Time : 3 Hours **Marks: 75**

Q.1 Answer the following MCQ 20 M

1) Which bacterial structure is primarily involved in locomotion?
   A) Flagellum
   B) Capsule
   C) Cell wall
   D) Plasmid
2) Gram staining is based on differences in bacterial:
   A) Shape
   B) Size
   C) Cell wall structure
   D) Motility
3) Blood agar is an example of:
   A) Selective medium
   B) Differential medium
   C) Enriched medium
   D) Minimal medium
4) Psychrophilic bacteria live in:
   A) High temperatures
   B) Moderate temperatures
   C) Low temperatures
   D) Extreme pH levels
5) Lyophilization is also known as
   A) Freeze-drying
   B) Salting
   C) Refrigeration
   D) Canning
6) Autoclaves are commonly used in:
   A) Chemical sterilization
   B) Dry heat sterilization
   C) Radiation sterilization
   D) Steam sterilization
7) Biological indicators measure
   A) Temperature
   B) Pressure
   C) Microbial death
   D) Humidity

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8) Which of the IMViC tests is associated with the ability of an organism to ferment glucose and produce acid and gas?
   A) Indole test
   B) Methyl Red test
   C) Voges-Proskauer test
   D) Citrate test
9) The principle of filtration for sterilization is based on the removal of microorganisms through:
   A) Heat
   B) Chemicals
   C) Mechanical barriers
   D) Radiation
10) What is the genetic material of a virus?
   A) DNA only
   B) RNA only
   C) Both DNA and RNA
   D) Neither DNA nor RNA
11) An agent that inhibits bacterial growth but doesn't kill bacteria is termed
   A) Bacteriostatic
   B) Bactericidal
   C) Bacteriolytic
   D) Bacteriogenic
12) The method primarily used for testing the sterility of heat-sensitive liquid products is
   A) Membrane filtration
   B) Direct transfer method
   C) Immersion test
   D) Dry-heat sterilization
13) Which source of contamination can occur due to improper gowning techniques?
   A) Personnel
   B) Air
   C) Surfaces
   D) Equipment
14) What is the primary purpose of using disinfectants in an aseptic area?
   A) Remove particulate matter
   B) Kill microorganisms
   C) Reduce temperature
   D) Control humidity
15) What principle is commonly used in microbiological assays for antibiotics?
   A) Inhibition of bacterial growth
   B) Promotion of bacterial growth
   C) Formation of bacterial colonies
   D) Bacterial motility

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16) Microbiological assays for amino acids often involve the use of
   A) Bacteria
   B) Fungi
   C) Algae
   D) Protozoa
17) High humidity is a factor that contributes to microbial spoilage primarily by
   A) Accelerating chemical degradation
   B) Encouraging microbial growth
   C) Reducing water activity
   D) Enhancing product stability
18) The "Zone of Inhibition" in microbial testing measures
   A) Microbial growth rate
   B) Microbial resistance
   C) Area of microbial inhibition around a test substance
   D) Microbial features
19) Which factor is crucial for successful cell growth in culture?
   A) High osmolarity
   B) Low temperature
   C) Proper nutrient supply
   D) Increased light exposure
20 Primary cultures are derived directly from:
   A) Established cell lines
   B) In vitro cell fusion
   C) Freshly isolated tissue
   D) Cryopreserved stocks

II) Answer the following (any 2 out of 3) Long questions 20 Marks

1. Classify bacteria based on physicochemical requirements and add a note on cultivation of anaerobic bacteria
2. Classify Methods of sterilisation and explain radiation sterilisation in detail
3. Explain in detail Lytic cycle and add a note on cultivation of animal viruses

III) Answer the following (any 7 out of 9) Short questions 35 Marks

1. What is Microbiological assay? Explain Cup plate method in detail
2. What is SEM and TEM, Differentiate between SEM and TEM
3. Explain Phenol coefficient test in detail
4. Enlist differential staining techniques and add a note on Gram staining in detail
5. What is Animal Cell culture explain media used along with advantages and disadvantages
6. Explain layout of Sterile area for Pharmaceuticals with neat labelled diagram
7. What is Test for sterility explain in detail with interpretation
8. Explain in detail growth phases in bacteria along with growth curve
9. Explain the methods of preservation of bacteria

