Time: 3 Hours **Marks: 75**

1. All questions are compulsory.
2. Figures to the right indicate full marks.

Q. I. MCQs 20 Marks

1. Who is father of antiseptic surgery?
   a. L. Pasteur
   b. A.V. Leeuwenhoek
   c. Joseph Lister
   d. Robert Hooke

2. _____ is an example of lactose fermenting bacteria.
   a. Proteus vulgaris
   b. Salmonella typhi
   c. E.coli
   d. Shigella flexneri

3. The Exponential phase in bacterial growth curve is also known as _____.
   a.Log phase
   b. Stationary phase
   c. Lag phase
   d. Decline phase

4. _____ is used for preservation of microbial culture.
   a. Pour plate method
   b. Streak plate method
   c. Spread plate method
   d. Lyophilization

5. Which of the following is used in electron microscope?
   a) electron beams and magnetic fields
   b) light waves
   c) magnetic fields
   d) electron beams

6. Fritz Zernike discovered _____ microscope.
   a. Phase contrast
   b. Dark field
   c. Electron
   d. Bright field

7. _____ most confirmatory test for E. coli.
   a. Oxidase test
   b. catalase test
   c. Coagulase test
   d. Indole test

8. Cell wall of Mycobacterium leprae contains _____.
   a. Acetic acid
   b. Mycolic acid
   c. Peptic acid
   d. Gluconic acid

9. Bacterial protection is accomplished by _____.
   a. Fimbriae
   b. Capsule
   c. Cytoskeleton
   d. Spore

10. Which group of organism would be favoured in acid soils?
   a. Fungi
   b. Bacteria
   c. Virus
   d. Algae

11. Viruses are best grown in _____.
   a. Blood agar
   b. Tissue culture medium
   c. Enrichment medium
   d. Selective medium

12. Which test will have to perform to ensure that all microorganisms have been destroyed or removed.
   a.Clarity testing
   b. Leak testing
   c.Pyrogen testing
   d. Sterility testing

13. Phenol Coefficient indicates the _____ of disinfectants.
   a. Efficiency
   b. Purity
   c.Activity
   d.Quantity

14. The microorganism used for microbiological assay of Vitamin B12 is _____.
   a. Lactobacillus casei
   b. Lactobacillus leichamanii
   c. Lactobacillus viridescens
   d. Lactobacillus plantarum

15. HEPA filter is _____

a.High Efficiency Particular Air
b. High Efficiency Particular Air Filtration
c. High Efficiency Particulate Air
d. High Effective Particulate Air

16. Class 100 is stand for …
a. Clean room is used in semiconductor industry
b. Clean room is used in microelectronic industry
c. Clean room is used for hydraulic equipment
d. Clean room is used in aseptic manufacturing in pharma industry

17. The growth of animal cells in vitro in suitable culture medium is called _____.
a. Animal cell culture
b. Plant cell culture
c. Isolation of cells
d. Growth curve

18. _____ is used in a formulation to further reduce the risk of spoilage and to kill any contaminant.
a. Agar
b. Yeast extract
c. Preservative
d. Malachite green

19. Best suitable medium for isolation of Salmonella typhi is _____.
a. Nutrient agar
b. XLD agar
c. Mac Conkey agar
d. TCBS agar

20. The growth of test microorganisms is inhibited entirely in a circular area or zone around the cavity or cylinder containing a solution of antibiotic is called_____.
a. Concentration of Inhibition
b. Capacity of Inhibition
c. Zone of Inhibition
d. Ratio of Inhibition

a.

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

1. Define Electron Microscope. Which are the types of electron microscope.
   Explain SEM in detail with the help of diagram.
   Write a note on Pour plate and Streak plate method.
2. Enlist different methods for isolation of viruses. Explain Chick Embryo method using neat and label diagram.Write a note on lysogenic cycle.
3. Define sterilization. Explain Dry heat sterilization with the help of mode of action, Applications in pharmaceutical field, advantages, disadvantages.

