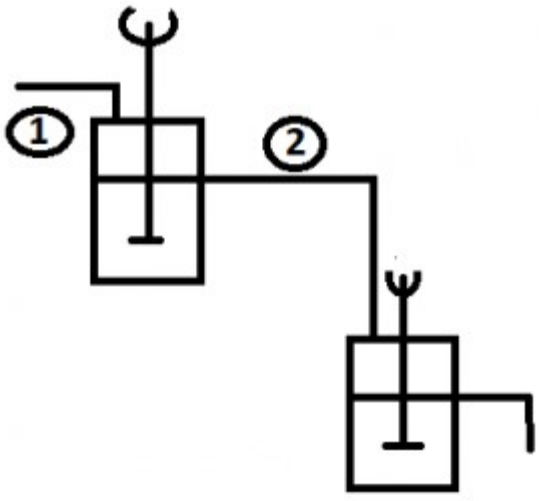
Format of Question paper

Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

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

Course: Fermentation Technology — **Semester : Vth**
Program: B.Sc Microbiology — **Duration : 3 Hours**
Course Code: HSMB 3003 — **Max. Marks: 100**

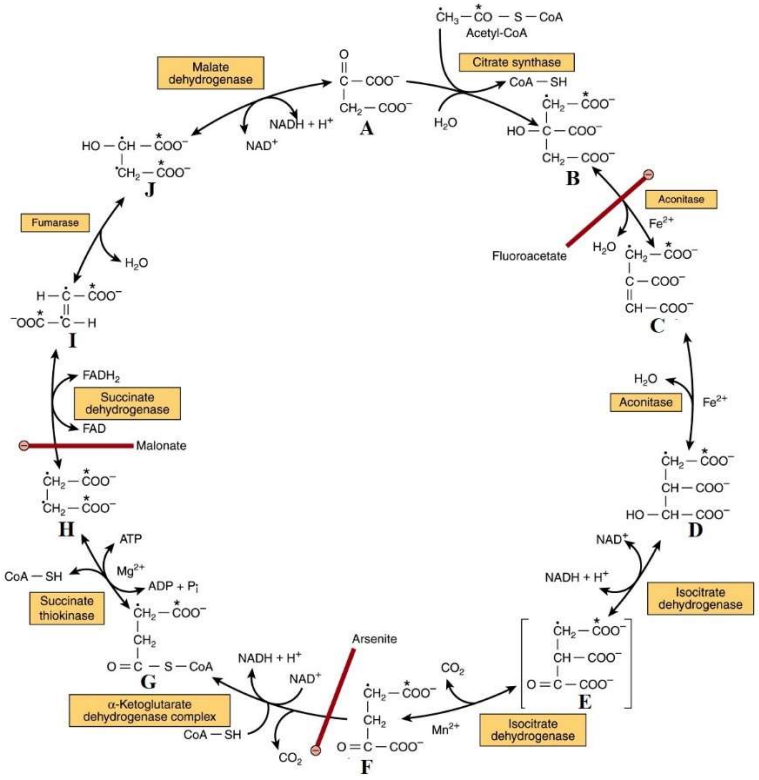
Instructions:

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q1	During batch fermentation, in which phase the microbes in the fermenter are adapting to the new environment? a) Lag phase b) Log or exponential phase c) Stationary phase d) Death phase	**1.5**	**CO1**
Q2	Multistage Fermenter system is being shown below. Label the stages 1 and 2.  a) 1-Medium inlet and 2-culture effluent b) 1-Mixing chamber and 2-culture effluent c) 1-Medium inlet and 2-Liquid reservoir d) 1-Culture effluent and 1-Medium Inlet	**1.5**	**CO3**
Q3	Which of the following was used in the production of bakers' yeast?	**1.5**	**CO2**

	a) Batch culture b) Continuous culture c) Fed-Batch culture d) Solid state culture		
Q4	Which of the following method proceeds with 2-plate preparation? a) Crowded plate technique b) Auxanographic technique c) Enrichment Culture technique d) Indicator dye technique	**1.5**	**CO2**
Q5	Which of the following method involves sublimation of cell water? a) Cryopreservation b) Lyophilization c) Dried Culture d) Desiccation	**1.5**	**CO3**
Q6	Which of the following is the raw material for lactic acid and SCP production? a) Fruit juices b) Beet molasses c) Cheese Whey d) Hydrocarbons	**1.5**	**CO2**
Q7	Which of the following nitrogen source is used in penicillin production? a) Peanut granules b) Corn steep liquor c) Phamamedia d) Soybean meal	**1.5**	**CO3**
Q8	Which of the following growth factor is used in vinegar production? a) Calcium Carbonate b) Calcium Phosphate c) Calcium Pantothenate d) Calcium Hydroxide	**1.5**	**CO1**
Q9	Which of the following is downstream processing? a) Cell breakdown b) Media formulation c) Product recovery d) Product formation	**1.5**	**CO2**
Q10	What do you mean by sterilization? a) Purification of products b) Recovery of products c) Elimination of contamination d) Formulation of media	**1.5**	**CO3**
Q11	While constructing the fermenter, which of the following is not required?	**1.5**	**CO1**