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Time: 3 hours **Total Marks 75**

Question No. 1. Multiple choice questions **1×20=20 Marks**

1 Which of the following is a variable area meter?
- A Venturimeter
- B Pitot tube
- C Orifice meter
- D Rotameter

2 Fanning equation helps to calculate
- A Friction losses
- B Enlargement losses
- C Contraction losses
- D Losses due to fittings

3 Which of the following factor is attributed to surface property?
- A Toughness
- B Moisture content
- C Hardness
- D Bulkiness

4 According to Rittinger's Law, the energy required for size reduction is directly proportional to _____
- A Surface area
- B Crack length
- C Crushing strength
- D Stress at atomic bond

5 Liver extract is obtained by use of _____ evaporator.
- A Climbing film evaporator
- B Basket type evaporator
- C Wiped film evaporator
- D Forced circulation evaporator

6 In horizontal tube evaporator steam is circulated _____.
- A Inside the evaporating tubes
- B Outside the evaporating tubes
- C Condensate inlet
- D Product outlet

7 The equation for rate of heat transfer by convection process is _____.
- A Rate = driving force/resistance
- B Rate = resistance/driving force
- C q = hcA (t1 – t2)
- D q = bAT4

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8 Which of the following is not the application of heat transfer?
- A Drying
- B Distillation
- C Evaporation
- D Mixing

9 Fixed oils can be extracted using _____ distillation.
- A Molecular still
- B Vacuum still
- C Water still
- D Fractional distillation

10 What does a lower HETP value indicate?
- A Higher separation efficiency
- B Lower energy consumption
- C Greater temperature control
- D Reduced pressure drop

11 What is the term for the point at which the drying rate is maximum and constant moisture is being removed?
- A Equilibrium moisture content
- B Critical moisture point
- C Saturation point
- D Drying equilibrium

12 Attrition is major disadvantage with one of the following
- A Fluidized bed dryer
- B Drum dryer
- C Freeze dryer
- D Tray dryer

13 A typical hallow cylinder joining angle in v-cone blender is between _____Degree
- A 10 to 20
- B 30 to 50
- C 70 to 90
- D 100 to 120

14 In which mixing mechanism do particles move primarily due to the bulk movement of the fluid?
- A Convective Mixing
- B Diffusive Mixing
- C Mechanical Mixing
- D Laminar Mixing

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15 Which factor is crucial for the selection of the appropriate filter medium in a filtration process?
A Particle shape
B Temperature
C color
D Particle size distribution

16 Which of the following characteristics of the filter cake can impact the efficiency of the filtration process?
A Thickness
B Color
C Temperature
D pH

17 How is the separation achieved in a perforated basket centrifuge?
A Sedimentation
B Filtration
C Decantation
D Precipitation

18 What is a common disadvantage of super centrifuges?
A Low energy consumption
B Limited scalability
C Inability to separate particles based on density
D High cost

19 Containers made for storage of injections are made from one of the following type of glasses.
A Borosilicate
B General purpose
C Lime soda
D Neutral

20 A sever type of corrosion at highly localized areas of metal surface is
A Galvanic Corrosion
B Pitting Corrosion
C Stress Corrosion
D Erosion

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Question No. 2: Answer any TWO **10×2= 20M**

A. Differentiate between Dry and Wet corrosion. Write a note on Lead and\ its alloys **10**

B. Illustrate with diagram principle, construction and working of spray dryer **10**

C. State and explain laws governing size reduction **10**

Question No. 3: Answer any SEVEN **5×7= 35M**

A. Discuss in detail construction and working of Differential manometer. **5**

B. Elaborate on the principle, construction and working of horizontal tube evaporator. **5**

C. Give briefly the principle, construction and working of double pipe heat exchanger. **5**

D. Describe the mechanism of fractional distillation with vapor liquid equilibrium diagram. **5**

E. Explain Principles, Construction, Working, uses, Merits and Demerits of twin shell blender. **5**

F. Describe in detail mechanism of liquids mixing. **5**

G. Explain Principle, Construction, Working, uses, Merits and Demerits of rotary drum filter. **5**

H. Describe principle, construction, working, uses, merits and demerits of Perforated basket centrifuge **5**

I. Discuss factors affecting Corrosion **5**

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Duration: 3 Hours **Total Marks: 75**

