


## Format of Question paper

<b>Name:</b>			
<b>Enrolment No:</b>			
<b>UNIVERSITY OF PETROLEUM AND ENERGY STUDIES</b> <b>End Semester Examination, December 2022</b>			
<b>Course: Fermentation Technology</b>		<b>Semester : IIIrd</b>	
<b>Program: M.Sc Microbiology</b>		<b>Duration : 3 Hours</b>	
<b>Course Code: HSMB 8002</b>		<b>Max. Marks: 100</b>	
<b>Instructions:</b>			
<b>S. No.</b>	<b>Section A</b> <b>Short answer questions/ MCQ/T&amp;F</b> <b>(20Qx1.5M= 30 Marks)</b>	<b>Marks</b>	<b>COs</b>
<b>Q1</b>	In which of the following fermenters the impellers are replaced by the constant flow of gas? a) Airlift fermenter b) Tower fermenter c) Hollow fibre fermenter d) Membrane bioreactor	<b>1.5</b>	<b>CO2</b>
<b>Q2</b>	Glycogen is a polymer of _____ a) $\beta$ -Glucose b) $\alpha$ -Glucose c) $\alpha$ (1,6)-Glucose d) $\beta$ (1,4)-Glucose	<b>1.5</b>	<b>CO1</b>
<b>Q3</b>	The unit rate of heat transfer (Q) is _____ a) J/s b) $J\ m^2/sK$ c) $m^2$ d) J	<b>1.5</b>	<b>CO3</b>
<b>Q4</b>	Mini-fermenters are used to study _____ a) The amount of oxygen evolved b) The effect of oxygen concentration on yeast fermentation c) The effect of carbon dioxide concentration on yeast d) The amount of carbon dioxide consumed	<b>1.5</b>	<b>CO2</b>
<b>Q5</b>	Which of the following is not a characteristic of the viable cell? a) The capability of cellular growth b) The capability of cellular proliferation c) Oxygen evolution and carbon-dioxide uptake d) Possession of membrane integrity	<b>1.5</b>	<b>CO3</b>
<b>Q6</b>	Which of the following is used to count the number of cells? a) Haemoglobinometer	<b>1.5</b>	<b>CO3</b>

	b) Haemocytometer c) Spectrophotometer d) Flowcytometry		
<b>Q7</b>	The reproduction in yeast is by _____ a) Binary fission b) Regeneration c) Budding d) Fragmentation	<b>1.5</b>	<b>CO1</b>
<b>Q8</b>	Which of the following is a Gram-positive bacteria? a) <i>Acetobacter aceti</i> b) <i>Escherichia coli</i> c) <i>Gluconobacter oxydans</i> d) <i>Streptococcus pneumoniae</i>	<b>1.5</b>	<b>CO2</b>
<b>Q9</b>	Which of the following substrate cannot be utilized by the lactic acid bacteria to produce gas? a) Citrate b) Gluconate c) Amino acids d) Alkanes	<b>1.5</b>	<b>CO1</b>
<b>Q10</b>	Which of the following is a homofermentative lactic acid bacteria? a) <i>Lactobacillus brevis</i> b) <i>Lueconostoc mesenteroides</i> c) <i>Lactobacillus fermentum</i> d) <i>Lactobacillus delbruckii</i>	<b>1.5</b>	<b>CO2</b>
<b>Q11</b>	The fermentation of milk to form cheese is done by _____ bacterium species. a) <i>Saccharomyces spp.</i> b) <i>Lactobacillus spp.</i> c) <i>Aspergillus spp.</i> d) <i>Penicillium spp.</i>	<b>1.5</b>	<b>CO2</b>
<b>Q12</b>	Steroids contain _____ rings. a) Cycloalkane b) Cycloalkyl c) Cycloalkyne d) Cycloalkene	<b>1.5</b>	<b>CO2</b>
<b>Q13</b>	Avermectins is used to _____ a) Inhibit the cell wall formation b) Inhibit the cell membrane formation c) Inhibit the neural activity d) Inhibit the protein synthesis	<b>1.5</b>	<b>CO3</b>
<b>Q14</b>	Which of the following is an antifungal antibiotic? a) Nystatin b) Amphotericin	<b>1.5</b>	<b>CO3</b>