	a) High-speed Agitation and Aeration system b) Temperature control system c) pH control system d) Sample facilities		
Q12	The agitator is required to _____ a) Provide air b) Mixing objectives c) Purify the product d) Sterilize the media	**1.5**	**CO2**
Q13	Which of the following is the disadvantage of cylindro-conical vessels in brewing? a) Time-consuming b) Fermentation and conditioning can be carried out in the same vessel c) Reduction in maturing time d) Yeast separation is good	**1.5**	**CO1**
Q14	What led to the development of Walhof-type fermenter? a) Yeast growth b) Bacterial growth c) Viral growth d) Fungi growth	**1.5**	**CO1**
Q15	Which of the following factors are not involved in the scale-up process? a) Inoculum development b) Sterilization c) Temperature d) Medium design	**1.5**	**CO3**
Q16	Which of the following is not a stage of product recovery? a) Removal of solids b) Isolation of organism c) Purification and concentration d) Cell disruption	**1.5**	**CO2**
Q17	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) Perfusion bioreactor	**1.5**	**CO1**
Q18	Which of the following is not the function of buffer? a) Prevent cell lysis b) Chelating the metals c) Prevent protease action d) Prevent lipase action	**1.5**	**CO3**

Q19	Which of the following provides the fewest problems while downstream processing? a) Natural media b) Synthetic media c) Complex media d) Semi-synthetic media	**1.5**	**CO2**
Q20	Which of the following does not influence filtration? a) Temperature b) Density c) Viscosity d) pH	**1.5**	**CO2**
	Section B **(4Qx5M=20 Marks)**		
Q1	Explain primary and secondary screening with examples? Mention the criteria for screening of industrially important microorganisms?	**5**	**CO1**
Q2	Explain the various components in a microbial media with examples?	**5**	**CO2**
Q3	Differentiate between Upstream and Downstream processing? Describe product recovery with an example?	**5**	**CO3**
Q4	Explain batch, fed-batch and continuous culture with examples?	**5**	**CO1**
	Section C **(2Qx15M=30 Marks)**		
Q1	The diagram shown here provides the Citrate cycle, with key substrates and intermediates that are essential for cellular metabolism and fermentative pathways.	**15**	**CO2**

	 Based on your understanding of biochemical pathways, answer the following: a) Label the substrates/metabolites/intermediates provided as A, B, C, D, E, F, G, H, I and J. b) Mention microbial groups involved in the production of at least 3 key metabolites? c) Why is it beneficial for pyruvate to be reduced via fermentation when oxygen is not available? d) What can be an essential substrate here from where bioethanol/biodiesel could be easily derived? e) At what step, amino acids could be synthesized?		
Q2	In an experimental setup, algal cultures were performed in photobioreactors? During the cultivation, there was need for periodic monitoring of growth and development of the culture. In addition, the biomass density and productivity of the systems was to be monitored. Based on the above set-up, answer the following 1) What are the different ways/approaches to check algal growth and development in the bioreactor? 2) Is it possible to develop a correlation among the various parameters that can be used for biomass growth monitoring? If so how? 3) What is cell density? How do we calculate cell/biomass densities in the working culture?	**15**	**CO3**

	4) What do you mean by cellular productivity? Is there a difference between yield and productivity? How do we measure that? Is cell productivity dependent on inoculum concentration? 5) Mention at least three-design augmentation for scaling up the algal culture set-up?		
Section D (2Qx10M=20 Marks)			
Q1	Explain fermentative pathways taking examples from 1. Alcohols 2. Antibiotics (Provide details of reactors, diagrams/schematics, process conditions, microbes used, products produced, efficiency and scope for improvements)	**10**	**CO2**
Q2	What are the various cell culture practices in context of animal cells? Briefly, explain the nutritional requirement, cell growth dynamics and maintenance for animal cell cultures with suitable examples?	**10**	**CO3**