

M. SC. (BIOTECHNOLOGY) PART I EXAMINATION, 2017

MICROBIOLOGY

PAPER - 1/1

Time : Four hours

Full Marks : 100

GROUP - A

Answer **any five** questions

1.
 - a) Describe the method of sterilization using an autoclave.
 - b) How to check whether an autoclave is functioning properly ?
 - c) How the following material could be sterilized (i) sputum, (ii) Petri plate made of glass, (iii) Petri plate made of plastic, (iv) solution of vitamin B₆, (v) solution of 1M Tris-HCl buffer of pH 8.8, (vi) an incubator.
 - d) Prokaryotes are the dominant forms of life on earth – Explain. [4+2+6+4=16]
2.
 - a) Schematically describe how to purify both the organisms *E. coli* and *B. subtilis* from a mixture in liquid broth.
 - b) Mention three major differences between the Gram positive and gram negative bacterial.
 - c) Mycoplasma are special kind of bacteria – Explain why ?
 - d) Explain the role of bacterial flagella in bacterial chemotaxis.
 - e) Are there any other taxas found in bacteria ? Give examples. [2+3+3+7+1=16]
3.
 - a) How do you define and measure bacterial growth ?
 - b) What is meant by the term “exponential growth” ? Why it could not be sustained ?
 - c) What are the desirable properties of an ideal antibiotic ?
 - d) Explain why antibiotics have a few targets only ?
 - e) How do bacteria become resistant to antibiotics ? 4+3+3+3+3=16
4.
 - a) How microbes are classified based on their requirements of (i) carbon and energy source, (ii) pH, (iii) O₂, and (iv) temperature ?
 - b) What are the nutritional requirements for bacterial media preparation ?
 - c) How do you design selective media to isolate (i) cyanobacteria, (ii) Nitrogen fixing bacteria [(2+2+2+2)+6+1+1=16]

[Turn over

5. a) Mention the role of bacteria in nitrogen cycle.
 b) Nitrogenase enzyme is usually oxygen sensitive – Explain how different nitrogen fixing bacteria protect their nitrogenase from oxygen.
 c) Photosynthesis by bacteria is mostly anoxygenic – explain.
 d) Explain the special properties of bacteriorhodopsin in *Halobacterium salinarum*.

[4+4+4+4=16]
6. a) What are the Koch's postulates ? What are their limitations ? How the use of molecular techniques can help to revise the postulates to overcome those limitations ?
 b) Give two examples of human diseases that are not caused by any microbes.
 c) How pulse polio vaccination works ? How to make it safe ?
 d) *Clostridium* sp are mostly pathogenic to human – Discuss.
 e) Unlike vaccination protocol in India, USA opted not to vaccinate against Typhoid and Tuberculosis. Why ?

[(4+1+1)+2+(2+1)+3+2=16]
7. Write short notes on **(any four)** : (4×4)=16
 - i) Virus classification based on their nucleic acid content.
 - ii) Implication of segmented genome of Influenza virus.
 - iii) Protozoan diseases
 - iv) Ecological importance of fungi
 - v) Archaeobacteria
 - vi) Antifungal antibiotics
 - vii) Risk group for HIV infection

GROUP - B

Answer ***any four*** questions

8. Why do we need to study the Carbon cycle. Describe the biological carbon cycle with schematic diagram. 2+3
 9. List the biochemical process carried out by the microorganisms in carbon cycle. 5
 10. Describe (with diagram) the biotic aerobic and anaerobic biological process that occurs in the Nitrogen cycle. Under what circumstances the nitrogen fixation does occur ? 4+1
 11. Describe the two-step process that occurs in nitrification with the name the bacterial genus responsible for each step. Describe the dissimilatory sulfate reduction. 4+1
 12. Describe the type of microbes-microbe's interactions with example. 5
 13. How does commensalism differ from cooperation and mutualism. Nitrification is a good example of which of above mentioned process and why. 3+2
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