Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2023

Course: Bioprocess Engineering **Semester : IV**

Program: B.Tech Biotechnology **Duration : 3 Hours**

Course Code: HSFT2009 **Max. Marks: 100**

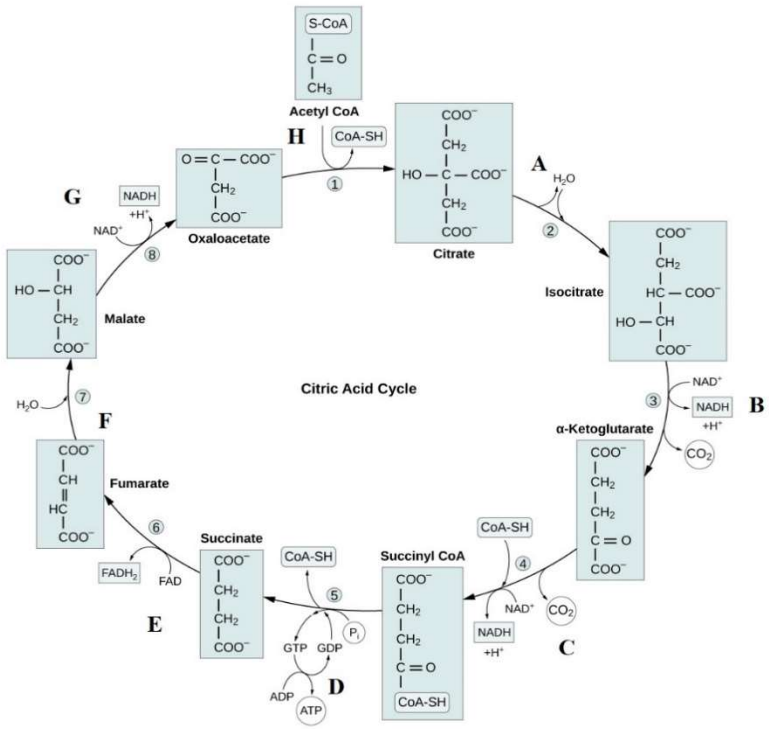
Instructions: Read all the questions carefully

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q1	Antibiotics are mainly produced by _____ a) Bacteria b) Algae c) Fungi d) Fungi and bacteria	1.5	CO1
Q2	How is streptomycin recovered? a) Paper chromatography b) Hydrophobic chromatography c) Size exclusion chromatography d) Ion exchange chromatography	1.5	CO2
Q3	How inoculum is prepared in the production of antibiotics? a) On solid media b) On liquid media c) First on solid media than on liquid media d) On suspension	1.5	CO3
Q4	Which one of the following is an example of starch crops biomass feed stocks? a) Sugar cane b) Wheat straw c) Corn stover d) Orchard prunings	1.5	CO3
Q5	The bio ethanol obtained in the fermentation process has _____ purity. a) 99% b) 99.2%	1.5	CO3

	c) 99.4% d) 99.7%		
Q6	_____ organism was used to produce recombinant insulin. a) Cyanobacteria b) *E.coli* c) *Saccharomyces cerevisiae* d) *B. subtilis*	**1.5**	**CO2**
Q7	The polypeptide chains present in insulin is connected by _____ bonds. a) ionic b) covalent c) disulphide d) hydrophobic interactions	**1.5**	**CO1**
Q8	Which of the following is true for single cell protein? a) Algae cannot be used in single cell protein b) It is produced through fermentation c) It does not contain carbohydrates and vitamins d) Its utilization increases environmental pollution	**1.5**	**CO2**
Q9	The production of enzyme is mostly carried out by? a) Batch fermentation b) Continuous fermentation c) Fed-batch fermentation d) Semi-batch fermentation	**1.5**	**CO2**
Q10	Which of the following is the most common source of SCP? a) Multicellular yeast b) Single-celled yeast c) Unicellular algae d) Unicellular bacteria	**1.5**	**CO2**
Q11	Which of the following is not a method of entrapment for immobilized systems? a) Inclusion in gels b) Diazotization c) Inclusion in fibers d) Inclusion in microcapsules	**1.5**	**CO1**
Q12	Which of the following is not a method of immobilization? a) Entrapment b) Ionic bonding c) Adsorption d) Encapsulation	**1.5**	**CO2**
Q13	The purpose of aeration is to provide _____ a) The medium to organisms b) The carbon dioxide to organisms	**1.5**	**CO3**

	c) The oxygen to organisms d) The water to organisms		
Q14	The agitator is required to _____ a) Provide air b) Mixing objectives c) Purify the product d) Sterilize the media	**1.5**	**CO3**
Q15	Which of the following is not the use of baffles? a) Increase the effect of agitation b) Improve aeration efficiency c) Improve cooling capacity d) Improve the fermenter capacity	**1.5**	**CO3**
Q16	The chemostat and turbidostat are the types of bioreactors that are used in which of the following culture? a) Batch culture b) Continuous culture c) Fed-Batch culture d) Solid State culture	**1.5**	**CO2**
Q17	Which carbon source has great application for SCP production? a) Cellulose b) Starch c) Methanol d) Methane	**1.5**	**CO1**
Q18	The breakdown of glucose is known as _____ a) Gluconeogenesis b) Glycolysis c) Glycogenolysis d) Glycogenesis	**1.5**	**CO1**
Q19	Which of the following does not include in the range of fermentation processes? a) Microbial Enzymes b) Microbial metabolites c) Biotransformation d) Recombinant DNA	**1.5**	**CO1**
Q20	The heat control at large-scale in the fermenter is carried out by _____ a) Inter heating coils b) Heating jacket c) Controlled bath d) Cold-water circulation	**1.5**	**CO3**

Section B (4Qx5M=20 Marks)			
Q1	What are the basic components in a Bioreactor? Explain them with examples?	**5**	**CO3**
Q2	What is enzyme inhibition? How many types of enzyme inhibition are found? Explain with examples?	**5**	**CO2**
Q3	Differentiate between primary and secondary metabolite? Provide the nutrient sources, process conditions for onset of their productions?	**5**	**CO2**
Q4	How do you carry out downstream processing? Explain with examples?	**5**	**CO3**
Q5	What is strain improvement? What are the various methods for strain improvement?	**5**	**CO2**
Section C (2Qx15M=30 Marks)			
Q1	In an experiment, fungal cultures are being used to produce 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?	**15**	**CO3**

Q2	 The diagram shown here provides the Citrate cycle, with key substrates and intermediates along with enzymes that are essential for cellular metabolism and fermentative pathways. Based on your understanding of biochemical pathways, answer the following: a) Label the enzymes provided as A, B, C, D, E, F, G and H b) Mention the microbial groups involved in the production of at least 3 key industrially important enzymes required for fermentation? c) Provide the name of a commercially important organic acid in the citrate cycle and enzyme responsible for its production? d) What can be an essential enzyme that is key for amino acid metabolism? e) Name the enzyme that is essential for citrate biosynthesis and fermentation?		**CO2**
Section D **(2Qx10M=20 Marks)**			
Q1	Describe Bioprocess Development for Bioethanol Production? (Provide details of reactors, diagrams/schematics, process conditions, microbes used, products produced, efficiency and scope for improvements)	**10**	**CO3**
Q2	Differentiate between bubble column, fluidized bed and fixed bed fermenters? Explain the advantages and limitations of the various fermenters studied?	**10**	**CO3**