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

1. Write significance of IMViC test? Explain Methyl red test and Citrate test.
2. Explain asexual method of reproduction in fungi.
3. Define Bioassay. Enlist types of microbiological assay and explain any one in detail.
4. Explain different factors affecting microbial spoilage of pharmaceutical products.
5. Write a note on applications of animal cell culture in pharma industry.
6. Explain isolation and cultivation of anaerobic bacteria using well labelled diagram of Anaerobic jar.
7. Define disinfection. Explain Gaseous sterilization with the help of mode of action, applications, disadvantages.
8. Write a note on design of aseptic area.
9. Define media. Explain selective media and differential media using suitable examples

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Time : 3Hrs **Total Marks 75**

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

1. Which type of head is measured during pitot tube?
   A. Kinetic velocity head
   B. Pressure head
   C. Static velocity head
   D. Total head
2. Reynolds number may be defined as
   A. The ratio of elastic forces to pressure forces
   B. The ratio of gravity forces to inertial forces
   C. The ratio of inertial forces to viscous forces
   D. The ratio of viscous forces to inertial forces
3. Which of the quality control parameter is important for size reduction of potent materials in formulation of dosage forms?
   A. Content uniformity
   B. Friability
   C. Hardness
   D. Strength
4. In cyclone separator the separation depends on?
   A. Density and shape
   B. Shape and surface area
   C. Surface texture and size
   D. Size and density
5. Which of the following is TRUE about multiple effect evaporator
   A. It is suitable for batch operation
   B. It is highly economical relative to single effect
   C. It cannot attach more than two evaporators
   D. It utilizes horizontal tube evaporator
6. In evaporators calandria consists of number of
   A. Baffles
   B. Jackets
   C. Outlets
   D. Tubular surfaces
7. Which of the following statements is true about heat transfer by thermal radiation
   A. IR lamp is a source for low intensity radiation
   B. Thermal radiation usually occurs simultaneously with heat transfer by conduction
   C. Thermal radiations are not reflected from a surface
   D. Solid bodies radiate energy at a temperature below absolute zero
8. Emissivity value for black body is _____
   A. Equal to 1
   B. Less than 1
   C. More than 1
   D. Equal to zero
9. In fractional distillation as the vapours travels from bottom to top of the fractionating column it becomes rich in _____
   A. Less volatile component of the mixture
   B. More volatile component of the mixture
   C. With component of intermediate volatility
   D. the amount of vapours
10. Condenser function as
    A. Energy exchanger
    B. Heat exchanger
    C. Liquid exchanger
    D. Mass exchanger
11. In which step of the freeze dryer, 98 % of moisture is removed?
    A. Pre-freezing
    B. Pretreatment
    C. Primary drying
    D. Secondary drying
12. Fluidised bed dryer has one of the following advantages?
    A. Attrition is observed
    B. Entire material is continuously exposed to a heat source
    C. Fluffy mass is formed
    D. Humidity can be increased

13. Which equipment is used for mixing of immiscible liquids?
    A. Double cone Mixer
    B. Jet Mixer
    C. Silverson Mixer
    D. Sigma Mixer
14. Which type of mixture is easily formed?
    A. Positive
    B. Negative
    C. Neutral
    D. Ampholytic
15. Who proposed the filtration process is similar to the streamline flow of a liquid under pressure through capillaries?
    A. Carman
    B. Darcy
    C. Kozeny
    D. Poiseuilli
16. The separation process in which the amount of solid in a liquid is not more than 1% w/v is called
    A. Clarification
    B. Filtration
    C. Centrifugation
    D. Evaporation
17. The solid that has high specific gravity remains in one of the following states in a centrifuge tube, once centrifugation is completed
    A. Bottom
    B. Middle
    C. Top
    D. Uniform
18. Centrifugation is based on?
    A. Patrick's Law
    B. Stoke's Law
    C. McLaren's law
    D. Stain's Law
19. Zinc – aluminium galvanic couple, when exposed to acidic solutions
    A. Zinc dissolves
    B. Aluminium dissolves
    C. Both zinc – aluminium dissolve
    D. Both zinc – aluminium remains undissolved
20. Containers made for storage of parenterals are made from one of the following types of glass.
    A. General purpose
    B. Lime soda
    C. Neutral
    D. Borosilicate

Question No. 2: Answer any <u>TWO</u> of the following **10×2= 20 Marks**

A. What are different types of corrosion? Give different preventive measures to control the corrosion.
B. Elaborate on a dryer with an atomizer used for manufacturing of powder for reconstitution.
C. Give objectives of size reduction. Describe the construction working, advantages and disadvantages of fluid energy mill.

