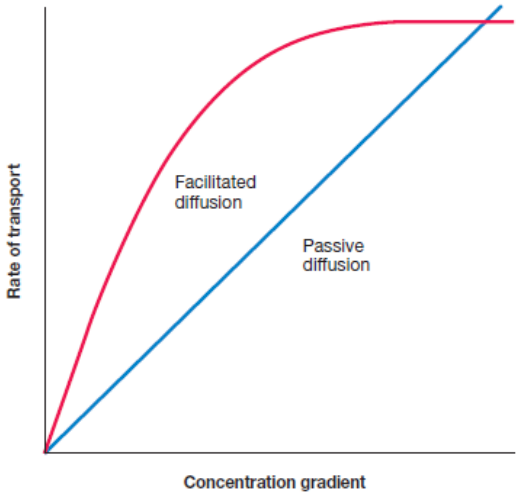
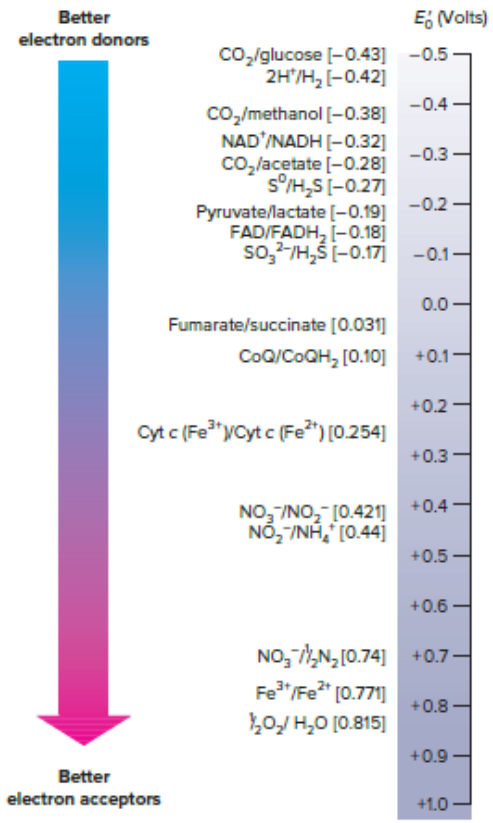
	UPES UNIVERSITY WITH A PURPOSE **UNIVERSITY OF PETROLEUM AND ENERGY STUDIES** **End Semester Examination, December 2021** **Course: Microbial Physiology and Metabolism Semester: III** **Program: B.Sc. Microbiology** **Duration: 03 hrs.** **Course Code: HSMB 2006** **Max. Marks: 100** **Instructions:**		
	SECTION A **(Type the answers in test box)**	**(20Q x1.5M= 30 Marks)**	**CO**
	MCQs or Fill in the blanks	**1.5**	**CO**
Q1	The generation time of a culture that produces three generations per hour is a. Greater than that produces two generations per hour b. Lesser than that produces two generations per hour c. Equal to that produces two generations per hour d. Greater than that produces two generations per hour	**1.5**	1
Q2	What will happen, due to osmosis, if you keep a cell in a hypotonic environment a. Water will go into the cell b. The cell will shrink c. Water will come out of the cell d. The cell will live happily	**1.5**	1
Q3	The bacteria that use reduced inorganic molecules as the source of electron are Known as a. Organotrophs b. Lithotrophs c. Chemotrophs d. Autotrophs	**1.5**	1
Q4	Which of the following is a trace element for microbial growth? a. Copper ion b. Iron ion c. Plumbum ion d. Mercury ion	**1.5**	1
Q5	During diauxic growth curve, the bacterial growth shows two peaks. Which of the following phase is present between the two peaks? a. Lag phase b. Log phase c. Saturation phase d. Decline phase	**1.5**	1
Q6	The movement of nutrients from a higher concentration outside the cell to a lower concentration inside the cells, without the utilization of energy and without the need of carrier is called_____ a. Simple diffusion b. Facilitated diffusion c. Group translocation d. Active diffusion	**1.5**	2

