Duration: 3 hours **Total marks: 75**

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

Q.1 Choose the appropriate option for following multiple choice-based questions. (20)
Each question carries one mark.

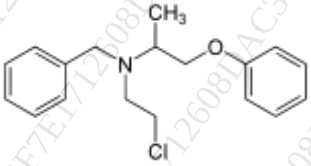
1 Following are the Phase I metabolism reactions except
[a] oxidation of olefins
[b] Sulfate conjugation
[c] Hydration of epoxides
[d] oxidation of olefins

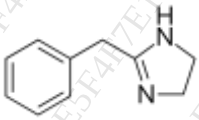
2 The shortest duration of action of the following benzodiazepines is of
[a] Chlordiazepoxide
[b] Diazepam
[c] Clorazepate
[d] Lorazepam

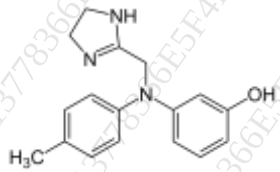
3 Which of the following is a nonselective β-adrenergic agonist?
[a] Oxymetazoline
[b] Naphazoline
[c] Xylometazoline
[d] Isoproterenol

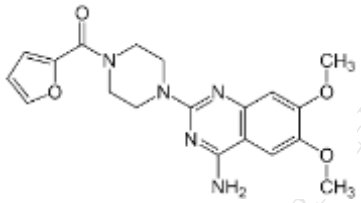
4 Which of the following is an example of inhalation anaesthetics
[a] Halothane
[b] Ketamine
[c] Thiopental
[d] Methohexital

5 Which of the following is an irreversible α- adrenoceptor antagonist?

[a] 

[b] 

[c] 

[d] 

6 Typical antipsychotics cause extrapyramidal side effects by strongly blocking
- [a] D1 receptors
- [b] D2 receptors
- [c] D3 receptors
- [d] D4 receptors

7 N-demethylation of Mephobarbital gives
- [a] Phenobarbital
- [b] Secobarbital
- [c]Pentobarbital
- [d] Amobarbital

8 Name the prodrug of phenytoin
- [a] Phenoxylate
- [b] Fosphenytoin
- [c] Hydroxy phenytoin
- [d] Phenytoin sodium

9 Morphine metabolized by CYP3A4-mediated N-dealkylation to
- [a] Normorphine
- [b] 5-hydroxymorphine
- [c] Codeine
- [d] Levorphanol

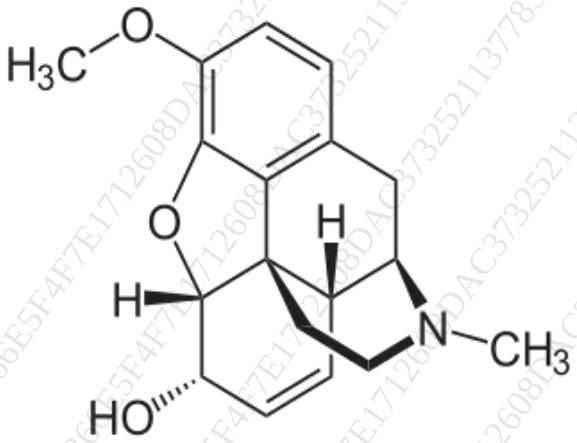
10 Which of the following has mixed action with antagonist activity at mu receptor and agonist activity at kappa receptor
- [a] Morphine
- [b] Naloxone
- [c] Codeine
- [d] Nalorphine

11 Carbamoyl-β-methylcholine is also known as _____?
- [a] Methacholine
- [b] Carbachol
- [c] Bethanechol
- [d] Acetylcholine

12 Which of the following is the incorrect pair of NSAIDs
- [a] Propionic acid derivative: Ibuprofen
- [b] Pyrazolidinediones: phenylbutazone
- [c] Salicylates: Indomethacin
- [d]Oxicam: Piroxicam

13 Which of the following drug is having 4-phenylpiperidine pharmacophore and is an opioid agonist
- [a] Pentazocine
- [b] Naloxone
- [c] Meperidine
- [d] Fentanyl

14 Identify the following drug



- [a] Morphine
- [b] Naloxone
- [c] Codeine
- [d] Nalorphine

15

Which of the following reaction sequence will produce oxazepam from diazepam
- [a] N-demethylation & hydroxylation
- [b] N-demethylation & Reduction
- [c] N-oxidation and N-dealkylation
- [d] Hydrolysis and N–dealkylation