Question No. 3: Answer any <u>SEVEN</u> of the following **5×7= 35 Marks**

A. Describe Reynolds classical experiment elucidating different types of flow patterns.
B. Explain the principle, construction and working of evaporating pan
C. What are the objectives of heat transfer process and describe the working of multipass double pipe heat exchanger.
D. With the help of neat labelled diagram explain the principle and working of falling film Molecular still
E. What is mixing? Elaborate liquid mixing mechanisms.
F. Explain the principle, construction, working and uses of double cone blender
G. Write an account on filter media.
H. Describe the principle, construction, working and uses of super centrifuge
I. What are the properties of glass? Discuss its applications as a material of construction

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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 appropriate option for following multiple choice based questions. 20

1 _____ are triesters of long chain saturated fatty acids with glycerol.
a Waxes
b Oils
c Fats
d Lipid

2 In the nitrating mixture, the HNO_3 acts as _____ and the H_2SO_4 acts as _____
a A base, an acid
b An acid, a base
c Source of nitronium ion, a catalyst
d Source of nitronium ion, strong acid

3 Reaction of cyclopropane with bromine in dark and in presence of CCl_4 forms
a 1,4-dibromopropane
b 1,2,3-tribromopropane
c 1,2-dibromopropane
d 1,3-dibromopropane

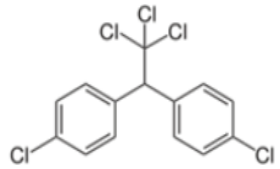
4 Halogens are ortho/para director for electrophilic aromatic substitution due to
a Inductive effect
b Resonance effect
c Steric effect
d Electronegativity

5 In a butter, triglyceride upon hydrolytic rancidity liberates
a Myristic acid
b Oleic acid
c Caproic acid
d Palmitic acid

6 Which entity from the following is abstracted by the base from the intermediate in electrophilic aromatic substitution:
a H^+
b H^-
c $H:^-$
d Benzenium ion

7 Which of the following is cyclic fatty acid?
a Cerebronic acid
b Ricinoleic acid
c Chaumoorgic acid
d Oleic acid

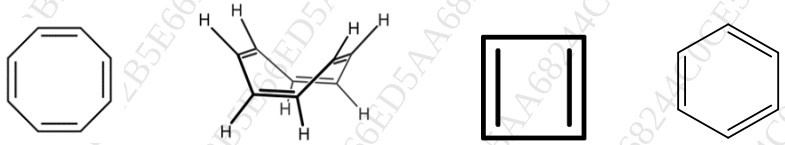
8 The given structure is _____ and is used as _____



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

9 Baeyer's strain theory is valid for all, except
a Cyclohexane
b Cyclopentane
c Cyclobutane
d Cyclopropane

10 Predict which of the following molecules is non aromatic?



i ii iii iv

a i
b ii
c iii
d Iv

11 Identify the correct example of an omega 3 fatty acid
a Stearic acid
b Myristic acid
c Linoleic acid
d Lauric acid

12 _____ can be used to convert -COOH to -CH_2OH
a Catalytic hydrogenation
b $LiAlH_4$
c $NaBH_4$
d Sn/ HCl

13 When Naphthalene reacts with $CH_3COCl/AlCl_3$ in presence of CS_2 , -----is formed
a 1-Acetyl naphthalene
b 2-Acetyl naphthalene
c 1-methyl- naphthalene
d 2-methyl- naphthalene

14 Aminobenzoic acids are _____ benzoic acid
a Stronger acids than
b Weaker acids than
c As acidic as
d Cannot be compared

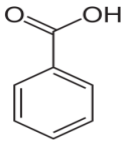
15 Order of reactivity of Benzene, naphthalene, anthracene and phenanthrene towards Electrophilic Aromatic Substitution Reactions is: -
a Benzene < naphthalene < anthracene < phenanthrene
b Benzene > naphthalene > anthracene > phenanthrene
c Benzene < naphthalene < anthracene < phenanthrene
d Benzene > naphthalene > anthracene and phenanthrene

16 The probable starting material for the synthesis of o-Toluic acid could be
a p-Toluidine
b o-Toluidine
c m-toluidine
d o-Anisidine

17 Decalin is obtained on reduction of naphthalene using _____
a Na/EtOH
b Na/Isoamyl alcohol
c H_2/Ni
d $NaBH_4$

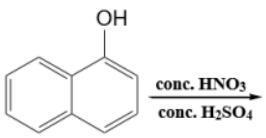
18 According to Coulson-Moffitt model, the C-C-C bond angle in cyclopropane is
a 90 degree
b 109.5 degree
c 104 degree
d 60 degree

19 The given compound cannot be used as _____



a Plasticizers.
b Food preservatives.
c Whitfield's ointment
d Blood thinner

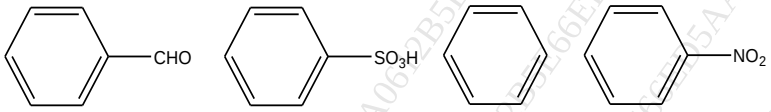
20 Predict the product of the following reaction?



