This question paper contains **4** printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **8713**

Unique Paper Code : **253303** **C**

Name of the Paper : **MIHT-305 Microbial Physiology and Metabolism—I**

Name of the Course : **B.Sc. (Hons.) Microbiology Part II**

Semester : **III**

Duration : **3 Hours** Maximum Marks : **75 Marks**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *five* questions in all.

Question No. **1** is compulsory.

All questions carry equal marks.

1. (*a*) State giving reasons whether the following statements are true *or* false

   (*i*) Photosynthesis in *Halobacterium helobium* is oxygenic.

   (*ii*) A biphasic growth curve indicates preferential utilization of substrates.

   (*iii*) Anaerobic microorganisms grow at oxygen levels below normal atmospheric levels. 3×3=9

   (*b*) Write about the contributions of any *two* of the following scientists :

   (*i*) Robert Emerson

   (*ii*) S. Winogradsky

   (*iii*) Arnon, Buchanan and Evans 2×2=4

P.T.O.

(*c*) Define electrogenic transport giving an example.

Or

How is the problem of iron transport overcome by microbes? 2

2. (*a*) What do you understand by secondary active transport mechanisms? Explain giving suitable examples. 4

(*b*) Define the following terms with examples :

(*i*) Photoorganotroph

(*ii*) Uniport

(*iii*) Halophile

(*iv*) Anaerobic chemolithotroph 4×2=8

(*c*) How are green bacteria adapted to photosynthesize at weak light intensities ? 3

3. (*a*) How does pH influence the growth of microorganisms? Classify microorganisms based on pH ranges giving an example of each class. 2+3=5

(*b*) Differentiate between the following pairs :

(*i*) Passive and facilitated diffusion

(*ii*) Cyclic and non-cyclic photophosphorylation. 2×4=8

(*c*) Define specific growth rate. What units would you use to express it ? 2

4. (*a*) What is a continuous culture? Explain the techniques used for maintaining bacteria in continuous culture. What are its practical applications? 1+3+2=6

(*b*) Define the term water activity. Explain the mechanism which enables the microorganisms to grow at low water activity. 1+3=4

(*c*) Why do bacteria show a prolonged lag phase following inoculation into a fresh nutrient medium? 2

(*d*) What is an action spectrum? Comment on its significance.

Or

Write the mechanisms involved in the formation of ion gradients to be used in transport processes. 3

5. (*a*) Write short notes on any *two* of the following :

(*i*) PEP:PTS

(*ii*) Physiological groups of aerobic chemolithotrophs

(*iii*) Kinetics of batch culture 2×4=8

(*b*) How would you form different groups of microorganisms on the basis of their tolerance to oxygen ? What is toxicity of oxygen towards anaerobic microorganisms due to? 4+2=6

(*c*) Give an example of a microorganism capable of growing in the presence of ionizing radiation. 1

6. (*a*) Discuss purple bacterial photosynthesis under the following heads :

Pigments and their localization

Electron transport

Reductant biosynthesis 2+3+2=7

(*b*) Write enzymatic reactions for the following conversions :

(*i*) Citrate to acetyl CoA

(*ii*) Phosphoglyceraldehyde to 1, 3-Bis phosphoglyceric acid

(*iii*) Ribulose bisphosphate to phosphoglyceraldehyde

(*iv*) Succinyl CoA to α-oxoglutarate 4×2=8