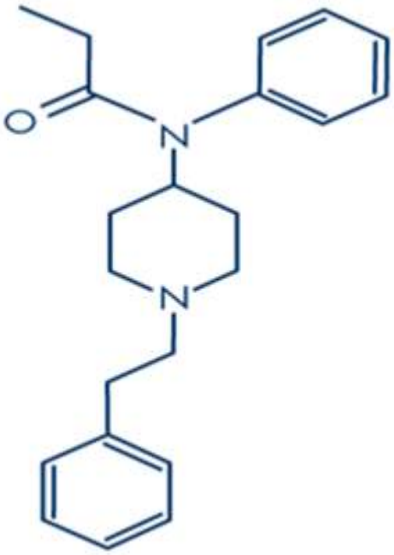
16 Solanaceous alkaloids are the esters of bicyclic amino alcohol that is _____.
- [a] 3-hydroxy tropane
- [b] 2-hydroxy tropane.
- [c] 4-hydroxy tropane
- [d] 6-hydroxy tropane

17 Which of the following NSAIDS belong to aryl and heteroaryl propionic acid class
- [a] Piroxicam
- [b] Nabumetone
- [c] Aspirin
- [d] Naproxen

18 Select the benzisoxazole and piperidine containing drug from the following

[a] Risperidone
[b] Loxapine
[c] Clozapine
[d] Sulpiride

19 Identify the drug



[a] Morphine
[b] Meperidine
[c] Levorphanol
[d] Fentanyl

20 Which of the following is an example of NSAIDs belonging to Indole Acetic acids?

[a] Indomethacin
[b] Aspirin
[c] Ibuprofen
[d] Naproxen

Q.2 Answer <u>any two</u> of the following three questions. **(20)**

Answer the following – **(5)**

A [i] Discuss SAR of Morphine analogues with suitable examples. (Draw structures wherever required. **(5)**

[ii]Discuss the influence of Optical and Geometrical isomerism on biological activity of drugs along with examples.

B (5)

i) Give the chemical classification of α-adernergic agonist with suitable examples. Draw the structure of at least one example from each class. (5)

ii) Describe the development of first generation β -blocker, propranolol. Support your answer with relevant structures.

C (10)

Classify anticonvulsants based on their chemical structures. Give any one suitable example with structures from each class. Outline the metabolic scheme of phenytoin and indicate the metabolites responsible for toxicity. Depict the synthesis of Ethoxsuximide indicating the reagents and reaction conditions used.

Q.3 Answer **any seven** of the following nine questions. **(35)**

A The list of sympathomimetic agents given below includes both selective and non-selective agents. Draw their structures and classify them as selective or non-selective. For those that are selective, state the receptor subtype. Clonidine, Isoproterenol and Xylometazoline **(5)**

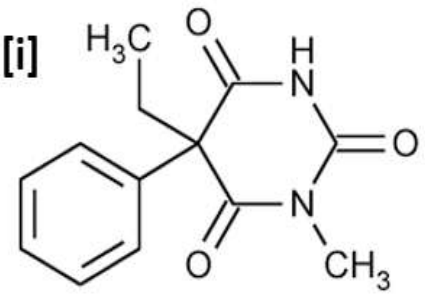
B Match the following drugs to their chemical classes- **(5)**

	Drug		**Chemical class**
1.	Glutethimide	a.	carbamate derivative
2.	Meprobamate	b.	alcohol derivative
3.	Ethchlorvynol	c.	glutarimide derivative
4.	Zolpidem	d.	triazolo-fused derivative
5.	Alprazolam	e.	imidazopyridine derivative

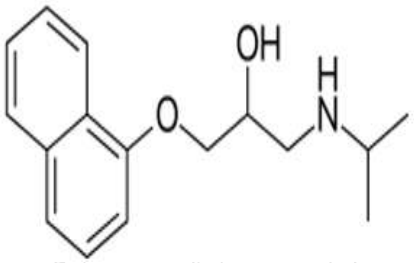
C Give mechanism of action and uses of Salbutamol. Outline its synthesis along with the reaction conditions and necessary reagents. **(5)**

D Predict any two Phase-I and one Phase -II metabolites for each of the following (draw structures): **(5)**

[i]



[ii]



