

Ph.D. ENTRANCE EXAMINATION, APRIL 2022

MICROBIOLOGY

Time : Two Hours

Maximum : 100 Marks

Section A

Answer all questions.

1. According to Abbe's equation, in a microscopic observation, when the distance between two objects decreases, the numerical aperture _____.
(a) Decreases. (b) Increases.
(c) Neither decreases, nor increases. (d) None of these.
2. The wave length of electron microscope is _____ times shorter than a light microscope.
(a) 100,000. (b) 100,00.
(c) 100,0000. (d) 100,0.
3. In a biological stain, the chemical group that conveys the property of ionisation and form salt is known as :
(a) Chromogen. (b) Chromophore.
(c) Auxochrome. (d) All of these.
4. The decolouriser used in endospore staining by Schaeffer Fulton method is _____.
(a) Malachite Green. (b) Copper Sulphate.
(c) Ethanol. (d) Water.

5. A person is visualising to study the morphology of a fungus-*Aspergillus niger* using 15 X ocular and 40 X objective of a compound microscope. The best possible magnification of the specimen is _____.
- (a) 40X. (b) 15X.
(c) 1000X. (d) 600X.
6. Fluorescence microscope is invented by _____.
- (a) Ruska. (b) Leeuwenhoek.
(c) Kohler. (d) Zernike.
7. Which of the following bacteria has lanceolate appearance in their morphological form ?
- (a) *Streptococcus pneumoniae*. (b) *Diplococcus pneumoniae*.
(c) *Pneumococcus pneumoniae*. (d) All of these.
8. Hiss's serum water is used for the study of which feature of *Streptococcus pneumoniae*.
- (a) Optochin sensitivity. (b) Carbohydrate fermentation.
(c) Bile solubility. (d) Alkaline phosphatase.
9. The penicillin resistance of gonococci mainly due to the presence of :
- (a) Transmissible plasmid. (b) Cryptic plasmid.
(c) Both of these. (d) None of these.
10. Ritter's disease by *Staphylococcus aureus* is caused by :
- (a) Enterotoxin. (b) Exfoliative toxin.
(c) Cytolytic toxin. (d) None of these.

11. Which of the following antibiotic used as a standard for the identification of *Streptococcus pyogenes* from other hemolytic streptococci ?
- (a) Methicillin. (b) Cloxacillin.
(c) Bacitracin. (d) Vancomycin.
12. Which of the following host is not an animal model for the study of the infection caused by *Bacillus anthracis* ?
- (a) Guinea pig. (b) Mice.
(c) Rabbit. (d) Frog.
13. The colony features of *Corynebacterium diphtheriae* in Tellurite blood agar :
- (a) Alpha hemolytic black coloured colonies.
(b) Betahemolytic black coloured colonies.
(c) Gamma hemolytic black coloured colonies.
(d) None of these.
14. The causative role of *Clostridium tetani* in tetanus is first described by _____.
- (a) Hippocrates. (b) Rosenbach.
(c) Kitasato. (d) Nicolaier.
15. Triplex vaccine DPT is prepared by utilizing the toxoids from *Corynebacterium*, *Clostridium* and _____.
- (a) *Borrelia*. (b) *Bacillus*.
(c) *Bordetella*. (d) *Brucella*.

16. The double zone of inhibition of *Clostridium perfringens* in blood agar is due to :
- (a) Complete hemolysis by beta toxin and incomplete hemolysis by alpha toxin.
 - (b) Complete hemolysis by alpha toxin and incomplete hemolysis by beta toxin.
 - (c) Complete hemolysis by theta toxin and incomplete hemolysis by alpha toxin.
 - (d) Complete hemolysis by alpha toxin and incomplete hemolysis by theta toxin.
17. The secondary metabolites such as antibiotics is produced in ————— phase of the bacterial growth curve.
- (a) Lag phase.
 - (b) Log phase.
 - (c) Late log phase.
 - (d) Stationary phase.
18. Which of the following organism is considered as a biopreservative in food industry due to the production of Bacteriocin ?
- (a) *Lactobacillus*.
 - (b) *Pediococcus*.
 - (c) *Lactococcus*.
 - (d) All of these.
19. The major hotspots of psychrophilic barophilic organism are :
- (a) Freshwater.
 - (b) Marine water.
 - (c) Brackish water.
 - (d) All of these.
20. Green and purple bacteria are commonly present in ————— zone of aquatic ecosystem.
- (a) Littoral zone.
 - (b) Limnetic zone.
 - (c) Profoundal zone.
 - (d) Benthic zone.
21. The pioneer of microbial ecology :
- (a) Arthur George Tansley.
 - (b) Martinus Beijerinck.
 - (c) Sergi N Winogradsky.
 - (d) Louis Pasteur.

22. The major enzyme that possesses 5'-3' exonuclease activity in DNA replication :
- (a) RNA polymerase I. (b) DNA polymerase I.
(c) DNA dependent RNA polymerase. (d) RNA dependent DNA polymerase.
23. Okazaki fragments are _____.
- (a) Short sequences of nucleotides which are synthesized discontinuously and linked by DNA ligase.
(b) Short sequences of nucleotides which are synthesized continuously and linked by DNA ligase.
(c) Short sequences of nucleotides which are synthesized discontinuously and linked by RNA polymerase.
(d) Short sequences of nucleotides which are synthesized discontinuously and linked by RNA polymerase.
24. Which of the following initiation factor is attached with P site of ribosome during translation ?
- (a) IF1. (b) IF2.
(c) IF 3. (d) All of these
25. Which of the following is a typical inhibitor of protein synthesis ?
- (a) Tetracycline. (b) Gentamycin.
(c) Nitrofurantoin. (d) Amoxicillin.

(25 × 2 = 50 marks)

Section B

*Write essay on any **five** of the following.*

26. Illustrate the salient features of the genome, structure and virulent factors of SARS-CoV2.
27. Elaborate in detail the major steps involved in Sanger sequencing. Add a short note on the merits and demerits of this method.
28. What do you mean by biogeochemical cycles? Critically discuss on Nitrogen cycle.
29. Investigate the steps and processes involved in the purification of wastewater.
30. Investigate the step involved in the industrial production of bread with a special emphasis on various types of leavening process.
31. Elaborate in detail on various methods employed for the preservation of cultures.
32. Examine the scope and applications of genetic engineering of bacteria and their potential for bioremediation.

(5 × 10 = 50 marks)