a 4-Nitro 1-naphthol
b 8-Nitro -1-naphthol
c 4-Nitro 2-naphthol
d 8-Nitro 2-naphthol

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

1. a) **10**



For the above given four molecules,

a. Arrange the molecules in increasing order of reactivity towards electrophilic aromatic substitution and justify the order.
b. Identify which of the above molecules will readily undergo electrophilic aromatic substitution. Depict the mechanism of sulphonation for it.
c. Select an appropriate molecule from above as the starting material to synthesize acetanilide. Give the reactants and reaction conditions for it.

b) State the limitations of Baeyer's angle strain theory. Discuss Coulson and Moffitt's modification with suitable example.

2. **a)** Compare the reactivity of naphthalene with benzene. Explain electrophilic aromatic substitution in naphthalene. Discuss sulphonation reaction of naphthalene. **10**

b) Discuss in detail Kolbe's reaction and Reimer Tiemann's reaction.

3. **a)** Comment on the orientation and reactivity of the -Cl and -OH group towards electrophilic aromatic substitution. **10**

b) What is hydrogenation of oil? Explain what trans fats are and how they are unhealthy?

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

1. What is Baeyer's strain? Explain why does cyclopropane undergo ring opening reactions radially? **5**

Match the following with their respective profile.

A) Butterfly conformation	A) Banana bond
B) Cyclopropane	B) Sachse Mohr
C) Boat conformation	C) Cyclobutane
D) Strainless rings	D) Cyclohexane

2. Define drying oil and enlist one example. Write the structure and uses of diphenyl methane, Triphenylmethane and Triphenylcarbinol. **5**

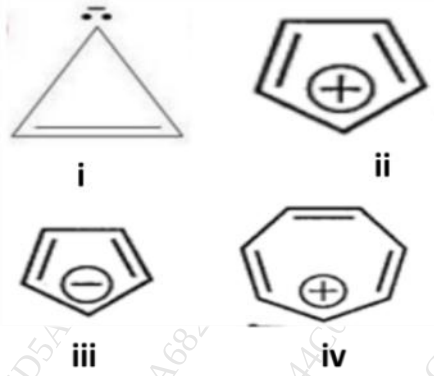
3. Give the mechanism and synthetic utility of the Friedel Crafts reaction. Predict whether phenol, benzoic acid and aniline easily undergo this reaction. **5**

4. Explain the tern rancidity and saponification value. Discuss the different types of rancidity with reactions involved in it. **5**

5. Discuss the steps involved in the Azo-coupling reaction. Give the significance of pH in this reaction. Give the uses of Azo compounds. **5**

6. Explain the terms RM value and acetyl value with the principle and significance involved in their determination. **5**

7. Identify whether following compounds are aromatic, antiaromatic or nonaromatic. **5**



With the help of suitable structures and examples, explain why aromatic amines are less basic than aliphatic and cycloaliphatic amines.

8. Give the products obtained on the reaction of the following reagents with nitrating mixture. i) Ethyl benzene ii) Benzene nitrile iii) Benzoic acid iv) Anisol v) Acetanilide. **5**

9. Which is the preferred position for electrophilic substitution in an anthracene? Justify. Predict the product/s of the following reaction: **5**

i. Anthracene + $K_2Cr_2O_7$/ H_2SO_4

ii. Anthracene + Br_2 /CCl_4 at low temp

iii. Phenanthrene + Na /C_2H_5OH

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(3 Hours) **[Total Marks: 75]**

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

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

1. ---------- involves interaction between solute and solvent molecules which leads to stabilization of solute species in the solution.
    a. Precipitation
    b. Crystallisation
    c. Solvation
    d. Lyophilization

2. From the point of view of dissolution, which of the following dosage forms exhibits the slowest dissolution rate.
    a. Coated tablets
    b. Solutions
    c. Suspensions
    d. Uncoated tablets

3. A real solution is that which
    a. Obeys Raoult's Law
    b. Does not obey Raoult’s Law
    c. Obeys Henry’s Law
    d. Does not obey Henry’s Law

4. For the study of distribution law, the two solvents should be:
    a. Miscible
    b. Immiscible
    c. Volatile
    d. Reacting with each other

5. Which of the following produces conjugate solutions:
    a. Partially miscible liquids
    b. Completely miscible liquids
    c. Practically miscible liquids
    d. Practically immiscible liquids

