Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Course: Food Microbiology **Semester: III**
Program: M.Sc. Nutrition and Dietetics **Duration: 03 hrs.**
Course Code: HSMB8001 **Max. Marks: 100**
Instructions:

	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**

	a. Chlorella b. Polysiphonia c. Ulothrix d. Spirogyra		
Q7	Find the incorrectly matched pair a. Serratia – Drug addiction b. Spirulina – Single cell protein c. Rhizobium – Biofertilizer d. Streptomyces – Antibiotic	**1.5**	**CO2**
Q8	The major factors involved in the spoilage of stored grains by molds include a. microbial content b. moisture levels above 12% c. physical damage d. all of the above	**1.5**	**CO2**
Q9	In bread Bacillus subtilis causes a. decay b. rotting c. ropiness d. pigmentation	**1.5**	**CO3**
Q10	Fungal growth is inhibited in cane or sugar beet by 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	Which of the following statements are not true for sucrose? 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	Hydrocooling refers to a. use of cold water spray b. spraying of liquid nitrogen c. ice crystal formation d. none of the above	**1.5**	**CO3**
Q13	To double the storage time of loosely packed small fresh fruits, these fruits are exposed to a. ozone	**1.5**	**CO4**

	b. carbon dioxide c. oxygen d. nitrogen		
Q14	The factors influencing the invasion of microbes in meat tissues are 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	The kind and rate of spoilage of fish vary with a. the kind of fish b. temperature c. the condition of the fish when caught d. all of the above	**1.5**	**CO4**
Q16	Deterioration of fatty fish produces appreciable amounts of 'stale fishy', which is a. trimethylamine b. chloramines c. ammonia d. unsaturated fatty acids	**1.5**	**CO4**
Q17	Chocolate-brown discoloration in fish is caused by a. Serratia b. Bacillus c. Proteus d. asporogenous yeast	**1.5**	**CO5**
Q18	Dry packing of eggs are done by using a. salt and sand b. lime and sawdust c. oiling and waxing d. both a and b	**1.5**	**CO5**
Q19	Eggs are selected for storage by a. waxing b. oiling c. candling d. none of them	**1.5**	**CO5**
Q20	The limitations on the use of bacteria as SCP is 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	What are the three main approaches that is used by microbiologists to identify microorganisms?	**5**	**CO1**
Q2	Discuss the microbial contamination, spoilage and preservation of meat and meat products	**5**	**CO2**
Q3	Describe why *Staphylococcus aureus* can survive and grow but *Pseudomonas fluorescens* 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 and concentrations (very approximately) of microbes would you expect to find in the following foods? Give reasons for your predictions and mention the measures for control. i) comminuted (minced) beef ii) freshly cooked rice iii) freshly prepared salad iv) yoghurt	**5**	**CO4**
	SECTION C **(Scan and upload)**	**(2Qx15M=30 Marks)**	**CO**
Q1	There have been many reports to the outbreak of infections such as salmonellosis from the consumption of raw eggs. Use of eggs to prepare mayonnaise, deserts, etc. have increased the incidence of the outbreaks. Most outbreaks have been reported in summers, due to improper refrigeration and handling of eggs. On 18 January 2010, NSW Health notified NSW Food Authority of a gastroenteritis outbreak in 20 people who had eaten from a retail burger bar on 14 and 15 January 2010. The burger bar was a popular eatery: by 28 January 2010, NSW Health had linked a total of 179 Salmonella typhimurium phage type 9 cases to the business over the two days in question. Interviews of Salmonella cases determined that aioli was a common food served over the exposure period. The business prided itself on its homemade burgers and ingredients. The aioli was prepared on the premises. DNA fingerprinting using multiple locus variable number of tandem repeats analysis (MLVA) identified a match between clinical isolates and Salmonella isolates detected from the burger-bar premises. Initial interview of the proprietor confirmed the aioli had been prepared using raw eggs and did not receive any further cooking or processing. The business was instructed to cease serving this type of product. Additional food and environmental samples were obtained for testing on 19 January 2010. In total, there was a sample of the aioli, eggs, a cleaning cloth, swabs of a food preparation bench, food-preparation	**15 (3 marks each)**	**CO3**

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<td>cutting boards, a food-storage area, and the hand-washing area. As there were no new cases linked to eating at the premises after 15 January 2010, the business was allowed to continue operating

Based on the above mentioned study, answer the following:
a) Name the bacteria found to be responsible for major cause of gastroenteritis.
b) What are the common food items served during exposure period?
c) What are the detective techniques used for confirming the presence of salmonella spp. and why?
d) What are the food and environmental samples collected to perform the contamination check?
e) What is the corrective measures taken to prevent such outbreak from this premises</td>
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<td>Q2</td>
<td>Considering the practical aspect of thermal processing, rate of heat transfer and process uniformity are influenced by many factors. Liquid foods are often heated by convection; consequently, heating rate is rapid. However, solid foods are heated slowly by conduction. Despite the multiplicity of factors affecting thermal treatments, temperature and time are the major parameters governing any thermal process operation. Processors often need to determine the heating time, at a specified temperature, which is sufficient to process the food effectively. Knowledge of the kinetics of microbial death helps in determining these critical processing parameters. Kinetics of microbial inactivation, at a given temperature, are determined by observing the decline in population survivors during heating time. Thermal inactivation D values and the thermal resistance constant z value of selected bacterial spores are provided in table below.

<table>
<tr><th>Microorganisms</th><th>Reference Temp (°C)</th><th>D-value (min)</th><th>Z value (°C)</th></tr>
<tr><td>Geobacillus stearothermophilus</td><td>121.1</td><td>4.0-5.0</td><td>7.8-12.2</td></tr>
<tr><td>Clostridium botulinum types A and B</td><td>121.1</td><td>0.10-0.20</td><td>7.8-10.0</td></tr>
<tr><td>Clostridium sporogenes</td><td>121.1</td><td>0.10-1.5</td><td>7.8-10.0</td></tr>
<tr><td>Bacillus coagulans</td><td>121.1</td><td>0.01-0.07</td><td>7.8-10.0</td></tr>
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Based on the above study, answer the following:
a) Discuss various factors which influence heat transfer during food preservation</td>
<td>15 (5 marks each)</td>
<td>CO4</td>
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	b) Explain the terms D value and z value and what is the significance of these terms in food industry c) 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		
	SECTION- D **(Scan and upload)**	**(2Qx10M=20 Marks)**	**CO**
	Long Answer type Question		
Q1	(a) Explain five major reasons of microbial food spoilage (b) What emerging technologies are available for reduction of pathogenic and spoilage organisms in food.	**10 (5 marks each)**	**CO4**
Q2	(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?	**10 (5 marks each)**	**CO5**