

Name:

Enrolment No:



**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

**End Semester Examination, December 2022**

**Course: Microbial physiology and metabolism**

**Program: Int.B.Sc.-MSc. Microbiology**

**Course Code: HSMB 2006**

**Semester: III**

**Duration: 03 hrs.**

**Max. Marks: 100**

**Instructions:**

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q1	Passive Transport occurs a. Along the concentration gradient b. Without the use of metabolic end product c. Both d. None	1.5	CO1
Q2	Nitrifying bacteria are: a) Chemoheterotroph b) Chemoautotroph c) Photoheterotroph d) Photolithotroph	1.5	CO2
Q3	The organism which grows best above 45°C called _____	1.5	CO2
Q4	The conversion of nitrogen to nitrogenous compound is called as a. Nitrogen assimilation b. Denitrification c. Nitrogen fixation d. Nitrification	1.5	CO2
Q5	The type of fermentation observed in yeasts is a. acrylic fermentation b. lactic acid fermentation c. pyruvic fermentation d. alcoholic fermentation	1.5	CO3
Q6	A food container was forgotten in the refrigerator and shows contamination. The contaminants are probably a. psychrotrophs b. mesophiles c. thermophiles	1.5	CO2

	d. acidophiles										
Q7	Which of the following methods does not require any carrier or channel for transport of substances? a. secondary active transport b. facilitated diffusion c. simple diffusion d. primary active transport	1.5	CO2								
Q8	Match the following-  <table border="1" data-bbox="316 656 1110 1122"> <tr> <td>a. simple diffusion</td> <td>1. Movement via a membrane protein</td> </tr> <tr> <td>b. secondary active transport</td> <td>2. Energy from hydrolysis of ATP</td> </tr> <tr> <td>c. primary active transport</td> <td>3. Stored energy from ionic gradient</td> </tr> <tr> <td>d. facilitated diffusion</td> <td>4. Movement without a membrane protein</td> </tr> </table>	a. simple diffusion	1. Movement via a membrane protein	b. secondary active transport	2. Energy from hydrolysis of ATP	c. primary active transport	3. Stored energy from ionic gradient	d. facilitated diffusion	4. Movement without a membrane protein	1.5	CO2
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Q9	What is a group translocation? a. The process of transporting and transforming the molecules at the same time b. The process of transporting and transforming the molecules one at a time c. The process of transporting and transforming the molecules randomly	1.5	CO2								
Q10	A group translocation system presents in bacteria that aids in the uptake of sugar a. Phosphotransferase system b. Twin-arginine translocation pathway c. Phosphotransferase system and Twin-arginine translocation pathway	1.5	CO2								
Q11	The concept of chemolithotrophy was first proposed by a. Pasteur b. Beijerinck c. Petri d. Winogradsky	1.5	CO1								
Q12	In prokaryotes, which of the following is true?	1.5	CO3								

	<ul style="list-style-type: none"> <li>a. As electrons are transferred through an ETS, H<sup>+</sup> is pumped out of the cell.</li> <li>b. As electrons are transferred through an ETS, H<sup>+</sup> is pumped into the cell.</li> <li>c. As protons are transferred through an ETS, electrons are pumped out of the cell.</li> <li>d. As protons are transferred through an ETS, electrons are pumped into the cell.</li> </ul>		
Q13	<p>Transport proteins that move substrates in opposite directions across the cell membrane are</p> <ul style="list-style-type: none"> <li>a. uniporters</li> <li>b. symporters</li> <li>c. antiporters</li> <li>d. xenoporters</li> </ul>	1.5	CO2
Q14	<p>In prokaryotes, which of the following is true?</p> <ul style="list-style-type: none"> <li>I. As electrons are transferred through an ETS, H<sup>+</sup> is pumped out of the cell.</li> <li>II. As electrons are transferred through an ETS, H<sup>+</sup> is pumped into the cell.</li> <li>III. As protons are transferred through an ETS, electrons are pumped out of the cell.</li> <li>IV. As protons are transferred through an ETS, electrons are pumped into the cell.</li> </ul>	1.5	CO
Q15	<p>Which of the following is not an electron carrier within an electron transport system?</p> <ul style="list-style-type: none"> <li>a. flavoprotein</li> <li>b. ATP synthase</li> <li>c. ubiquinone</li> <li>d. cytochrome oxidase</li> </ul>	1.5	CO4

Q16	Which of the following does not occur during cyclic photophosphorylation in cyanobacteria? a. electron transport through an ETS b. photosystem I use c. ATP synthesis d. NADPH formation	1.5	CO4
Q17	The enzyme responsible for CO <sub>2</sub> fixation during the Calvin cycle is called _____.	1.5	CO4
Q18	Name one ETC uncoupling agent.	1.5	CO4
Q19	Algae are a) Photoautotroph b) Photoheterotroph c) Chemoautotroph d) Chemoheterotroph	1.5	CO4
Q20	In the passive diffusion, solute molecules cross the membrane as a result of  (i) Concentration difference (ii) pressure difference (iii) all of these (iv) ionic difference	1.5	CO4

**Section B**  
(4Qx5M=20 Marks)

Q1	What is a multi-enzyme complex? Cite an example and explain how it operates?	5	CO1
Q2	What is the difference between cyclic and non-cyclic phosphorylation and where are they observed?	5	CO3
Q3	How does oxygen affect microbial growth? Characterize microbes based on their growth on oxygen tension.	5	CO2
Q4	Distinguish between how chemiosmotic potential is generated in bacteria ( <i>E. coli</i> ) versus mammals.	5	CO2

**Section C**  
(2Qx15M=30 Marks)

Q1	Yeast were shifted from oxygenic atmosphere to anoxygenic atmosphere and glucose consumption increased massively. Based on this answer the following questions: (i) What is this phenomenon called? Who discovered it? (2) (ii) What is the science behind this phenomenon? (2)	15	CO2
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	<p>(iii) Is this reaction/fermentation seen in bacteria also? If yes; please distinguish between yeast and bacterial pathway with name of yeast and name of bacteria involved. (5)</p> <p>(iv) Differentiate between linear and branched fermentation pathways with example. (2)</p> <p>(v) Differentiate between homolactate and heterolactate fermentation. (4)</p>		
Q2	<p>This reaction chemically happens at very high temperatures and pressures. But, extract of a legume also showed somewhat similar activity with some production of H<sub>2</sub> was detected. Based on this answer the following:</p> <p>(i) Which reaction is being referred to and which microbes perform it? (2)</p> <p>(ii) Write the equation for the reaction. (1)</p> <p>(iii) Write the process with suitable illustrations as to what happens in legume? (6)</p> <p>(iv) Does similar reaction happen in cyanobacteria? If so, where; write a note and make suitable flowchart/illustration to express your answer. (5)</p> <p>(v) Why is H<sub>2</sub> released? (1)</p>	15	CO3
<p><b>Section D</b> <b>(2Qx10M=20 Marks)</b></p>			
Q1	<p>‘TCA cycle is both amphibolic.’ Comment on the statement with flow charts with view of bacteria especially aerobes and anaerobes.</p> <p style="text-align: center;">OR</p> <p>Explain photosynthesis with flowcharts and examples of microbes where it happens.</p>	10	CO3
Q2	<p>What is group translocation? Why do bacteria prefer group translocation over simple diffusion?</p>	10	CO2