

This question paper contains 4 printed pages]

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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  $\alpha$ -oxoglutarate

4×2=8