E Match the following with respect to their chemical class and mechanism **(5)**

Sr. No.	Name of Drug		Column A		Column B
1	Tacrine	i	Contains Pyridine nucleus	a	Long acting AChEI
2	Echothiophate	ii	Acridine	b	Direct acting cholinomimetic agent
3	Physostigmine	iii	Carbamoyl choline	c	AChE reactivator
4	2-PAM	iv	Indole alkaloid	d	Reversible Carbamate AChEI
5	Carbachol	v	Organophosphate	e	Anti-Alzheimer agent

F Discuss ultra short acting barbiturates and dissociative anaesthetics with examples. [Draw structures] **(5)**

G Discuss the effect of substitutions at the 1,2 and 4 positions on the phenothiazine ring on their antipsychotic activity. Draw the protonated form of chlorpromazine and compare the basicity of the two nitrogens in the structure. **(5)**

H **(3)**
[i] Discuss factors affecting drug metabolism
[ii] Enlist Phase i metabolic reaction pathways **(2)**

I Classify the parasympatholytic agents based on their chemical structures with suitable examples. Discuss the metabolism of atropine. **(5)**

****

Duration: 3 hours **Total marks: 75**

N.B.: 1. Answer all questions sequentially.
2. Figures to right indicate full marks.

Q. 1 Choose appropriate option for the following multiple choice questions. 20M

1 _____classification includes classification of organised and unorganised drugs.
a Morphological
b Pharmacological
c Chemical
d Chemo-taxonomical

2 Lycopodium spore method can be performed in the
a leaf drugs only
b powdered drugs with well-defined particles which may be counted
c any powdered drugs
d unorganised drugs only

3 _____is an organoleptic evaluation parameter.
a Odour
b Melting point
c Moisture content
d Foaming index

4 Following statements are true for unorganised drugs; except
a Unorganised drugs have cellular structure.
b Unorganised drugs do not have morphological structure.
c Unorganised drugs are obtained from natural sources.
d Unorganised drugs can be solid, semisolid or liquid.

5 Coppicing is
a method of collection of bark
b type of vegetative propagation
c plant tissue culture technique
d method of sowing the seeds

6 Raphides are bundles of
a prismatic crystals
b compound starch
c acicular crystals
d Phloem fibers

7 Following are the exogenous factors; except
a Hybridization
b Altitude
c Temperature
d Soil

8 Change in DNA sequence is called as
a Grafting
b Polyploidy
c Formation of callus
d Mutation

9 Following are the types of plant tissue culture technique except
a Garbling culture
b Anther culture
c Suspension culture
d Protoplast culture/

10 _____ are transgenic plants which trigger an immune response to provide immunity against particular infectious diseases.
a Allergens
b Edible vaccines
c Polyploids
d Mutants

11 _____ is the pericyclic fibre.
a Jute
b Cotton
c Dextrin
d Hemp

12 _____ is the natural growth inhibiting substance present in plants.
a Auxins
b Abscisic acid
c Polyamines
d Ethylene

13 Pollens are _____ type of allergens
a inhalants
b contact
c ingestants
d injectants

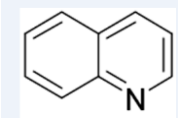
14 Which of the following constituent in tragacanth is responsible for swelling & forming gel?
a Tragacanthin
b Bassorin
c Tragacanthic acid
d Amylose

15 _____ is obtained from *Ananas comosus*
a Papain
b Streptokinase
c Bromelain
d Serratiopeptidase

16 _____ is heated at 80 degree centigrade for removal of toxic principle.
a Sunflower oil
b Chaulmogra oil
c Castor oil
d Arachis oil

17 Foam test is done for
a Saponins
b Volatile oils
C Anthraquinones
d Flavonoids

18 Following structure represents



a Catechol
b Quinoline
c Anthraquinone
d Indole

19 _____is produced by fermentation technology
a Papain
b Urokinase
c Serratiopeptidase
d Pepsin

20 Astringent action is shown by
a Tannins
b Glycosides
c Volatile oils
d Steroids

Q. II A **Answer ANY TWO of the following:** **20M**

1a Give biological source, chemical constituent and identification test for Gelatin. **5M**

1b Draw the heterocyclic nucleus/ general structure and write one example with its use & chemical test for the following phytoconstituents: **5M**
i. Cardiac glycoside
ii. Hydrolysable tannin

2a Write a note on **5M**
i. Ash value and its significance in quality control of DONO
ii. Effect of altitude & temperature in cultivation of DONO with suitable examples.