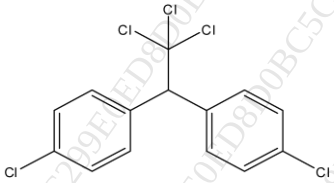
N.B.: 1. All questions are compulsory
2. Figures to right indicate full marks

Q. 1 Choose the appropriate option for following multiple choice-based questions. **(20)**

1. Halogens are o/p directors for electrophilic aromatic substitution due to

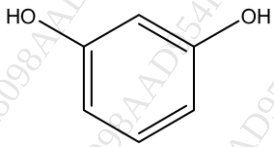
a) Resonance effect
b) Inductive effect
c) Steric effect
d) Electronegativity

2. The given structure is _____ and is used as _____



a) DDT, pesticide
b) Chloramine, disinfectant
c) Saccharin, sweetener
d) BHC, agricultural insecticide

3. Identify the structure and its use



a) Resorcinol, topical analgesic
b) o-cresol, antiseptic
c) m-cresol, disinfectant
d) m-cresol, antiseptic

4. Decalin is obtained on reduction of naphthalene using _____

a) Na/EtOH
b) Na/Isoamyl alcohol
c) H_2/Ni
d) $NaBH_4$

5. Order of reactivity of Benzene, naphthalene, anthracene and phenanthrene towards Electrophilic Aromatic Substitution Reactions is: -

a) Benzene < naphthalene < anthracene and phenanthrene
b) Phenanthrene > benzene > naphthalene > anthracene
c) Benzene < naphthalene < phenanthrene < anthracene
d) Benzene > naphthalene > anthracene and phenanthrene

6. Dimerization of —---- occurs in presence of U. V. light and xylene as a solvent

a) naphthalene
b) anthracene
c) Phenanthrene
d) 1-naphthol

7. _____ does not undergo Birch Reduction

a) Naphthalene
b) Anthracene
c) Phenanthrene
d) Biphenyl

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8. *para* fluoro benzoic acid is less acidic than *para* chloro benzoic acid because—

a) +R-effect dominates the -I effect in p-fluoro benzoic acid

b) -I -effect dominates the +R effect in p-fluoro benzoic acid

c) +R-effect dominates the -I effect in p-chloro benzoic acid

d) -R-effect dominates the -I effect in p-chloro benzoic acid

9. _____ can be used to convert -COOH to -CH_2OH

a) Catalytic hydrogenation
b) $LiAlH_4$
c) $NaBH_4$
d) Sn/ HCl

10. Carboxylic acids can react with _____ while phenols react with _____

a) $NaHCO_3$ & NaOH, only $NaHCO_3$
b) $NaHCO_3$, only NaOH
c) $NaHCO_3$ & NaOH, only NaOH
d) Both can react with $NaHCO_3$ & NaOH

11 The groups -OCH3 and -NH2 in the p- position of aniline _____ basicity

a) Increase
b) Decrease
c) Do not affect
d) None of the above

12 Benzamide on reaction with bromine in alkaline medium (NaOH) gives:

a) Benzoic acid and ammonia

b) 3-Bromobenzoic acid and ammonia

c) Aniline

d) 2,4-Dibromobenzoic acid and ammonium bromide

13 Melting point of fat is _____ and melting point of oil is _____

a) Higher, higher
b) Lower, lower
c) Higher, lower
d) Lower, higher

14 _____ are tri-esters of a long chain of saturated fatty acids with glycerol.

a) Waxes
b) Oils
c) Fats
d) Lipid

15 Which of the following is cyclic fatty acid

a) Cerebronic acid
b) Ricinoleic acid
c) Chaulmoogric acid
d) Oleic acid

16 Identify the correct example of omega free fatty acid

a) Stearic acid
b) Myristic acid
c) Linoleic acid
d) Lauric acid

17 Cyclopropane reacts with chlorine in absence of sunlight light to form_____

a) 1-Chlorocyclopropane
b) 1,3-dichlorocyclopropane
c) 1,1-dichlorocyclopropane
d) 1,2-dichlorocyclopropane

