



# UNIVERSITY OF THE PUNJAB

First Prof. A/2017

Examination:- Doctor of Pharmacy (Pharm.D.)

Roll No. ....

Subject: Pharmaceutical Chemistry-I (Organic)

TIME ALLOWED: 3 hrs.

PAPER: 1 (Old & New Course)

MAX. MARKS: 100

**NOTE:** Attempt any FIVE questions. All questions carry equal marks.

- Q. No. 1 a) Describe the factors effecting the stabilization of free radicals. 10  
b) Define Pinacol-Pinacolone rearrangement and describe its reaction mechanism. 10
- Q. No. 2 a) Write detail note on R, S and E, Z methods of configuration. 10  
b) Explain Optical Isomerism with examples. 10
- Q. No. 3 a) How ethylene glycol prepared? Mention at least three methods. 10  
b) How primary, secondary and tertiary alcohols prepared simultaneously? Discuss methods for separation of primary, secondary and tertiary alcohols. 10
- Q. No. 4 a) What is steric hindrance? Explain with examples. 10  
b) What is resonance? Describe rules for drawing resonance structure. 10
- Q. No. 5 What are Esters? Give methods of preparation, chemical properties and pharmaceutical applications. 20
- Q. No. 6 Write note on the followings: 10, 10  
a) Perkin Reaction                      b) Metal Hydride Reduction
- Q. No. 7 Describe methods of preparations, chemical reactions and pharmaceutical applications of Furan and Indole. 20



# UNIVERSITY OF THE PUNJAB

First Prof: Annual – 2018

Examination: Doctor of Pharmacy (Pharm.D.)

Roll No. ....

Subject: Pharmaceutical Chemistry-I (Organic)  
PAPER: 1 Part – I (Compulsory) (Old & New Course)

TIME ALLOWED: 30 min.  
MAX. MARKS: 20

**Attempt this Paper on this Question Sheet only.**

**Please encircle the correct option. Each MCQ carries 1 Mark. This Paper will be collected back after expiry of time limit mentioned above.**

Q. No. 1 Multiple Choice Questions

20

- IUPAC name of Pyrrole is  
a. Diazine b. Azine c. Azolidine d. Azole
- Which of the following has least resonance energy?  
a. Benzene b. Thiophene c. Pyrrole d. Furan
- Amongst the following most basic compound is  
a. Aniline b. Piperidine c. Pyridine d. Pyrrole
- In isoquinoline the nucleophilic substitution occurs, readily at  
a. 1-position b. 3-position c. 4-position d. 5-position
- For the preparation of Grignard reagent the essential condition is that  
a. All reactants are pure b. All reactants are dry c. Reactants do not contain any alcohol d. All of these
- Which of the following can act as a dienophile in Diels-Alder reaction?  
a. Cinnamic acid b. *p*-Benzoquinone c. Benzophenone d. Acetophenone
- Reaction of acetic acid with  $\text{LiAlH}_4$  gives  
a. Ethyl alcohol b. Ethane c. Ethanal d. Ethyl acetoacetate
- Cannizzaro reaction involves migration of which species  
a. Proton b. Carbene c. Hydride ion d. Carbanion
- The reactions of carbonyl group are  
a. Free radical addition b. Electrophilic addition c. Nucleophilic addition  
d. Nucleophilic substitution
- The optical isomers with equal but opposite angles of rotation are called  
a. Anomers b. Conformers c. Epimers d. Enantiomers
- Heterolysis of a 'C—C' covalent bond forms?  
a. Free radicals b. Carbocations only c. Carbanions only d. Both Carbanions and Carbocations
- Identify an electrophile  
a.  $\text{SO}_2$  b.  $\text{SO}_3$  c.  $\text{NF}_3$  d.  $\text{H}_3\text{O}^+$
- A reaction intermediate having only six electrons in the outer orbit of carbon but no charge on it, is known as  
a. Carbene b. Carbocation c. Carbanion d. Free radical