2b Define plant tissue culture & give its applications in Pharmacognosy. **5M**

3a Comment on significance of drying of crude drugs with suitable examples. **5M**
Discuss various methods used for drying in detail.

3b Write biological source, preparation, chemical test for identification and uses of Jute. **5M**

Q.II.B	Answer ANY SEVEN out of the Nine	35 M
1	Give Complete Pharmacognosy of mucilage containing drug obtained from marine source.	5M
2	Define Volatile oil. Discuss the different classes of volatile oil and its chemical test with examples.	5M
3	Write a note on i. Biodiversity. ii. Cytokinins	5M
4	Give salient features and applications of edible vaccine.	5M
5	Discuss chemical classification of drugs of natural origin with suitable examples along with the merits & demerits of the same.	5 M
6	Write a note on types of adulteration with suitable examples	5M
7	Discuss Urokinase and Papain in detail.	5M
8	Write a note on significance of Pharmacognosy in various alternative systems of medicine.	5M
9	Draw the heterocyclic nucleus/ general structure and write one example with its use, chemical test for the following phytoconstituents: i. Flavonoid glycoside ii. Indole alkaloid	5M

****

Duration: 3 Hrs **Total marks: 75**

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

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

1. The clearance of a drug is _____
a. the theoretical volume of CSF from which the drug is completely removed in unit time.
b. the theoretical volume of plasma from which the drug is completely removed in unit time.
c. the time after which the drug is completely removed from the body.
d. the time after which the drug is completely removed from the site of action.

2. Aqueous Solubility, Concentration, Vascularity, and Route of Administration are factors affecting _____
a. Distribution **b.** Excretion
c. Absorption **d.** Metabolism

3. A receptor which itself has enzymatic property is _____
a. Insulin receptor **b.** Progesterone receptor
c. Thyroxine receptor **d.** Glucagon receptor

4. An undesirable effect of a drug that occurs at therapeutic doses and can be predicted from its pharmacological actions is called _____.
a. Side effect **b.** Toxic effect
c. Allergic reaction **d.** Idiosyncrasy

5. The cardiac muscarinic receptors_____.
a. Are of the M1 subtype **b.** Are of the M2 subtype
c. Are selectively blocked by pirenzepine **d.** Function through the PIP2---- IP3/DAG Pathway

6. The following is a selective α2 adrenoceptor antagonist
a. Prazosin **b.** Phentolamine
c. Yohimbine **d.** Clonidine

7. The _____ drug is the inhibitor of aldehyde dehydrogenase
a. Disulfiram **b.** Ethanol
c. Acomprosate **d.** Methanol

8. The phenytoin gives _____ adverse effect in fetous .
a. Erythroblastosis Fetalis **b.** Foetal hydantoin syndrome
c. Down syndrome **d.** Wernick's encephalopathy

9. The reduced action of drug on repeated use by a subject is termed as _____
a. Drug addiction **b.** Drug tolerance
c. Drug dependence **d.** Drug abuse

10. Donepezil is useful in treatment of _____
a. Parkinson's disease **b.** Psychosis
c. Alzheimer's disease **d.** Depression

11. The route of excretion for volatile general anesthetics is _____
a. Exhaled air **b.** Faeces
c. Sweat **d.** Saliva

12. If the effect of combination of two drugs is equal to the sum of their individual effects, the two drugs are exhibiting ____
a. Potentiation **b.** Additive effect
c. Cross tolerance **d.** Antagonism

13. Which of the following statement is correct for neuromuscular blocking agents?
a. Induces bronchodilatation
b. Produces respiratory paralysis and prolonged apnoea
c. Acts by uncoupling the muscle contraction from depolarization of the membrane
d. Produces malignant hyperthermia

14. Benzodiazepines fail to exert therapeutic use in _____
a. Insomnia **b.** Epilepsy
c. Anxiety **d.** Neurodegenerative disease

15. These CNS stimulants drug predominately acts on cortical action.
a. Convulsants **b.** Analeptics
c. Psychostimulants **d.** Respiratory stimulants

16. Cheese reaction is side effect of _____
a. MAO inhibitors **b.** TCA
c. Levodopa **d.** Disulfiram

17. Distribution is defined as_____
a. The volume that would accommodate all the drug in the body, if the concentration throughout was the same as in plasma.
b. The time taken for its plasma concentration to be reduced to half of its original value.
c. The reversible movement of drug from one compartment of the body to another.
d. The rate and extent of absorption of a drug from a dosage form as determined by its concentration-time curve in blood or by its excretion in urine.