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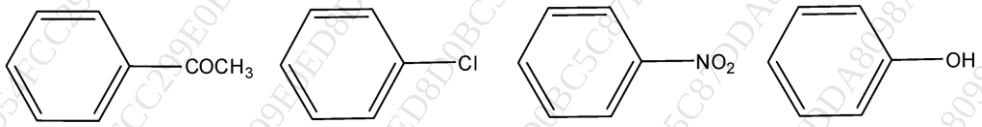
18 According to Baeyer's theory deviation, the normal bond angle is
a) 60 **c)** 109.5
b) 70 **d)** 45

19 According to Mohr's theory cycloalkanes are
a) Two dimensional **c)** Non planar
b) Three dimensional **d)** None of the above

20 According to Mohr's theory more the value of angle strain
a) Less stable is the ring **c)** No effect on stability
b) More stable is the ring **d)** Ring remains in plane

Q. 2 Answer any TWO questions **(20)**

a) 1. Identify the molecule which is least reactive towards electrophilic aromatic substitution. Justify your answer. Use the least reactive molecule to synthesize benzene nitrile. **(05)**



2. Describe qualitative tests used to identify phenols with reactions. **(05)**

b) 1) What are axial and equatorial bonds of cyclohexane? Write the complete reactions along with products of cyclopropane with the following reagents. **(05)**
i) Br_2 /CCl_4 dark ii) H_2 /Ni 80°C iii) Cl_2 /UV light iv) Conc. HBr.

2) Discuss in detail the reaction mechanism of the soap making process. How does saponification help in standardization of oils? **(05)**

c) 1) a) Give structure and names of the principal organic products expected from mono nitration of 1) o-cresol 2) p-chloro aniline **(05)**
b) Give Huckel's rule of aromaticity

2) a) Arrange the following molecules in increasing order of Acidity and justify. **(05)**
ortho hydroxybenzoic acid, meta hydroxybenzoic acid, para hydroxybenzoic acid and benzoic acid.
b) How benzoic acid reacts with $NaHCO_3$

Q. 3 Answer any SEVEN questions **(35)**

a) What do you mean by drying oils? Explain how drying of oils is associated with Iodine value?

b) State and explain the significance of the various analytical values used to control the quality of oils.

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c) Explain Beyer strain theory? Enlist various limitations

d) Draw the reaction involved during rancidity of oil. Comment on Analytical, synthetic, and other evidence in the derivation of structure of benzene.

e) Write the reactions and give reaction conditions when aniline reacts with
1) Benzoyl chloride 2) Bromine

f) Justify: "Preferred position for electrophilic aromatic substitution in anthracene is position 9 or 10". Give the synthesis of anthracene using Diel Alder's Reaction.

g) Explain the effect of temperature on orientation of incoming electrophile in naphthalene towards electrophilic aromatic substitution reaction.

h) Discuss the steps involved in the Azo-coupling reaction. Give the significance of pH in this reaction. Give the uses of Azo compounds.

i) Convert the followings **(Any 2)**
1) Benzene to 3-Ethylbenzene nitrile
2) Benzaldehyde to 3-Aminobenzaldehyde
3) Toluene to 3,5-Dinitrobenzoic acid

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Time: 3 Hours **Marks: 75**

N.B.: 1. All questions are compulsory
2. Draw diagram wherever necessary
3. Figure to the right indicate full marks
4. Use of scientific calculators is permissible

Q.1. Multiple Choice Questions (MCQs) (Answer all the 20 questions) 20 M

1 The solution which does not obey Raoult's law or shows deviation from Raoult's law is known as
a Real Solution
b Ideal Solution
c True Solution
d Coarse Dispersion

2 Parts of solvent required to dissolve one part of slightly soluble drug is
a From 100-1000
b From 1000-10000
c From 30-100
d From 10-30

3 In Osmotic tablets the driving force for diffusion of drugs is_____
a Pressure
b Temperature
c Concentration Gradient
d Electric Potential