Q7	The main barrier regulating the passage of solutes between the external environment and the cell is the _____ membrane	**1.5**	2
Q8	The following organisms typically get their carbon for biosynthesis from organic comp a. Aerobic, glucose-respiring bacteria (aerobic respiration) b. Ammonia-oxidizing bacteria (chemolithotrophic bacteria) c. Photosynthetic cyanobacteria (phototrophic metabolism) d. None of the above	**1.5**	2
Q9	The structural unit of photosynthesis is called a. Nucleus b. Endoplasmic reticulum c. Thylakoid d. Grana	**1.5**	2
Q10	Which of the following does not affect the rate of the photosynthesis? a. Temperature b. Light duration c. Light intensity d. Light quality	**1.5**	2
Q11	In photosynthesis, light reaction occurs in a. Nucleus b. Stroma c. Endoplasmic reticulum d. Grana	**1.5**	2
Q12	In nitrogen fixation, nitrogen is ultimately converted to a. Nitrate b. Nitrite c. Urea d. Ammonia	**1.5**	2
Q13	The association of nitrogen fixing Rhizobium with plant is an example of a. Neutralism b. Commensalism c. Mutualism d. Parasitism	**1.5**	2
Q14	Which of the following is a highly reactive and potentially a toxic ion for plant cells? a. Nitric oxide b. Nitrate c. Nitrite d. Nitrous oxide	**1.5**	2
Q15	In which of the following processes, glucose is not completely oxidized to carbon dioxide? a. Fermentation b. Aerobic respiration c. Anaerobic respiration d. None of the above	**1.5**	3
Q16	Which of the following acts as an electron acceptor in fermentation process? a. Oxygen b. Carbon dioxide c. Pyruvate d. Nitrogen	**1.5**	3
Q17	NAD+ accepts _____ and gets reduced during glycolysis. a. Electron b. Proton c. Neutron d. Electron and proton	**1.5**	3

Q18	The electron transport chain of bacteria takes place in a. Mitochondria b. Nucleus c. Cytoplasm d. Plasma membrane	**1.5**	3
Q19	Glucose is oxidized to _____ as the end product of glycolysis	**1.5**	3
Q20	In the Chemiosmotic theory, the energy obtained from the electron transport chain is used to transport _____ across the membrane	**1.5**	3
	SECTION B **(Scan and upload)**	**(4Qx5M=20 Marks)**	**CO**
	Short Answer Type Question (5 marks each) (100-120 words)		
Q1	Define the types of bacteria based on their ability to grow at various temperature, pH and solute and water activity?	**2.5+1+1.5**	**1**
Q2	Cyanobacteria are aerobic bacteria that perform nitrogen fixation. However, the nitrogenase enzyme involved in nitrogen fixation requires anaerobic condition. Identify how do Cyanobacteria perform nitrogen fixation? Also mention the 2 components of the nitrogenase enzyme.	**4+1**	**2**
Q3	 a. Explain the two modes of diffusion process for nutritent transport b. The figure shows one of the differences between the two diffusion processes. Identify the difference and explain the rationale for the observed difference	**3+2**	**2**

Q4	 a. What can be used as the terminal electron acceptor under arobic respiration and an aerobic respiration? b. Suppose an organism can use O2, fumarate, FE^{3+}, SO_3^{2-} or nitrate as a terminal electron acceptor under different conditions. This organism uses NADH as an electron donor. Based on the picture, determine the order of energy yield from highest to lowest for these electron acceptors. Also mention the rationale for your answer.	**1.5+3.5**	3
	SECTION C **(Scan and upload)**	**(2Qx15M=30 Marks)**	**CO**
	Two case studies 15 marks each subsections (300 words max)		
Q1	Which type of photosynthetic metabolism is used by Cyanobacteria? Describe the oxygenic phototrophic metabolism using figure	**15**	**2**
Q2	a. Analyze the ATP yield during the mitochondrial aerobic respiration process. Show the calculation for each step involved in aerobic respiration. b. Also mention the rationale for lower ATP generation during bacterial aerobic respiration. c. Point out why less ATPs are generated in reality than the theoretical calculation of ATP?	**11+2+2**	3
	SECTION- D **(Scan and upload)**	**(2Qx10M=20 Marks)**	**CO**
	Long Answer type Question **(200-250 words)**		
Q1	a. Draw a graph for microbial growth curve in a closed system, label the axis of the graph and write the name of different phases on the graph b. Explain each phase of the growth curve c. Define generation time	**3+6+1**	1
Q2	What is an active transport? Explain the two types of active transport in detail with example Identify the differences between those two.	**1+8+1**	2