6. The rise of a liquid in a capillary tube does not depend upon_____
    a. Angle of contact
    b. Density of liquid
    c. Atmospheric pressure
    d. Radius of capillary tube

7. Wetting occurs when:
    a. Adhesive force = surface tension
    b. Adhesive force > Cohesive force
    c. Adhesive force < Cohesive force
    d. Adhesive force = Cohesive force

8. With increase in temperature the surface tension of most liquids _____
    a. Increases
    b. Decreases
    c. Remains same
    d. Becomes zero

9. The concentration of surfactant at which it begins to form micelles is called as:
    a. Critical point
    b. Krafft point
    c. Cloud point
    d. Critical micellar concentration

10. If the change from one polymorph to another is reversible, the system is called
    a. Monotropic
    b. Isotropic
    c. Enantiotropic
    d. Anisotropic

11. Under the ideal gas laws, which of the following is NOT a correct assumption
    a. Molecules occupy a negligible volume
    b. Gas volume are insensitive to changes in pressure
    c. No energy is lost when molecules collide
    d. Forces between molecules are insignificant

12. Optically active substance is able to show its optical activity due to_____
    a. Chiral Carbon in molecule
    b. Electronegativity in molecule
    c. Polarity of molecule
    d. Cohesivity of molecule

13. _____ has the fluidity of a liquid and optical properties of solid crystals.
    a. Liquid crystal
    b. Supercritical fluid
    c. Glassy state
    d. Crystalline state

14. For the proper functioning of aerosol, adequate vapor pressure is needed for this component
    a. Propellant
    b. Actuator
    c. Drug Solution
    d. Preservative

15. The correct order of extent of drug protein binding
    a. Albumin>glycoprotein > lipoprotein> globulin
    b. Glycoprotein >Albumin > lipoprotein> globulin
    c. Globulin>glycoprotein > lipoprotein> albumin
    d. Lipoprotein>glycoprotein > albumin> globulin

16. Which method is used to study copper glycine complexation?
    a. pH titration method
    b. Method of continuous variation
    c. Distribution method
    d. Solubility method

17. _____is a versatile complexometric agent.
    a. Ethylene diamine tetra acetic acid
    b. Iodine
    c. Sodium hydroxide
    d. Hydrochloric acid

18. The quantity of strong acid or base that must be added to change the pH of one liter of solution by one pH unit is known as
    a. Buffer equivalent
    b. Buffer capacity
    c. Equivalence point
    d. Buffer action

19. Range of pH scale is
    a. 7 to 10
    b. 0 to 10
    c. 0 to 14
    d. 7 to 14

20. In which method, tonicity is calculated by adding water to the drug to make an isotonic solution?
    a. Sodium chloride equivalent Method
    b. Cryoscopic Method
    c. White Vincent Method
    d. Freezing point depression method

Q.2. Answer **any two** questions 20 M

1. Explain the process of solvation and discuss factors affecting solubility of drugs in liquids.
2. Explain the concept of surface tension and deduce an equation for determination of surface tension by drop count method with a neat labeled diagram.
   In the determination of surface tension of a liquid by the drop-number method, it gives 35 drops while water gives 18 drops for the same volume. The densities of the liquid and water are 0.996 and 0.800 g/cm3 respectively. Find the surface tension of the liquid if that of water is 72.0 dynes/cm.
3. Define polymorph and explain its different types. Elaborate on significance of polymorphism in pharmaceuticals with examples.

Q.3. Answer **any seven** questions 35 M

1. What is distribution law? Give its limitations and applications.
2. Write a note on solubility of gas in liquids.
3. Define adsorption isotherm. Discuss different types of adsorption isotherms.
4. Define dipole moment and give its significance in structural elucidation.
5. Classify complexes and explain metal complexes in detail.
6. Explain any one Class I method to adjust isotonicity. Calculate the amount of sodium chloride required in producing a 200 mL solution of 1% apomorphine hydrochloride isotonic with blood serum? (Given: Freezing point depression of 1% apomorphine = 0.08). Freezing point depression of 1% w/v sodium chloride is 0.576°C.
7. Derive the buffer equation for a weak acid and its salt. Calculate pH of the buffer solution containing 0.5 M each of acetic acid and sodium acetate, respectively. (Given: pKa of acetic acid is 4.76).
8. Enlist different methods used in analysis of complexes and explain any one in detail
9. What is protein binding? Write a note on the significance of drug-protein binding.