Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2023

Course: Fermentation Technology **Semester : V**

Program: B.Sc Microbiology **Duration : 3 Hours**

Course Code: HSMB3003 **Max. Marks: 100**

Instructions: Read all questions carefully

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q 1	Which of the following is not true for anaerobic fermentation (A) Absence of oxygen (B) complete oxidation of glucose (C) CO_2 production (D) Ethanol production	1.5	CO1
Q 2	Which part of the fermenter is useful for thorough mixing of medium and inoculum (A) Sparger (B) Impeller (C) Baffles (D) Anti-foam agent	1.5	CO1
Q 3	Which of the following factor affects the fermentation reaction? (A) Temperature (B) pH (C) Nutrients (D) All of these	1.5	CO1
Q 4	Which of the following is the least preferred carbon source in industrial fermentation? (A) Molasses (B) Glucose (C) Sulphite waste liquor (D) Cellulose	1.5	CO1
Q 5	Industrially important antibiotic producing organisms shall be isolated by (A) Disc diffusion method (B) Media containing antibiotic (C) Crowded plate method (D) Auxanography technique	1.5	CO2
Q 6	Which of the following is an example of a product produced through fermentation? (A) Penicillin (B) Aspirin (C) Paracetamol (D) Ibuprofen	1.5	CO2
Q 7	What is the purpose of using a starter culture in fermentation? (A) To initiate and accelerate the fermentation process (B) To filter out contaminants from the fermentation broth (C) To provide additional nutrients to the fermenter (D) To maintain pH levels in the fermentation broth	1.5	CO2

Q 8	Which of the following is a common method for monitoring the progress of a fermentation process? (A) Measuring pH and dissolved oxygen levels (B) Counting the number of cells in the fermenter (C) Weighing the fermenter (D) Measuring the viscosity of the fermentation broth	1.5	CO2
Q 9	Which microorganism is commonly used in the production of beer through fermentation? (A) Saccharomyces cerevisiae (B) Lactobacillus acidophilus (C) Escherichia coli (D) Aspergillus niger	1.5	CO3
Q 10	What is the primary purpose of aseptic techniques in fermentation? (A) To prevent contamination of the fermentation process (B) To improve the flavor of the final product (C) To increase the yield of the fermentation process (D) To enhance the color of the final product	1.5	CO3
Q 11	Which of the following is a primary goal of downstream processing? (A) Maximizing the yield of the fermentation process (B) Minimizing the cost of raw materials (C) Achieving high purity of the desired product (D) Reducing the duration of the fermentation process	1.5	CO3
Q 12	Which technique is used for the purification of proteins and other biomolecules based on their size and charge? (A) Chromatography (B) Membrane filtration (C) Distillation (D) Crystallization	1.5	CO3
Q 13	Which of the following is a characteristic of exponential (logarithmic) growth phase of microorganisms? (A) Slow growth rate (B) Maximum rate of cell division and population growth (C) Stationary population size (D) High levels of cell death	1.5	CO4
Q 14	Which phase of microbial growth occurs when resources become limited, leading to a steady state population size? (A) Lag phase (B) Exponential growth phase (C) Stationary phase (D) Death phase	1.5	CO4
Q 15	Which of the following is a factor that can lead to the decline of a microbial population in the death phase? (A) Depletion of nutrients (B) Accumulation of waste products (C) pH changes (D) All of the above	1.5	CO4

Q 16	What is a bioreactor in cell culture? (A) A vessel for growing cells in suspension (B) A type of microscope for cell imaging (C) A device for genetic modification of cells (D) A tool for extracting cellular DNA	1.5	CO4
Q 17	Which type of cell culture system allows cells to grow in a monolayer attached to the surface of the culture vessel? (A) Suspension culture B) Adherent culture C) Bioreactor culture D) Hybridoma culture	1.5	CO5
Q 18	Which type of cells have a finite lifespan and eventually stop dividing in culture? (A) Primary cells (B) Stem cells (C) Cancer cells (D) Immortalized cells	1.5	CO5
Q 19	Which of the following is a key factor affecting cell growth in culture? (A) pH of the medium (B) Size of the culture vessel (C) Presence of light (D) Magnetic field strength	1.5	CO5
Q 20	Which type of cell culture is used for the production of monoclonal antibodies? (A) Hybridoma culture (B) Suspension culture (C) Organoid culture (D) Adherent culture	1.5	CO5
Section B (4Qx5M=20 Marks)			
Q 1	Differentiate between aerobic and anaerobic fermentation?	5	CO1
Q 2	State the application of MacConkey Agar media as differential media.	5	CO2
Q 3	Explain in brief the design of packed bed fermenter and why it is preffered?	5	CO3
Q 4	Write the materials required for animal cell culture. Differentiate between primary cells and cell lines.	5	CO1
Section C (2Qx15M=30 Marks)			
Q 1	You own a pharmaceutical industry and would like to produce penicillin antibiotic. A. How do you screen, select and improve the microbial strain for the production of penicillin in your industry? **(5 marks)** B. Formulate a medium (carbon and nitrogen source) out of waste product to produce the antibiotic. **(5 marks)** C. Which fermenter design you would employ to produce penicillin and explain why? **(5 marks)**	15	CO2

Q 2	A nutraceutical company would like to produce single cell protein (SCP) products. A. What organisms would you recommend for SCP and justify your suggestion? **(5 marks)** B. Would you recommend aerobic or anerobic fermentation and explain why? **(5 marks)** C. Which fermenter (Batch, Fed-batch or continuous) would you suggest for the SCP production and justify? **(5 marks)**	15	CO3
Section D **(2Qx10M=20 Marks)**			
Q 1	Explain in detail the principle and procedure of any two strain improvement methods with examples	10	CO4
Q 2	Explain in detail the different preservation methods of microbes in a tabular form. Discuss their pros and cons of each method.	10	CO5