18. A partial agonist can antagonize the effects of a full agonist because it has _____
a. High affinity but low intrinsic activity **b.** Low affinity but high intrinsic activity
c. No affinity and low intrinsic activity **d.** High affinity but no intrinsic activity

19. Adrenaline injected with a local anaesthetic:
a. Reduces local toxicity of the local anaesthetic
b. Reduces systemic toxicity of the local anaesthetic
c. Shortens duration of local anaesthesia
d. Makes the injection less painful

20. Which of the following general anesthetics belongs to inhalants?
a. Ketamine **b.** Thiopental
c. Propofol **d.** Desflurane

2 Long Answers (Answer 2 out of 3) 20

A. What is biotransformation? Discuss Phase I reactions. Add a note on enzyme induction.
B. Classify anticholinergics. Give the detailed account of any two classes. Write the uses of anticholinergics.
C. Discuss in detail pharmacotherapy of Parkinsonism.

3 Short Answers (Answer 7 out of 9) 35

A. Give the advantages and disadvantages of the parenteral route.
B. Classify the receptors along with the examples. Explain in brief ion channel receptors.
C. Write a note on drug interactions
D. Define myasthenia gravis. Enlist the drugs used in its treatment
E. Classify local anaesthetics. Discuss the mechanism of action and routes of administration.
F. Give mechanism of action of sodium valproate and lithium
G. Give detailed note on halogenated anesthetics
H. Explain SSRIs in detail.
I. Write a note on Opioid antagonists

****

Time : 3 Hrs. **Marks : 75**

Question – I **1x20**

1 Newton's law of viscosity relates:
a Intensity of pressure and rate of deformation
b Shear stress and rate of shear
c Shear stress and viscosity
d Viscosity and rate of shear

2 Reciprocal of viscosity is known as
a Fluidity
b Mobility
c Reduced viscosity
d Kinematic viscosity

3 Bingham bodies are materials that exhibit
a plastic flow
b pseudoplastic flow
c dialatant flow
d newtonian flow

4 Which one of the following is observed when high force is applied on the powder mass? 1
a Brittle fracture
b Elastic deformation
c Plastic deformation
d Elasticity

5 During elastic deformation, the stress–strain relationship for a specimen is described by
a Hooke's law
b Boyle's law
c Beer Lambert's law
d Charle's law

6 ……is concentration of globules at the top or bottom of the emulsion.
a Coalescence
b Creaming
c Breaking
d Phase inversion

7 The sedimentation rate of particles in _____ suspension is found to be slow
a Deflocculated
b Flocculated
c Fine
d Coarse

8 In flocculated suspension, the supernatant layer is _____
a. Cloudy
b. Clear
c. Turbid
d. Opaque

9 As the viscosity of the emulsion is _____ the flocculation of globules will be reduced.
a Lowered
b Increased
c Decreased
d Maintained zero

10 In an emulsion, the relative volume of water and oil is expressed as _____.
a Phase concentration
b Phase volume ratio
c Phase inversion
d Viscosity

11 Which of the following statement is correct
a Association colloids are usually moderately thermodynamically unstable
b Association colloids are thermodynamically stable
c Association colloids are usually slightly thermodynamically unstable
d Association colloids are usually highly thermodynamically unstable

12 Which of the following statement is correct
a Linear colloidal materials yield dispersions of relatively low viscosity
b Spherical colloidal materials yield dispersions of relatively low viscosity
c Viscosity of the colloidal depersion does not depend on the shape of the colloidal material
d Spherical colloidal materials yield dispersions of relatively high viscosity

13 Which of the following statement is correct
a Lyophobic systems show most intense Tyndall effect
b Lyophilic systems show most intense Tyndall effect
c Lyophobic systems do not show Tyndall effect
d Lyophobic systems show little Tyndall effect

