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BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – M.Sc.(MLT)-2024
Course Name – Industrial and Pharmaceutical Microbiology
Course Code - MMTC04002
(Semester IV)

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) Identify the batch culture or fermentation can be used to produce
   a) Single Cell Protein b) Antibiotics
   c) Organic acids d) Amino acids

(ii) State that Which of the following is correct with respect to Fermentation
   a) A process involving the mass culture of micro-organisms b) Fermented food products are always healthy
   c) It is a fast process d) Oxygen is produced during fermentation

(iii) Natural Penicillin is also named as
   a) Benzyl Penicillin b) Amoxycillin
   c) Ampicillin d) Phenoxy methyl Penicillin

(iv) Cite which of the following is NOT integral to Down stream processing?
   a) Cell disruption b) Cell harvesting
   c) Product purification d) Media sterilisation

(v) Select which of these enzymes is found in yeasts and widely used in ethanol fermentation?
   a) Lipase b) Amylase
   c) Zymase d) Chymosin

(vi) Select the correct name of antibiotic which would be most appropriate for treating a patient with a severe penicillin allergy and a suspected gram-negative bacterial infection.
   a) Azithromycin b) Ciprofloxacin
   c) Amoxicillin d) Clindamycin

(vii) Select which of the following antimicrobial agent does not act on 50s ribosomal subunit.
   a) Aminoglycosides b) Macrolides
   c) Streptogramin d) Chloramphenicol

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(viii) What is the role of preservatives in pharmaceutical formulations?

a) To increase drug efficacy
b) To prevent microbial growth
c) To improve product color
d) To increase shelf life

(ix) Which of the following is an example of a commonly used preservative in pharmaceuticals?

a) Sodium chloride
b) Benzalkonium chloride
c) Sodium bicarbonate
d) Potassium permanganate

(x) Which microorganism is commonly found in contaminated injectable solutions?

a) Escherichia coli
b) Pseudomonas aeruginosa
c) Staphylococcus aureus
d) Candida albicans

(xi) Select the type of test commonly used to detect microbial contamination in sterile pharmaceutical products.

a) Endotoxin testing
b) Microbial limit testing
c) Membrane filtration
d) All of these

(xii) In mammalian cell culture, what is the PRIMARY reason for using a buffered medium such as one containing HEPES or bicarbonate?

a) To supply a direct energy source in place of glucose
b) To provide essential amino acids for protein synthesis
c) To stabilize the medium pH despite cellular metabolism and gas exchange
d) To increase osmolarity so cells do not swell and lyse

(xiii) In adherent mammalian cell culture, what is the MAIN purpose of using a trypsin-EDTA solution during passaging?

a) To provide additional amino acids for rapid cell proliferation
b) To sterilize the culture dish before reseeding cells
c) To induce differentiation by activating specific signaling pathways
d) To detach cells from the culture surface by digesting adhesion proteins and chelating Ca2+

(xiv) In stirred-tank bioreactors used for suspension cell culture, impeller design and agitation speed must be carefully optimized PRIMARILY to balance which two factors?

a) Serum concentration and glucose uptake
b) pH and antibiotic stability
c) Temperature and light intensity
d) Shear stress on cells and mixing/oxygen transfer

(xv) During routine maintenance of an adherent cell line, why is it important to avoid overexposure to trypsin when detaching cells?

a) Because trypsin will quickly neutralize the buffering capacity of the medium
b) Because extended trypsinization permanently sterilizes the culture, preventing future contamination
c) Because prolonged trypsin exposure can digest cell surface proteins, affecting viability and downstream assays
d) Because long trypsin exposure always induces immediate differentiation

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Contrast the Primary Cell culture and Secondary Cell culture (3)
3. Explain the effectiveness of an antimicrobial agent with respect to penetration power and stability of the agent (3)
4. Analyze the differences in the mechanisms of action between nucleoside analogs and protease inhibitors in the treatment of viral infections. (3)
5. Differentiate type I and type II preservatives. (3)

6. Primary cells closely resemble in vivo tissue characteristics but have limited lifespan, while immortalized lines can proliferate indefinitely with possible genetic and phenotypic alterations. Justify the statement. (3)

OR

In a T-flask with phenol red–containing medium, a student notices that the medium has turned bright yellow. Interpret the findings. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Compare the modes of action of fluoroquinolones and rifampicin in terms of their effects on bacterial DNA synthesis. (5)

8. Explain the use of alginate in cell immobilisation process. (5)

9. Justify the mechanistic insight of doxorubicin as chemotherapeutics. (5)
10. 5-Fluorouracil exerts its cytotoxic effect primarily by inhibiting thymidylate synthase and disrupting DNA synthesis. A patient with colorectal cancer initially responds to 5-FU therapy but later develops resistance. Suggest therapeutic strategies to overcome this resistance based on the drug's mechanism of action. (5)
11. Correlate the effect of serum concentration on cell growth and differentiation in culture. (5)
12. Contrast the advantages and disadvantages of using adherent versus suspension cell culture systems. (5)

OR

Judge whether the use of antibiotics in cell culture media is beneficial or detrimental to long-term cell growth (5)

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