	c) Polyenes d) Streptomycin		
<b>Q15</b>	Which of the following is a major component of cider apple juice? a) Glucose b) Pectin c) Sucrose d) Fructose	<b>1.5</b>	<b>CO1</b>
<b>Q16</b>	Which of the following process occurs in the absence of free liquid? a) Submerged fermentation b) Batch fermentation c) Solid state fermentation d) Continuous fermentation	<b>1.5</b>	<b>CO3</b>
<b>Q17</b>	In which of the following the microorganisms grow on the surface of the medium? a) Submerged fermentation b) Surface fermentation c) Solid state fermentation d) Batch fermentation	<b>1.5</b>	<b>CO2</b>
<b>Q18</b>	Which of the following requires a substrate as support? a) Submerged fermentation b) Surface fermentation c) Solid state fermentation d) Batch fermentation	<b>1.5</b>	<b>CO3</b>
<b>Q19</b>	Which of the following organisms is not used for the production of citric acid? a) <i>Aspergillus wentii</i> b) <i>Bacillus licheniformis</i> c) <i>Candida oleophila</i> d) <i>Saccharomyces cerevisiae</i>	<b>1.5</b>	<b>CO3</b>
<b>Q20</b>	Which of the following is a major source of $\beta$ -Amylase? a) <i>Bacillus amyloliquefaciens</i> b) <i>Bacillus licheniformis</i> c) <i>Aspergillus niger</i> d) Malted barley	<b>1.5</b>	<b>CO2</b>
<b>Section B</b> <b>(4Qx5M=20 Marks)</b>			
<b>Q1</b>	What are the different approaches for strain improvement? Describe with examples?	<b>5</b>	<b>CO1</b>
<b>Q2</b>	Describe various microbial media types with examples? What is the role of C, N and P in media formulations?	<b>5</b>	<b>CO2</b>
<b>Q3</b>	What do you mean by Scale up? How does it influence product development and commercialization?	<b>5</b>	<b>CO3</b>

<b>Q4</b>	Describe inoculum development with respect to various microbial classes with examples?	<b>5</b>	<b>CO4</b>
<b>Section C</b> <b>(2Qx15M=30 Marks)</b>			
<b>Q1</b>	<p>Microbes especially yeasts have been used from time immemorial for the production of beverages like wine, beer, whisky, brandy or rum. For this purpose the same yeast <i>Saccharomyces cerevisiae</i> used for bread-making and commonly called brewer's yeast, is used for fermenting malted cereals and fruit juices, to produce ethanol. Depending on the type of the raw material used for fermentation and the type of processing (with or without distillation) different types of alcoholic drinks are obtained. Wine and beer are produced without distillation whereas whisky, brandy and rum are produced by distillation of the fermented broth.</p> <p>Antibiotics produced by microbes are regarded as one of the most significant discoveries of the twentieth century and have greatly contributed towards the welfare of the human society. Anti is a Greek word that means 'against', and bio means 'life', together they mean 'against life' (in the context of disease causing organisms); whereas with reference to human beings, they are 'pro life' and not against. Antibiotics are chemical substances, which are produced by some microbes and can kill or retard the growth of other (disease-causing) microbes. We are familiar with the commonly used antibiotic Penicillin. Penicillin was the first antibiotic to be discovered, and it was a chance discovery! Alexander Fleming while working on <i>Staphylococci</i> bacteria, once observed a mould growing in one of his unwashed culture plates around which <i>Staphylococci</i> could not grow. He found out that it was due to a chemical produced by the mould and he named it Penicillin after the mould <i>Penicillium notatum</i>. However, its full potential as an effective antibiotic was established much later by Ernest Chain and Howard Florey. This antibiotic was extensively used to treat American soldiers wounded in World War II. Fleming, Chain and Florey were awarded the Nobel Prize in 1945, for this discovery.</p> <p>Questions</p> <ol style="list-style-type: none"> <li>1) Define antibiotics ?</li> <li>2) Explain the mode of action of antibiotics?</li> <li>3) Among the microbes mentioned above, mention the one used for the production of beverages?</li> <li>4) Name the yeast used for production of bread?</li> <li>5) The firstly discovered antibiotic is known as _____</li> <li>6) Mention the contribution of Fleming, Chain and Florey</li> <li>7) The inability of <i>Staphylococci</i> to grow is due to _____.</li> </ol>	<b>15</b>	<b>CO4</b>

	8) Mention the role of distillation in QA/QC of alcoholic beverages? 9) Can yeast be used for fermenting cereals and juices ? 10) Name some alcoholic beverages that require stringent distillation steps ? 11) Provide a schematic of antibiotic production?		
<b>Q2</b>	In an experiment, fungal cultures are being used for the production of cellulose degrading enzymes (fungal cellulases). In the due course of reaction, there is need for surveillance for fungal growth, assuring optimal conditions and apt design of the fermenter? Based on the above set-up, answer the following 1) Explain how can we check the fungal growth? What are the factors to enhance the growth conditions for fungal cells? 2) Do we require aeration/mechanical agitation? If so why? 3) Mention the ways for monitoring proper growth and metabolism in the fungal culture? 4) Distinguish between fungal density and fungal biomass productivity? 5) Mention at least three-design augmentation for scaling up the fungal culture set-up?	<b>15</b>	<b>CO5</b>
<b>Section D</b> <b>(2Qx10M=20 Marks)</b>			
<b>Q1</b>	Describe Fermentation systems with respect to following with suitable examples 1. Organic acids 2. Antibiotics 3. Amino acid (Provide details of reactors, diagrams/schematics, process conditions, microbes used, products produced, efficiency and scope for improvements)	<b>10</b>	<b>CO3</b>
<b>Q2</b>	Discuss about the various types of fermenters with examples? What is the difference between bubble column, fluidized bed and fixed bed fermenters and where these can be used? Enumerate the advantages and disadvantages of the various fermenters studied?	<b>10</b>	<b>CO4</b>