



BRAINWARE UNIVERSITY

Term End Examination 2024-2025

Programme – M.Sc.(MB)-2024

Course Name – Pharmaceutical Microbiology

Course Code - MMB20204

(Semester II)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) How does a reduction in water activity (A_w) in a pharmaceutical product affect the efficacy of preservatives?
 - a) Increases preservative activity
 - b) Has no effect on preservatives
 - c) Significantly reduces preservative efficiency
 - d) Increases the rate of preservative kill
- (ii) What is the role of quaternary ammonium compounds (Quats) in pharmaceutical formulations, as discussed in the text?
 - a) They increase solubility of preservatives
 - b) They act as surfactants with antimicrobial activity
 - c) They enhance preservative solubility in oils
 - d) They are primarily used to increase product shelf life
- (iii) What does the D-value represent in sterilization?
 - a) Time for a 90% reduction in viable cells
 - b) Increase in temperature required to reduce resistance
 - c) The duration of heat exposure
 - d) Total microbial count
- (iv) Select the gas that is used for sterilization and requires strict atmospheric control.
 - a) Ozone
 - b) Ethylene oxide
 - c) Carbon dioxide
 - d) Nitrogen dioxide
- (v) Examine the term used to describe a drug's ability to harm pathogens but not the host.
 - a) Therapeutic dose
 - b) Selective toxicity
 - c) Chemotherapeutic index
 - d) Antimicrobial spectrum

- (vi) Choose the significant modification that led to the development of fluoroquinolones from nalidixic acid.
- Addition of nitrogen at C-4
 - Addition of fluorine at C-6
 - Substitution of hydroxyl group
 - Removal of carboxyl group
- (vii) Select the mode of action of Class IIa bacteriocins like pediocin.
- Disrupting bacterial DNA
 - Disrupting bacterial cell membrane
 - Inhibiting cell wall synthesis
 - Targeting protein synthesis
- (viii) Select the feature that makes tetracyclines selectively toxic to bacteria.
- Active uptake by bacterial cells
 - Inhibition of ergosterol synthesis
 - Binding to 50S ribosome subunit
 - Disruption of outer membrane
- (ix) Select how erythromycin inhibits protein synthesis.
- Blocking translocation
 - Misreading of mRNA
 - Inhibiting peptidyl transferase
 - Disrupting membrane integrity
- (x) Select the major mechanism of tetracycline resistance in Gram-negative bacteria.
- Efflux pumps
 - DHFR overproduction
 - Ribosomal methylation
 - Enzymatic degradation
- (xi) Classify the genetic determinant responsible for ethambutol resistance.
- pncA gene mutation
 - Deletion of katG
 - Missense mutations in embB
 - Alteration of ribosomal proteins
- (xii) Select the correct definition of Minimum Inhibitory Concentration (MIC).
- The highest concentration of a drug that prevents bacterial growth
 - The lowest drug concentration that prevents visible bacterial growth
 - The average drug concentration required for bacterial inhibition
 - The drug concentration required to kill 50% of bacteria
- (xiii) Examine the key focus of pharmacogenetics.
- Study of environmental drug interactions
 - Study of drug formulation
 - Study of genetic influence on drug response
 - Study of clinical trial designs
- (xiv) Examine the effect of grapefruit juice on drug metabolism. Which enzyme does it inhibit?
- CYP3A4
 - MAO
 - CYP2D6
 - Amylase
- (xv) Identify the pharmacokinetic parameter that represents the time required for 50% of a drug to be eliminated.
- Clearance
 - Half-life
 - Bioavailability
 - Area under the curve

Group-B

(Short Answer Type Questions)

3 x 5=15

- Classify antibiotics based on their origin and provide examples. (3)
- Justify the statement: "Horizontal gene transfer plays a crucial role in bacterial antibiotic resistance." (3)
- Tabulate the different drug administration routes along with one advantage and one disadvantage for each. (3)
- Explain how the presence of moisture in pharmaceutical formulations affects microbial spoilage. (3)
- Assess the major causes and consequences of antibiotic resistance. (3)

OR

- Analyze the mechanism of action of D-cycloserine in blocking peptidoglycan synthesis. (3)

Group-C
(Long Answer Type Questions)

5 x 6=30

7. Explain how the physicochemical properties of pharmaceutical products influence microbial spoilage. (5)
8. Discuss the historical development of sulfonamides, focusing on the discovery of sulfanilamide and its impact on antimicrobial therapy. Include the mechanisms of action and how drug resistance developed over time. (5)
9. Assess the advantages and disadvantages of combination chemotherapy, including examples of its clinical applications. (5)
10. Differentiate between chromosomal and plasmid-borne tetracycline resistance in Gram-positive bacteria with respect to their regulatory mechanisms. (5)
11. Distinguish between MIC determination by dilution methods and the disk diffusion method in antibiotic susceptibility testing. (5)
12. Explain how genetic polymorphisms in CYP2D6 influence the metabolism of antidepressants and their clinical implications. (5)

OR

Compare the roles of CYP2C9 and VKORC1 polymorphisms in warfarin therapy, including their influence on dosing and bleeding risk. (5)

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