

<b>Name:</b>	
<b>Enrolment No:</b>	

**UPES**  
**End Semester Examination, December 2023**

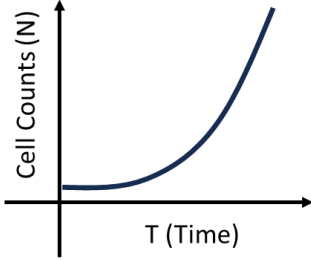
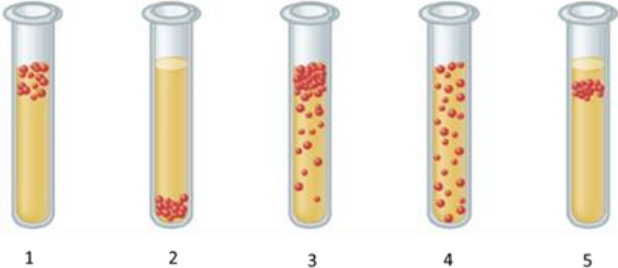
**Course: Microbial Physiology and Metabolism**  
**Semester: III**  
**Program: Integrated BSc-MSc Microbiology** **Duration : 3 Hours**  
**Course Code: HSMB2006** **Max. Marks: 100**

**Instructions:**

1. All questions are compulsory.
2. Do not scribble on Question Paper.
3. Use a scientific calculator, wherever required.

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
<b>Q 1</b>	Name an osmotolerant microorganism.	<b>1.5</b>	<b>CO1</b>
<b>Q 2</b>	<i>Rhodospirillum rubrum</i> is a typical example of: A. Photoorganotroph B. Chemoorganotroph C. Chemolithotroph D. Chemolithoautotroph	<b>1.5</b>	<b>CO1</b>
<b>Q 3</b>	<b>State True or False:</b> Fermentation is an example of anaerobic respiration.	<b>1.5</b>	<b>CO2</b>
<b>Q 4</b>	What are capnophiles?	<b>1.5</b>	<b>CO2</b>
<b>Q 5</b>	Which molecule typically serves as the final electron acceptor during fermentation? A. oxygen B. NAD <sup>+</sup> C. pyruvate D. CO <sub>2</sub>		<b>CO2</b>
<b>Q 6</b>	In prokaryotes, in which direction are protons pumped by the electron transport system of photosynthetic membranes? A. to the outside of the plasma membrane B. to the inside (cytoplasm) of the cell C. to the stroma D. to the intermembrane space of the chloroplast	<b>1.5</b>	<b>CO2</b>
<b>Q 7</b>	What is FACS?	<b>1.5</b>	<b>CO1</b>
<b>Q 8</b>	Define redox potential.	<b>1.5</b>	<b>CO2</b>

Q 9	Define cardinal temperature.	1.5	CO1
Q 10	<b>State True or False:</b> Reverse TCA cycle is an example of catabolic pathway.	1.5	CO1
Q 11	Bacterial growth is defined as: A. Increase in cell numbers B. Increase in cell size and numbers	1.5	CO3
Q 12	State the function of molecules like NAD <sup>+</sup> /NADH and FAD/FADH <sub>2</sub> in cells?	1.5	CO1
Q 13	What is Synchronous growth?	1.5	CO1
Q 14	Why are some microbes unable to perform aerobic respiration, even in the presence of oxygen?	1.5	CO3
Q 15	What is the function of photosynthetic pigments in the light-harvesting complex?	1.5	CO2
Q 16	Name the final electron acceptor during dissimilatory reduction of iron-oxides?	1.5	CO2
Q 17	What is great plate count anomaly?	1.5	CO1
Q 18	What are phycobilisomes?	1.5	CO2
Q 19	The following pigment acts as proton pump in Haloarchaea? A. Bacteriorhodopsin B. Bacterioruberin C. Carotenoids D. Lycopene	1.5	CO2
Q 20	Why is Oxygen not formed during anoxygenic photosynthesis?	1.5	CO2
<b>Section B</b> <b>(4Qx5M=20 Marks)</b>			
Q 1	Classify microorganisms based on their Carbon and Energy sources.	5	CO1
Q 2	Briefly describe the function of citric acid cycle during aerobic respiration.	5	CO3
Q 3	A. What is 'reverse electron flow'? (2) B. Give an example of phototroph which needs to use reverse electron flow, and why? (3)	5	CO2
Q 4	Explain the various microbial growth phases in a batch culture.	5	CO1
<b>Section C</b> <b>(2Qx15M=30 Marks)</b>			
Q 1	A. Describe the distinct features of the Entner–Doudoroff (ED) pathway in bacteria with a schematic. (10) B. Compare energetic yields of this pathway with Glycolysis. (1) C. Comment on the archaeal variations of this pathway. (4)	15	CO2

<p><b>Q 2</b></p>	<div style="text-align: center;">  </div> <p>You have inoculated an unknown bacterial culture in defined media and performed cell counts at periodic intervals to calculate various growth parameters.</p> <p>A. What is specific growth rate constant and generation time. (2)</p> <p>B. Deduce a mathematical relationship for calculation of specific growth rate and generation time from cell counts. (8)</p> <p>C. In exponential phase, say your culture grows from <math>5 \times 10^6</math> cells/ml to <math>5 \times 10^8</math> cells/ml in 15 h. Calculate specific growth rate and generation time. (3)  [Use values: <math>\text{Ln}(5 \times 10^6) = 15.4</math>; <math>\text{Ln}(5 \times 10^8) = 20.03</math>]</p> <p>D. Comment on the physiology of your culture in comparison to <i>E. coli</i>. (2)</p>	<p><b>15</b></p>	<p><b>CO1</b></p>
<p><b>Section D</b> (2Qx10M=20 Marks)</p>			
<p><b>Q 1</b></p>	<div style="text-align: center;">  </div> <p>A. Explain the oxygen requirements of microorganisms growing in above culture tubes. (7.5)</p> <p>B. In which media this test can be performed and why? (2.5)</p>	<p><b>10</b></p>	<p><b>CO1</b></p>
<p><b>Q 2</b></p>	<p>Describe the electron transport chain of <i>E. coli</i> and its function with a schematic diagram.</p>	<p><b>10</b></p>	<p><b>CO3</b></p>