14. The ratio of void volume to bulk volume is known as
a. Porosity
b. Tapped density
c. Granule volume
d. Bulk Density

15. Coulter counter is used to determine
a. Number of particles
b. Particle volume
c. Particle interaction
d. Viscosity

16. The potential difference developed when particles settle under the influence of gravity is called
a. Streaming potential
b. Oxidation Potential
c. Reduction potential
d. Sedimentation potential

17. Which of the following is the half life of First order reaction
a. $t_{1/2}$ =0.693/k
b. $t_{1/2}$ = A_0/2k
c. $t_{1/2}$ = 0.693/2k
d. $t_{1/2}$ =2k

18. According to ICH guidelines, climate zone III is
a. Hot/dry climate
b. Subtrobical and Mediterranean climate
c. Hot/humid climate
d. Moderate climate

19. The dielctric constant is used to measure
a. Polarity of the solvent
b. Spreadability of the solvent
c. Viscosity of the solvent
d. Temperature of the solvent

20. Accelerated stability testing is done to
a. Predict shelf life of the formulation
b. Predict dissociation constant
c. predict diffusion constant
d. determine activation energy

Q.II Long Answer Questions (ANSWER ANY TWO) 2x10

Q. 1: Differentiate between flocculated and deflocculated suspension. Describe the theory of sedimentation. Discuss the significance of sedimentation volume (10 M)

Q. 2: A- Explain Helium displacement method to determine true density.
B-. Write a note on derived properties of powders?

Q. 3- A How does temperature influence drug degradation. Explain with the help of Arrhenius equation.

B- The initial concentration of a drug X was found to be 0.065 M. The concentration after 12 hours was 0.041 M. Calculate the reaction rate constant if decomposition of drug follows first order kinetics.

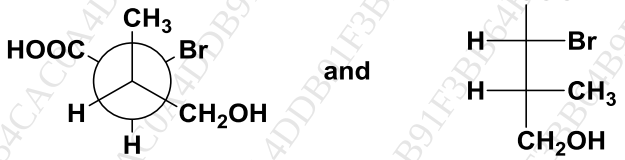
Q.III Short Answer Questions (Answer any seven) **7x5**

1. Write short note on classification of colloids.
2. Discuss the dispersion methods to prepare lyophobic colloids
3. Explain the DLVO theory
4. Discuss any two mechanisms of crystal growth in suspension.
5. Describe the non-Newtonian type of flow using rheograms and examples only.
6. Describe the mechanical behaviour of solids in terms of stress- strain relationship.
7. What is photolytic degradation? What are the ways to prevent it?
8. What are the methods used for determining particle surface area? Explain any one.
9. Explain using formula, three ways of measuring flow properties.

Time: 3 Hrs **Marks: 75**

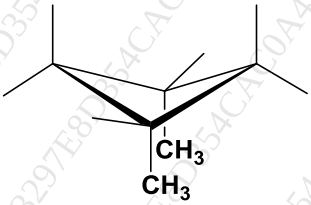
QI. Choose the correct option for the following multiple choice questions: (20)

1. Predict the relationship between the given pair of molecules:



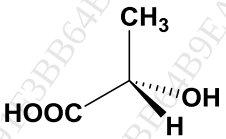
a. Diastereomers b. Enantiomers c. Homomers d. Mesomers

2. Choose the appropriate statement to describe the given molecule:



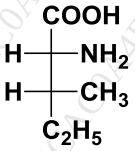
a. The given molecule is chiral since it has asymmetric carbons.
b. The given molecule is achiral since it has alternating axis of symmetry.
c. The given molecule is achiral since it has a plane of symmetry.
d. The given molecule is achiral since it possesses a centre of symmetry.

3. Choose the correct name of the given molecule:



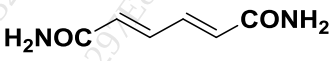
a. 2(R)-Hydroxypropanoic acid. b. 2(S)- Hydroxypropanoic acid.
c. (±)-Hydroxypropanoic acid. d. 2(R)- 2-Carboxyethanol.