PTO

14. Which of the following reactions are not shown by benzaldehyde?  
a. Benzoin condensation b. Perkin reaction c. Cannizzaro reaction  
d. Beckmann rearrangement
15. Which conformation has lowest potential energy?  
a. Eclipsed b. Staggered c. Skew d. All have same energy
16. Molecules that are not superimposable on their mirror images are  
a. Asymmetric b. Symmetric c. Achiral d. Non-planar
17. Which type of isomerism is exhibited by maleic fumeric acids?  
a. Optical isomerism b. Geometrical isomerism c. Conformational isomerism  
d. Functional isomerism
18. By metal hydride reduction ketones are converted to  
a. Primary alcohols b. Tertiary alcohols c. Secondary alcohols d. None of the above
19. Vitamin B6 (pyridoxal) has the basic ring structure of  
a. Piperidine b. Pyrrole c. Pyridine d. Pyrrolidine
20. Quinoline undergoes electrophilic substitution reactions at position  
a. 2-position b. 3- and 5-positions c. 3-position d. 8- and 5-positions



# UNIVERSITY OF THE PUNJAB

First Prof: Annual – 2018  
Examination: Doctor of Pharmacy (Pharm.D.)

Roll No. ....

TIME ALLOWED: 2 Hrs. & 30 min.  
MAX. MARKS: 80

Subject: Pharmaceutical Chemistry-I (Organic)  
PAPER: 1 Part – II (Old & New Course)

*Attempt this Paper on Separate Answer Sheet provided.*

Attempt any 4 questions. Each question carry equal marks.

- Q. No. 2 Explain briefly: (5x4=20)  
a) free radicals b) Carbocations c) Carbanions d) Carbenes
- Q. No. 3 a) What do you mean by racemic mixture? Why it is optically inactive? Explain the methods for resolution of racemic mixture. 10  
b) Explain Conformational Isomerism with examples. 10
- Q. No. 4 a) What is steric hindrance? Explain with examples. 10  
b) Write note on Inductive Effect. 10
- Q. No. 5 Write a note on the following reactions in benzene: 20  
a) Friedel-Crafts Alkylation b) Friedel-Crafts Acylation c) Halogenation
- Q. No. 6 Give the mechanism and the reaction conditions of the followings: (10x2=20)  
a) Hofmann Rearrangement b) Wittig Rearrangement
- Q. No. 7 Describe methods of preparations, chemical reactions and pharmaceutical applications of Quinoline and Pyridine. 20



# UNIVERSITY OF THE PUNJAB

First Prof: 2<sup>nd</sup> Annual – 2018

Examination: Doctor of Pharmacy (Pharm.D.)

Roll No. ....

Subject: Pharmaceutical Chemistry-I (Organic)

PAPER: 1 Part – II (Old & New Course)

MAX. TIME: 2 Hrs. 30 Min.

MAX. MARKS: 80

**ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED**

**NOTE: ATTEMPT ANY FOUR QUESTIONS. EACH QUESTION CARRIES EQUAL MARKS.**

- Q. No. 2 a) Define and explain the terms with examples: Enantiomers, Diastereomers, Epimers, Anomers and Racemic Mixtures. 10  
b) Write detail note on Geometrical Isomerism with examples. 10
- Q. No. 3 Discuss the mechanism and reaction conditions of the following: 20  
A) Mannich reaction B) Cannizzaro reaction
- Q. No. 4 Write the methods of preparation of haloalkanes. Discuss the mechanism of nucleophilic substitution reactions in haloalkanes. 20
- Q. No. 5 Write note on the following: 20  
a) Baeyer-Villiger oxidation b) Hydrogen Bonding
- Q. No. 6 Describe methods of preparation, chemical properties and pharmaceutical applications of Indole. 20
- Q. No. 7 a) How are esters prepared? Give their important reactions. 10  
b) How phenol is prepared? Give four methods. Discuss their chemical properties and importance in pharmacy. 10



# UNIVERSITY OF THE PUNJAB

First Prof: 2<sup>nd</sup> Annual – 2018

Examination: Doctor of Pharmacy (Pharm.D.)

Roll No. in Fig. ....

Roll No. in Words. ....

Subject: Pharmaceutical Chemistry-I (Organic)

MAX. TIME: 30 Min.

PAPER: 1 Part – I (Compulsory) (Old & New Course)

MAX. MARKS: 20

Signature of Supdt.:

**Attempt this Paper on this Question Sheet only.**

**Please encircle the correct option. Division of marks is given in front of each question.**

**This Paper will be collected back after expiry of time limit mentioned above.**

**Q.1. Encircle the right answer cutting and overwriting is not allowed.**

**(20x1=20)**

1. Hybridisation of nitrogen atom in pyridine is  
a.  $sp$  b.  $sp^2$  c.  $sp^3$  d. It is not hybridised
2. Skraup synthesis is used to prepare  
a. Pyridine b. Quinoline c. Isoquinoline d. All of these
3. Quinoline on oxidation with  $KMnO_4$  gives  
a. Quinolinic acid b. Nicotinic acid c. Picolinic acid d. All of these
4. Identify an indole alkaloid  
a. Morphine b. Quinine c. Cocaine d. Strychnine
5. IUPAC name of pyridine is  
a. Azole b. Azine c. Azolidine d. Diazine
6. Which of the following has least resonance energy?  
a. Furan b. Thiophene c. Pyrrole d. Benzene
7. The intermediate formed during Arndt Eiestert reaction is  
a. Ketene b. Ketone c. Aldehyde d. Carbanion
8. Baeyer-Villiger oxidation takes place in the presence of  
a.  $KMnO_4$  b. Per acids c.  $H_2SO_4$  d. Without catalyst
9. Diel-Alder reaction is an example of which type of reaction  
a. Electrophilic addition b. Nucleophilic addition c. Pericyclic reaction  
d. Sigmatropic reaction
10. What is the nature of H-atom in  $CHCl_3$ ?  
a. Neutral b. Acidic c. Basic d. None
11. Which of the following has most reactive carbonyl group  
a. Methanal b. Ethanal c. Propanone d. Benzaldehyde

**P.T.O.**

12. Wolf rearrangement involves which of the following reaction intermediate?  
a. Carbonium ion b. Carbanion c. Carbene d. Free radical
13. Heterolysis of which bond is likely to form carbanion?  
a. C—Cl b. C—O c. C—Mg d. C—N
14. Which of the following does not show conformational isomerism?  
a. Ethane b. Benzene c. Cyclohexane d. n-Butane
15. EZ system is related to  
a. Optical isomerism b. Geometrical isomerism c. Conformational isomerism  
b. None of above
16. Codensation reaction between HCHO, Dethylamine hydrochloride and a compound containing  $\alpha$ -H atom is known as  
a. Mannich reaction b. Knoevenagel reaction c. Reformatsky reaction d. Aldol condensation
17. Carbonyl group may be converted to alkanes by the reaction  
a. Clemmensen's reduction b. Wolf-Kishner reduction c. Both a & b d. None of these
18. Free radicals are characterized by  
a. Paramagnetism b. Diamagnetism c. Loss of electron d. Low reactivity
19. Among the following, the strongest halogenated acid is  
a. Iodoacetic acid b. Bromoacetic acid c. Chloroacetic acid d. Fluoroacetic acid
20. Hydrogen bonding does not occur in  
a. Diethylether b. Propanol c. Amino acids d. HF



# UNIVERSITY OF THE PUNJAB

Doctor of Pharmacy (Pharm.D.) First Prof: Annual – 2019

Roll No. ....

Subject: Pharmaceutical Chemistry-I (Organic)

Paper: 1 Part – II (Old & New Course)

Time: 2 Hrs. 30 Min. Marks: 80

**ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED**

**Note: Attempt any *FOUR* questions. Each question carries equal marks.**

- Q. No. 2: Define conformational isomerism. Describe the conformations of n-butane and cyclohexane. 20
- Q. No. 3: Define and explain the term substitution reactions. Describe Electrophilic Substitution reactions with reference to benzene. 20
- Q. No. 4: How is Grignard Reagent prepared and describe its applications in synthesis of organic compounds. 20
- Q. No. 5: a) Discuss methods of preparation of primary, secondary and tertiary amines. 10  
b) Describe methods of preparation and chemical reactions of pyrrole. 10
- Q. No. 6: Discuss in detail mechanisms and reaction conditions of Hofmann and Beckmann Rearrangements 20
- Q. No. 7: Write note on the followings: 20  
a) Pinacol-Pinacolone rearrangement b) Optical isomerism c) Friedel craft reaction



# UNIVERSITY OF THE PUNJAB

Doctor of Pharmacy (Pharm.D.) First Prof: Annual – 2019

Subject: Pharmaceutical Chemistry-I (Organic)  
Paper: 1 Part – I (Compulsory) (Old & New Course)

Time: 30 Min. Marks: 20

Roll No. in Fig. ....

Roll No. in Words. ....

Signature of Supdt.: .....

**ATTEMPT THIS PAPER ON THIS QUESTION SHEET ONLY.**

Division of marks is given in front of each question.

This Paper will be collected back after expiry of time limit mentioned above.

(20x1=20)

Q.1. Encircle the correct option.

- The most typical reaction of simple alkenes is;  
a) Electrophilic substitution b) nucleophilic substitution c) electrophilic addition  
d) nucleophilic addition
- Which of the following has least resonance energy?  
a) Benzene b) Thiophene c) Pyrrole d) Furan
- Amongst the following most basic compound is;  
a) Aniline b) Piperidine c) Pyridine d) Pyrrole
- Which reagent would be best for achieving an E2 elimination of 3-chloropentane?  
a)  $C_2H_5ONa$  b)  $CH_3CO_2Na$  c)  $NaHCO_3$  d)  $NaI$
- For the preparation of Grignard reagent, the essential condition is that;  
a) All reactants are pure b) All reactants are dry c) Reactants do not contain any  
alcohol d) All of these
- Which of the following aldehydes, used alone, will undergo an aldol reaction?  
a) Formaldehyde b) Butanal c) Benzaldehyde d) 2-propenal
- Reaction of acetic acid with  $LiAlH_4$  gives;  
a) Ethyl alcohol b) Ethane c) Ethanal d) Ethyl acetoacetate
- Cannizzaro reaction involves migration of which species;  
a) Proton b) Carbene c) Hydride ion d) Carbanion
- The reactions of carbonyl group are;  
a) Free radical addition b) Electrophilic addition c) Nucleophilic addition  
d) Nucleophilic substitution
- The optical isomers with equal but opposite angles of rotation are called;  
a) Anomers b) Conformers c) Epimers d) Enantiomers
- The spatial orientation of the atoms of a molecule is called its;  
a) Constitution b) configuration c) handedness d) composition
- Which of the following benzene ring substituent is deactivating but ortho-paradirecting:  
a)  $-N=O$  b)  $-Cl$  c)  $-COCH_3$  d)  $-NO_2$
- A reaction intermediate having only six electrons in the outer orbit of carbon but no charge on  
it, is known as;  
a) Carbene b) Carbocation c) Carbanion d) Free radical

P.T.O.

14. A tertiary carbocation is more stable than either a secondary or primary carbocation because;
- a) It carries three positive charges
  - b) it has a pyramidal configuration
  - c) it has a trigonal planar configuration
  - d) it possesses three electron donating substituent groups
15. Which conformation has lowest potential energy?
- a) Eclipsed
  - b) Staggered
  - c) Skew
  - d) All have same energy
16. If two isomers have been classified correctly as epimers, they may also called;
- a) Diastereomers
  - b) enantiomers
  - c) tautomers
  - d) conformers
17. Which type of isomerism is exhibited by maleic fumaric acids?
- a) Optical isomerism
  - b) Geometrical isomerism
  - c) Conformational isomerism
  - d) Functional isomerism
18. By metal hydride reduction ketones are converted to;
- a) Primary alcohols
  - b) Tertiary alcohols
  - c) Secondary alcohols
  - d) None of the above
19. Vitamin B6 (pyridoxal) has the basic ring structure of;
- a) Piperidine
  - b) Pyrrole
  - c) Pyridine
  - d) Pyrrolidine
20. Which of the following molecules will not have a dipole moment?
- a)  $\text{CH}_3\text{Cl}$
  - b)  $\text{CH}_3\text{OCH}_3$
  - c)  $\text{CH}_2\text{Cl}_2$
  - d)  $\text{CCl}_4$



# UNIVERSITY OF THE PUNJAB

Doctor of Pharmacy (Pharm.D.) 1<sup>st</sup> Prof: Annual – 2021

Roll No. ....

Subject: Pharmaceutical Chemistry-I (Organic)

Time: 2 Hrs. 30 Min. Marks: 80

Paper: 1 (Old & New Course) Part – II

**ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED**

**Note: Attempt any *FOUR* questions. Each question carries equal marks.**

**Q. 2 Write note on the following: (10, 10)**

- a) Wagner-Meerwein arrangements      b) Arynes and Free radicals

**Q. 3 Describe reaction mechanism and applications of the followings: (10, 10)**

- a) Favorskii Rearrangement      b) Wittig reaction

**Q. 4 Discuss the following in detail: (10, 10)**

- a) Conformational isomerism      b) Nucleophilic substitution reactions

**Q. 5 a) Define hybridization, discuss its role in determining geometry of organic compounds. (10)**

- b) Write note on the chemical reactions of benzene. (10)

**Q. 6 How is Grignard Reagent prepared in the laboratory? Describe its applications in synthesis of organic compounds. (20)**

**Q. 7 a) Describe methods of preparation and chemical reactions of pyrrole. (10)**

- b) What are metal hydrides? How they bring about reduction of carbonyl compounds? (10)



# UNIVERSITY OF THE PUNJAB

Doctor of Pharmacy (Pharm.D.) 1<sup>st</sup> Prof: Annual – 2021

Subject: Pharmaceutical Chemistry-I (Organic)

Paper: 1 (Old & New Course) Part – I (Compulsory)

Time: 30 Min. Marks: 20

Roll No. in Fig. ....