4 Solvation of a solute with water is called as
a Hydration
b Sublimation
c Crystallization
d Vaporization

5 Which of the following statements is correct with regards to solubility of gases in water?
a Increases with increase in pressure
b Increases by addition of non-electrolytes
c Increases with increase in temperature
d Remains unaltered in case of solute reacting with solvent

6 Composition of two or more compounds that exhibits a melting temperature lower than that of any other mixture of the compounds
a Critical composition
b Eutectic composition
c Conjugate composition
d Alloys

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7 The principle of Abbe's refractometer is based on measurement of _____
a Critical angle
b Critical surface tension
c Contact angle
d Critical temperature

8 Which of the following is the mesomorphic phase?
a Liquid complexes
b Liquid Crystal
c Eutectic mixture
d Supercritical fluid

9 Optically active substance can show its optical activity due to
a Chiral Carbon in molecule
b Symmetry in Molecule
c Polarity of molecule
d Cohesivity of molecule

10 If the concentration of surfactant molecules increases above the critical micelle concentration (CMC), then they
a Associate
b Dissociate
c Precipitate
d Decompose

11 At the liquid-gas interface
a Adhesive forces are small
b Adhesive and cohesive forces are the same
c Cohesive forces are small
d Both adhesive and cohesive forces are large

12 A surfactant with a very low Hydrophile-Lipophile Balance (HLB) value ie 1-2 are
a Solubilizing agent
b Anti-foaming agent
c Water in oil (w/o) emulsifier
d Oil in water (o/w) emulsifier

13 The surface tension usually decreases with
a Increase in temperature
b Decrease in temperature
c Addition of electrolytes
d Decrease in surfactant concentration

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14 Which of the following substance decrease surface tension of water
- a Sodium lauryl sulphate
- b Urea
- c Calcium carbonate
- d Kaolin

15 Identify the naturally occurring chelate
- a Hemoglobin
- b EDTA
- c Dimercaprol
- d Diethylenetriamine

16 The ….....sphere is enclosed in brackets in formula for complex species, and it includes the central metal ion plus the coordinated groups.
- a Co-ordination
- b Ligand
- c Chelate
- d Complex

17 Exterior of Beta Cyclodextrin is hydrophilic due to_____.
- a Hydroxyl groups
- b Ammonium groups
- c Sulfate groups
- d Pyrrolidone groups

18 pH of 1/100 N NaOH is
- a 10
- b 11
- c 13
- d 12

19 Bursting of blood cells takes place in….....solution
- a Hypertonic
- b Hypotonic
- c Isotonic
- d Neutral

20 Buffer capacity can be defined as the ratio of increment of strong base or strong acid to the….....
- a Small change in pH
- b Small change in buffer concentration
- c Small change in osmotic pressure
- d Small change in temperature

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Q2. Answer ANY TWO questions **20 M**

1. Elaborate on factors affecting solubility of drugs and explain with examples polar, nonpolar, and semi-polar solvents.
2. Write a note on HLB scale and explain micellar solubilisation phenomenon. Calculate the HLB of Tween 20, if its saponification number is 45 and acid number is 250.
3. Define refractive index and give its applications. Explain design and working principle for Abbe's Refractometer.

Q3. Answer ANY SEVEN questions **35 M**

1. Write a short note on the Langmuir's adsorption isotherm.
2. What is distribution law? Give its limitations and applications.
3. Elaborate on Aerosols and state its pharmaceutical applications.
4. Enlist the methods of analysis of complexes with examples and explain pH titration method in detail.
5. Explain Cryoscopic method to adjust tonicity of a solution. Calculate the amount of sodium chloride required for preparing 50 mL 1.5% Calcium Gluconate solution isotonic with blood serum? [Given: Sodium Chloride equivalent of Calcium Gluconate(E) is 0.16].
6. Explain buffer action of acidic buffer system with example and derive Henderson Hasselbalch equation for acidic buffer system.
7. Classify complexes with examples and explain inclusion complexes in detail.
8. Explain the concept of protein binding and give significance of protein binding in pharmaceuticals.
9. Explain the concept of diffusion and give its significance in pharmaceuticals.

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