4. The given amino acid is



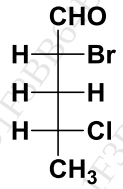
a. 2R,3S-Isoleucine b. 2S,3R-Isoleucine c. 2R,3R-Isoleucine d. D-Isoleucine

5. Assign R/S or E/Z notation (whichever relevant) to the given molecule:



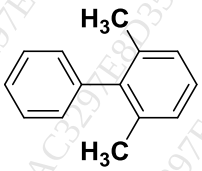
a. 2E,4E b. 2E,4Z c. 2Z,4E d. 2R,4S

6. Assign R/S notation to the asymmetric carbons:

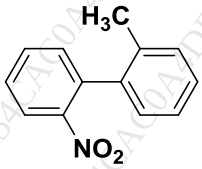


a. 2S,3R,4R b. 2R,4R c. 2R,3S,4S d. 2S,4S

7. Choose the most appropriate option for the given pair of molecules:



A



B

a. Compounds A and B are optically active.
b. Compound A is optically active, while B is optically inactive.
c. Compounds A and B are diastereoisomers.
d. Compound A is optically inactive, while B is optically active.

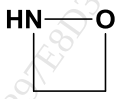
8. Strategies to resolve racemic mixtures exclude:

a. Use of physical methods of separation
b. Chiral chromatography
c. Separation of diastereomeric salts of the racemic molecule
d. Separation of racemates by distillation

9. Butane gauche interactions are observed in _____ while 1,4-flagpole interactions are present in _____.

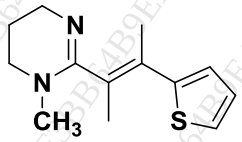
a. 1,3-Disubstituted cyclohexane, twist boat conformer
b. 1,2-Disubstituted cyclohexane, boat conformer
c. 1,4-Disubstituted cyclohexane, half chair conformer
d. 1,1-disubstituted cyclohexane, planar cyclohexane

10.The name of the given molecule as per Hantzsch Widman rules is:



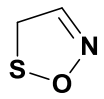
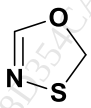
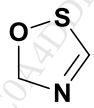
a. 1,2-Oxazetidine b. Indole c. 1,2,5-Oxadiazole d. Perhydroazine

11. Identify the heterocycle/s in the given drug moiety:



a. Thiophene
b. Pyrrole
c. Thiophene and 5,6-dihydro-*4H*-pyrimidine
d. Furan and N-Methyldiazabenzene

12. Structure _____ represents the molecule *5H*-1,2,3-Oxathiazole

a. 
b. 
c. 
d. 

13. The indole containing drug indomethacin is used as a/an _____ agent therapeutically.
a. Analgesic b. Antihypertensive agent c. Anti-inflammatory d. Antilipidemic

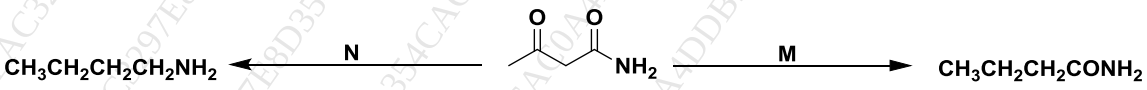
14. The correct order of basicity in the given heterocycles is:
a. Pyrrole<Pyridine<Imidazole
b. Imidazole>Pyrrole<Pyridine
c. Pyridine<Pyrrole<Imidazole
d. Pyridine<Imidazole<Pyrrole

15. The correct order of aromaticity is:
a. Imidazole<Thiazole<Oxazole
b. Thiazole<Oxazole<Imidazole
c. Oxazole<Imidazole<Thiazole
d. Thiazole<Imidazole<Oxazole

16. Isoquinoline undergoes the Chichibabin reaction to give:
a. 2-Aminoisoquinoline
b. 1-Aminoisoquinoline
c. 4-Aminoisoquinoline
d. 8-Aminoisoquinoline

17. Electrophilic aromatic substitution in furan takes place at position:
a. 3 b. 1 c. 2/5 d. 3 and 4

18. Identify N and M in the given reaction:



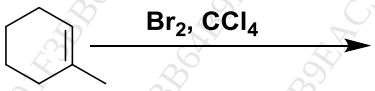
a. N=$LiAlH_4$, M=NH_2NH_2
b. N=$NaBH_4$, M=Zn/Hg, HCl
c. N=Sn, HCl, M= Na, liquid NH_3
d. N=$LiAlH_4$, M= Zn, AcOH

19. Salicylaldehyde can be converted to catechol by
a. Using H_2O_2, NaOH via Dakin's oxidation
b. Using KOH, alcohol via Claisen Schmidt condensation
c. Using $NaNH_2$ via Birch reduction
d. Using Aluminium isopropoxide via Oppenauer oxidation

20. 5,6-Diaminopyrimidine, on reaction with formic acid yield
a. Azepine b. Quinoline c. Purine d. Pyrazole

QII. Attempt **any two** of the following questions: (20)

1 i. Predict the product of the following reaction:



Comment on whether the reaction is stereoselective and/or stereospecific. Give a detailed mechanism to justify the formation of the proposed product.

