

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
Q 1	Nitrifying bacteria are: a) Chemoheterotroph b) Chemoautotroph c) Photoheterotroph d) Photolithotroph	1.5	CO2
Q 2	Passive Transport occurs a) Along the concentration gradient b) Without the use of metabolic end product c) Both d) None	1.5	CO3
Q 3	The organism which grows best above 45°C called _____	1.5	CO2
Q 4	The conversion of nitrogen to nitrogenous compound is called as a. Denitrification b. Nitrogen assimilation c. Nitrogen fixation d. Nitrification	1.5	CO3
Q 5	The type of fermentation observed in yeasts is a. acrylic fermentation b. lactic acid fermentation c. pyruvic fermentation d. alcoholic fermentation	1.5	CO1
Q 6	Radioisotopes are frequently used in the study of cells. Assume a culture of <i>E. coli</i> is grown in a culture medium containing radioactive phosphorous. At the end of 48 hours, it is expected to find the radioactive label located in a. enzymes b. RNA	1.5	CO1

	<p>c. phospholipids</p> <p>d. all of these</p>										
Q 7	<p>Which of the following methods does not require any carrier or channel for transport of substances?</p> <p>a. secondary active transport</p> <p>b. facilitated diffusion</p> <p>c. simple diffusion</p> <p>d. primary active transport</p>	1.5	CO3								
Q 8	<p>Match the following-</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;">a. simple diffusion</td> <td style="width: 50%; padding: 5px;">1. Movement via a membrane protein</td> </tr> <tr> <td style="padding: 5px;">b. secondary active transport</td> <td style="padding: 5px;">2. Energy from hydrolysis of ATP</td> </tr> <tr> <td style="padding: 5px;">c. primary active transport</td> <td style="padding: 5px;">3. Stored energy from ionic gradient</td> </tr> <tr> <td style="padding: 5px;">d. facilitated diffusion</td> <td style="padding: 5px;">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
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										
Q 9	<p>What is a group translocation?</p> <p>a. The process of transporting and transforming the molecules at the same time</p> <p>b. The process of transporting and transforming the molecules one at a time</p> <p>c. The process of transporting and transforming the molecules randomly</p>	1.5	CO2								
Q 10	<p>A group translocation system presents in bacteria that aids in the uptake of sugar</p> <p>a. Phosphotransferase system</p> <p>b. Twin-arginine translocation pathway</p> <p>c. Phosphotransferase system and Twin-arginine translocation pathway</p>	1.5	CO2								
Q 11	<p>In aerobic respiration, the terminal electron acceptor is:</p> <p>a) Oxygen</p> <p>b) Nitrogen</p> <p>c) Hydrogen</p>		CO3								

	d) nitrate		
Q 12	<p>In prokaryotes, which of the following is true?</p> <ul style="list-style-type: none"> a. As electrons are transferred through an ETS, H⁺ is pumped out of the cell. b. As electrons are transferred through an ETS, H⁺ is pumped into the cell. c. As protons are transferred through an ETS, electrons are pumped out of the cell. d. As protons are transferred through an ETS, electrons are pumped into the cell. 	1.5	CO3
Q 13	<p>Transport proteins that move substrates in opposite directions across the cell membrane are</p> <ul style="list-style-type: none"> a. uniporters b. symporters c. antiporters d. xenoporters 	1.5	CO2
Q 14	<p>In prokaryotes, which of the following is true?</p> <ul style="list-style-type: none"> I. As electrons are transferred through an ETS, H⁺ is pumped out of the cell. II. As electrons are transferred through an ETS, H⁺ is pumped into the cell. III. As protons are transferred through an ETS, electrons are pumped out of the cell. IV. As protons are transferred through an ETS, electrons are pumped into the cell. 	1.5	CO1
Q 15	<p>Which of the following is not an electron carrier within an electron transport system?</p> <ul style="list-style-type: none"> a. flavoprotein b. ATP synthase c. ubiquinone d. cytochrome oxidase 	1.5	CO1

Q 16	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	CO1
Q 17	The enzyme responsible for CO ₂ fixation during the Calvin cycle is called _____.	1.5	CO1
Q 18	Name one ETC uncoupling agent.	1.5	CO1
Q 19	Algae are a) Photoautotroph b) Photoheterotroph c) Chemoautotroph d) Chemoheterotroph	1.5	CO2
Q 20	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	CO1
Section B (4Qx5M=20 Marks)			
Q 1	What is a multi-enzyme complex? Cite an example and explain how it operates?	5	CO1
Q 2	What is the difference between cyclic and non-cyclic phosphorylation and where are they observed?	5	CO3
Q 3	How does oxygen affect microbial growth? Characterize microbes based on their growth on oxygen tension.	5	CO2
Q 4	Distinguish between how chemiosmotic potential is generated in bacteria (<i>E. coli</i>) versus mammals.	5	CO3
Section C (2Qx15M=30 Marks)			
Q 1	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)	15	CO3

	<p>(ii) What is the science behind this phenomenon? (2)</p> <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>		
Q 2	<p>Bacteria were grown in media with phosphate deficiency. To understand the physiological changes; radioactive tracer was added. Based on this; answer the following:</p> <p>(i) What pathway of glucose utilization are likely to be upregulated? (1)</p> <p>(ii) Briefly explain the pathway with suitable flowchart. (5)</p> <p>(iii) If this pathway is activated under phosphate deficiency; when will it be repressed? (1)</p> <p>(iv) What is the toxic metabolite that is produced in this pathway? (1)</p> <p>(v) This toxic metabolite does not accumulate normally in cell. Why? (2)</p> <p>(vi) With the help of flow chart explain Entener Duodoroff pathway in bacteria. (5)</p>	15	CO4
<p>Section D (2Qx10M=20 Marks)</p>			
Q 1	<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
Q 2	<p>What is group translocation? Why do bacteria prefer group translocation over simple diffusion?</p>	10	CO2