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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: Biotechnology **Duration: 3 hrs.**
Course Code: 19BT3DCMBG **Max Marks: 100**
Course: Microbiology **Date: 19.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) With the help of a ray diagram, describe the working principle and applications of a light microscope that works based on change in the phase of the wave front of light. **10**

b) Calculate the maximum limit of resolution when a microorganism is observed under 100x objective of a light microscope. The color of incident light ray is indigo radiations in visible spectrum. Also comment on the relation between wavelength and resolving power. **05**

c) Assume that *Mycobacterium tuberculosis* the causative agent of Tb infects rat which is died of symptoms. The bacteria targets the alveoli of lungs and takes at least 15 days to grow as colony under normal physical conditions in invitro. It need the serum proteins as special nutritional requirements. **05**
Using the above specific information arrive at the respective postulates as defined by Robert Koch. Mention the relevance of Koch's postulates in the present world.

UNIT - II

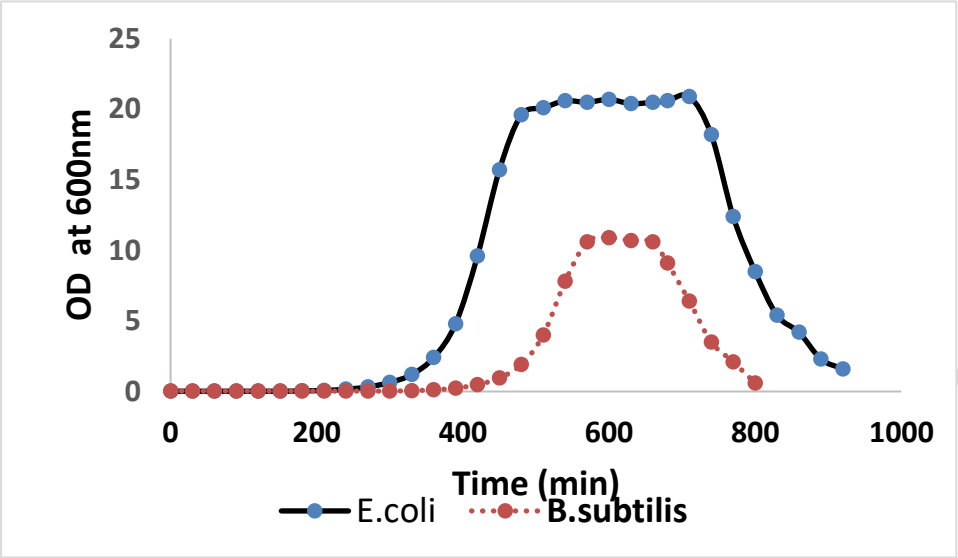
2 a) With a neat labeled diagram, discuss the salient features and functions of structures found internal to the plasma membrane in a bacteria. **10**

b) Assume that *Enterococcus faecalis* infects humans (the only host) and causes the severe disease while *Shigella sp*. infects humans (broader host range) and causes mild disease. While the latter organism could be cultivated easily, the former one is difficult to be cultivated with general nutrient media. Suggest and justify a microbiological media that could facilitate differentiation of both the organisms. **05**

c) Two petriplates one with bacteria colony (plate 1) and other with fungal colony (plate 2) are provided. The number of colonies counted on plate 1 is 600 while on plate 2 the colonies are 150. The dilution factor used for both the samples is 10^{-3} and the amount of sample inoculated is 0.1 mL. Calculate the CFU of both the organisms per mL of the sample. Will the CFU calculated theoretically accurate for both the organisms. Justify suitably your decision. **05**

OR

3 a) Refer to the following graphical plot and answer the questions. **10**



i. Name the graphical plot.

ii. Tabulate the differences between the two organisms with respect to curve pattern in the graph. Infer suitably the reasons for the same (assume that all physical conditions provided are optimum for the organisms).

iii. Which of the organisms will be ideal for industrial applications and justify your decision accordingly?

b) Discuss briefly the external layers found surrounding the bacterial cell wall with respect to their properties and importance. **05**

c) Classify the microorganisms based on pH requirement. Provide suitable examples of natural habitats and microbes under each group. **05**

UNIT - III

4 a) With a neat sketch describe the different morphological types of viruses based on capsid symmetry. Provide suitable examples under each class. **10**

b) A bacterial culture was provided with Glucose-6-Phosphate as initial carbon source. The cell suspension was incubated for 24 hr at 37 ^{o}C. When culture entered into log phase the bacterial cells were monitored continuously with a high end spectrophotometer and other sensitive instruments. It was observed that molecules of 10 carbon number were identified for faction of seconds which later dissociated into stable molecules. **05**

i.Identify the metabolic pathway that the bacteria catalysed and give suitable examples of bacteria.

ii. Write the specific steps of the pathway as per the information furnished above.

iii Discuss the role of stable molecules formed in the steps.

c) Infer the main criteria followed in scientific classification of fungi. Discuss any two groups with suitable examples. **05**

OR

5 a) Two bacterial cultures namely *Pseudomonas putida* and *Bacillus licheniformis* were found to be deficient in synthesizing tryptophan amino acid. Upon incubation on a complete media both could form the colonies with plaque in the surrounding which is characteristic of bacteriophages. Further when few viable cultures of bacteria were inoculated separately onto a media deficient of tryptophan, both the bacterial species could grow and form colonies. **10**

i. What could be the reason for ability of two bacteria to grow on tryptophan deficient medium?

ii. With a diagrammatic representation discuss the process involved in the above case study.

b) Two different curd samples were separately inoculated into a media consisting lactose as sole carbon source. Upon incubation for 48Hr, one of the culture broths had pH of 3.0 and another had a gas buildup in addition to media having pH 3.0. Identify the probable bacterial group responsible for such metabolic diversity and explain the pathways. **05**

c) Highlight the salient features of viruses. Reason why do viruses considered to be between living and non-living things. **05**

UNIT - IV

6 a) With a neat schematic representation, explain a laboratory instrument that involve four different sterilization methods during aseptic handling of microbes. **10**

b) With suitable examples, explain the mechanism and applications of halogens as sterilizing agents. **05**

c) Two bacterial cultures were taken namely culture A and B. Culture A was provided with metabolic precursor of THFA i.e. PABA while the culture B was provided with a structural analogue of PABA. After 24 hr of incubation, the OD of both the cultures recorded at 600nm. The culture A showed 0.6 OD (10 times higher than initial OD) while culture B showed 0.02 OD (same as initial OD). Infer the suitable reasons for the differences in the growth of two bacterial cultures and cite which of these cultures exhibits the normal growth. **05**

UNIT - V

7 a) With a schematic representation, describe the role of microorganisms in recycling of carbon in an ecological environment. **08**

b) Discuss *B.thuringiensis* as an ecofriendly pesticide in eradicating plant pests. **06**

c) Microbes play a vital role in processing of various foods improving their quality. Justify. **06**

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