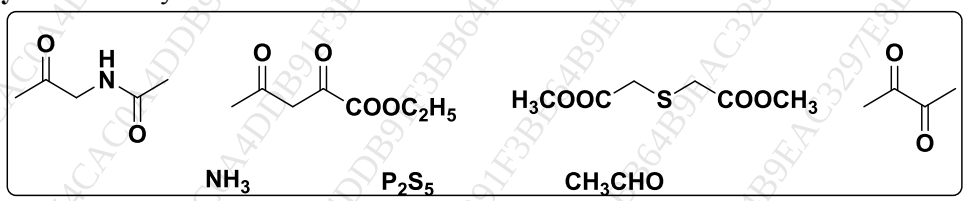
1 ii. Arrange the following in increasing order of reactivity and justify the same: Furan, thiophene, benzene, pyrrole. Depict the resonating structures for imidazole.

2 i. Predict the product/s of the following reaction:

Answer the following questions with respect to this reaction:

a. Assign R/S configuration to the chiral carbon in the substrate.
b. How many chiral carbons will the reduced product possess?
c. What will be the relation between the product/s formed? (in case if more than one product formed)?
d. Suggest a suitable technique/method of separating the isomeric products formed.

2 ii. Choose appropriate combinations of the molecules given in the figure below to propose concise schemes for synthesis of the stated heterocycles. Give the detailed mechanism for **any one** of the synthetic schemes.



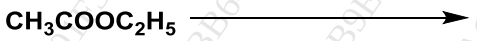
a. A substituted thiophene
b. A substituted thiazole
c. A substituted pyridine

3 i. Discuss the mechanism for the following:
a. Schmidt rearrangement
b. Oppenauer oxidation

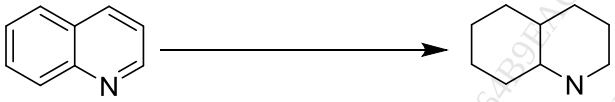
3 ii. Suggest suitable reducing agents for the following reactions:

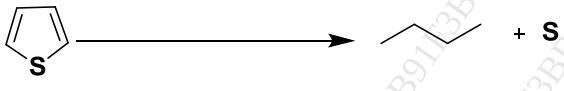
a)

b)



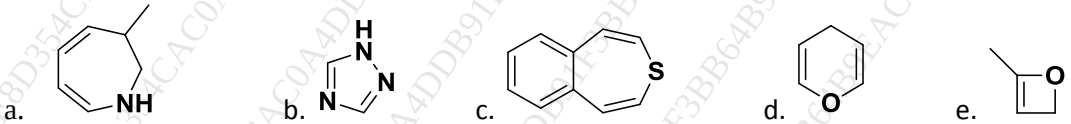
c)

d) 

e) 

QIII. Answer **any seven** questions from the following: (35)

1. With the help of an energy profile diagram, depict the conformers of n-butane. Draw the most stable and the least stable conformer of cyclohexane.
2. Represent 2R, 3S-Dihydroxybutanedioic acid using the various projection formulae. Comment on whether the molecule is chiral or achiral with suitable justification.
3. What is asymmetric synthesis? Discuss any two methods of the same.
4. Explain the term atropisomerism. What are the conditions required for substituted biphenyls to be optically active?
5. Attempt **any two** of the following conversions (Give detailed mechanism):
   a. Acetaldehyde to 2-Propenal
   b. 4-Hydroxybenzaldehyde to hydroquinone.
   c. Pyrimidine to pyrazole
   d. Pyrrole to 3-Chloropyridine
6. Use different reagents/ reaction conditions to discuss:
   a. Bromination of pyridine
   b. Reduction of isoquinoline
   c. Nitration of quinoline
7. Discuss the detailed mechanism of synthesis of any one N containing bicyclic heterocycle. Give the product/s of sulphonation and oxidation of quinoline.
8. Nomenclate **any three** of the following molecules using the Hantzsch-Widman rules:



What is the therapeutic use of ranitidine and atorvastatin?

9. Give the products of the following reactions **(any five)**: