh fruits, these fruits are exposed to</p> <ul style="list-style-type: none"> a) ozone 	1.5	CO4

	<ul style="list-style-type: none"> b) carbon dioxide c) oxygen d) nitrogen 		
Q14	<p>The factors influencing the invasion of microbes in meat tissues are</p> <ul style="list-style-type: none"> a) the load in the gut of the animal b) the method of killing and bleeding c) the physiological condition of the animal after slaughter d) all of the above 	1.5	CO4
Q15	<p>The kind and rate of spoilage of fish vary with</p> <ul style="list-style-type: none"> a) the kind of fish b) temperature c) the condition of the fish when caught d) all of the above 	1.5	CO4
Q16	<p>Deterioration of fatty fish produces appreciable amounts of 'stale fishy', which is</p> <ul style="list-style-type: none"> a) trimethylamine b) chloramines c) ammonia d) unsaturated fatty acids 	1.5	CO4
Q17	<p>Chocolate-brown discoloration in fish is caused by</p> <ul style="list-style-type: none"> a) Serratia b) Bacillus c) Proteus d) asporogenous yeast 	1.5	CO5
Q18	<p>Dry packing of eggs are done by using</p> <ul style="list-style-type: none"> a) salt and sand b) lime and sawdust c) oiling and waxing d) both a and b 	1.5	CO5
Q19	<p>Eggs are selected for storage by</p> <ul style="list-style-type: none"> a) waxing b) oiling c) candling d) none of them 	1.5	CO5
Q20	<p>The limitations on the use of bacteria as SCP is</p> <ul style="list-style-type: none"> a) poor public acceptance b) small size c) high content of nucleic acids d) all the above 	1.5	CO5

	SECTION B (Scan and upload)	(4Qx5M=20 Marks)	CO
Q1	Short Answer Type Question (5 marks each)		
Q1	What are the direct and indirect methods used by microbiologists for enumeration of microorganisms?	5	CO1
Q2	Discuss the microbial contamination and spoilage of milk and milk products	5	CO2
Q3	Describe why <i>Staphylococcus aureus</i> can survive and grow but <i>Pseudomonas fluorescens</i> cannot when each is transferred from a broth with a water activity of 0.98 to a broth with a water activity of 0.90.	5	CO3
Q4	What kinds of microbes would you expect to find in the following foods? Give reasons for your predictions. i) comminuted (minced) beef ii) Dairy food iii) freshly prepared salad iv) Fermented food items v) Bread	5	CO4
	SECTION C (Scan and upload)	(2Qx15M=30 Marks)	CO
Q1	It has been revealed that the microbiological quality of the ice cream in different parts of India is low (Pednekar et al., 1997). A systematic evaluation of 30 ice creams of two different brands and of different flavors from two localities in Mumbai showed that there was an incidence of <i>L. monocytogenes</i> and <i>Yersinia enterocolitica</i> at 3% for each bacterium. Primary contamination sources include water, raw milk and secondary contamination sources include flavoring agents, utensils and handling of the ice creams. Some of the samples had high counts of aerobic bacteria and coliforms, which do not meet the specifications prescribed by Indian Standards (Warke et al., 1999). The effect of irradiation on microbiological quality of the ice cream, irradiated and un-irradiated samples were melted by keeping at 4°C for 2 hours and used to enumerate aerobic mesophilic bacterial, moulds, coliforms, <i>Staphylococcus aureus</i> , and <i>B. cereus</i> , and isolate pathogens like <i>Listeria</i> , <i>Yersinia</i> , and <i>Salmonella</i> . Some contaminant organisms may become harmful as they might be responsible for cholera, typhoid, bacillary dysentery. A sensory evaluation was conducted within one week after the samples had undergone irradiation treatment.	15 (3 marks each)	CO3

It was seen that the respective microbial load was reduced by approximately 1 and 2 log cycles after irradiation to 1 and 2 kGy. The initial count of *B. cereus*, 3×10^2 cfu/ml, was reduced to 30 cfu/ml after the 2 kGy dose and was not detected in samples irradiated to 5 kGy and above. 1.9×10^3 cfu/ml of *S. aureus*, which was present initially, was reduced to 6×10^2 and 1.6×10^2 cfu/ml after irradiation to 1 and 2 kGy, respectively. *Listeria* spp. were not detected in ice cream exposed to the 1 kGy dose. There was no significant difference in the acceptability for all flavors of the unirradiated ice cream and ice cream exposed to 1 kGy at 5% level of confidence (Anu Kamat, 2000).

From this study, it can be concluded that a radiation dose of 1 kGy is sufficient to eliminate most of the naturally present pathogens without adversely affecting the sensory attributes of all three flavors of ice cream tested. Thus, one of the methods that India could deal with high microbial load would be to irradiate food products.

Based on the above case study, answer the following:

- What are the two main sources for bacteria that contaminate ice cream?
- Name three commonly found psychrotroph and coliform bacteria generally present in this kind of product and what are their harmful effects on health.
- Which biological, chemical, physical method is discussed in this case study to evaluate microbiological quality of the ice cream and did you see any significant difference in the acceptability for all flavors after treatment.
- What do you conclude from this case study
- Do you think irradiated food items are fully accepted by consumers and public opinion. Justify your statement.

Q2

- What are the various factors, which influence heat transfer during food preservation
- Explain the terms D value, z value & F value and what is the significance of these terms in food industry
- From the table shown below, identify the microorganism which is more resistance to heat or has the greater resistance to variation in the heating temperature

Microorganisms	Reference Temp (°C)	D-value (min)	Z value (°C)
<i>Geobacillus stearothermophilus</i>	121.1	4.0-5.0	7.8-12.2

15 (5 marks each)

CO4

	<i>Clostridium botulinum</i> types A and B	121.1	0.10-0.20	7.8-10.0		
	<i>Clostridium sporogenes</i>	121.1	0.10-1.5	7.8-10.0		
	<i>Bacillus coagulans</i>	121.1	0.01-0.07	7.8-10.0		
	SECTION- D (Scan and upload)					
	Long Answer type Question					
	a) What are the emerging technologies for the reduction of pathogenic and spoilage organisms in food. Detail any two (5) b) Discuss the role of biopreservation in improving food safety OR a) What physical, chemical and biological approaches are available to prevent or inhibit microbial food spoilage? (5) b) What are bacteriocins. Discuss the role of bacteriocins in food science (5)				CO5	CO5
	a) What is HACCP. Why is it important to implement and maintain a HACCP food safety plan in a food business? b) How would HACCP be applied from farm to table?				CO5	CO5