Roll No. in Words. ....

Attempt this Paper on this Question Sheet only.

Division of marks is given in front of each question.

This Paper will be collected back after expiry of time limit mentioned above.

.....  
Signature of Supdt.:

Q.1. Encircle the right answer cutting and overwriting is not allowed. (20x1=20)

1. Which of the following reaction intermediate is involved in Wolf Rearrangement?  
a) Carbonium ion   b) Carbanion   c) Free radicals   d) Carbene
2. Amides are converted into which of the following during Hofmann Rearrangement?  
a) Esters   b) Ethers   c) Amines   d) Lactones
3. Cyclic  $\alpha$ -halo ketones undergo which of the following in Favorskii Rearrangement?  
a) Ring contraction   b) Ring expansion   c) Ring addition   d) Ring opening
4. Which of the following reaction in alcohols involves O-H bond removal?  
a) Halogen reaction with hydrogen halides   b) Reaction with Lucas reagent  
c) Reactions with ammonia   d) Reaction with metals
5. Dehydration of amides by heating in the presence of phosphorus (V) oxide, or phosphorus oxychloride gives \_\_\_\_\_.  
a) Nitrile   b) Amine   c) Acids   d) Alcohol
6. The functional group represented as R-S-R is called;  
a) Sulfide   b) Sulfone   c) Sulfonic acid   d) Disulfide
7. Which of the following is a six membered heterocyclic ring?  
a) Pyrrole   b) Furan   c) Azide   d) Pyrimidine
8. Which of the following condensed heterocyclic compound contains benzene fused with pyridine?  
a) Indole   b) Benzofuran   c) Coumarin   d) Isoquinoline
9. Grignard's reagent is prepared in presence of \_\_\_\_\_.  
a) Ether   b) Acetone   c) Alcohol   d) Water
10. The end product of Bayer-Villiger oxidation of acyclic ketones is \_\_\_\_\_.  
a) Aldehyde   b) Ester   c) Carboxylic acid   d) Alpha beta unsaturated aldehyde
11. "E" and "Z" system is related to \_\_\_\_\_.  
a) Optical isomerism   b) Geometrical isomerism   c) Conformational isomerism  
d) Racemization
12. "R" and "S" system is related to \_\_\_\_\_.  
a) Optical isomerism   b) Geometrical isomerism   c) Conformational isomerism  
d) Substitution reaction

13. Under Arndt-Eistert reaction, ketocarbenes undergo rearrangement by \_\_\_\_\_ of the alkyl group to give ketene;  
a) 1,1-shift   b) 1,2-shift   c) 1,3-shift   d) 1,4-shift
14. Which of the following statements related to tautomerism is false?  
a) Keto form is less stable   b) Enol form is less stable   c) Keto form is more stable  
d) Two isomers are in dynamic equilibrium
15. In Mannich reaction, amine reacts with formaldehyde to give \_\_\_\_\_ with release of water molecule.  
a) Ammonium ion   b) Iminium ion   c) Carbonium ion   d) Carbanion
16. How many asymmetric carbons are present in the meso compound of tartaric acid?  
a) 2   b) 3   c) 4   d) 5
17. Conformational isomerism is found in \_\_\_\_\_;  
a) Alkane   b) Alkene   c) Alkyne   d) Aromatic compounds
18. The RS system is also known as \_\_\_\_\_.  
a) Relative configuration   b) Absolute configuration   c) Optical activity  
d) Therapeutical activity
19. Equimolar mixture of dextrorotatory and levorotatory isomer that has "0" optical activity is called \_\_\_\_\_;  
a) Racemic mixture   b) Enantiomeric excess   c) Diastereomers   d) Epimers
20. The isomers that differ from each other in the arrangement of carbon chain around the functional group are called;  
a) Metamers   b) Tautomers   c) Chain isomers   d) Functional isomers