Sem 5 BSc Chemistry Nov 2022

[Time: 3 Hours] [Total Marks: 100]

Please check whether you have got the right question paper.

N.B.

1. All Questions are compulsory.
2. Figures to the right indicate full marks.
3. The use of log-table/non-programmable calculator is allowed.
4. Answers for the same question as far as possible should be written together.

Q.1 Answer **ANY FOUR** of the following:

A Give the full form of NGP. Explain with a suitable example the effect of NGP on kinetics and stereochemistry of the reaction. **5**

B Explain the following terms: **5**
i) pyrolytic elimination ii) $A_{Ac}2$
iii) heterolytic fission iv) basicity
v) saponification

C With the help of a well labelled Jablonski diagram explain any three relaxation (decay) processes which an electronically excited molecule undergoes to loose energy. **5**

D What are pericyclic reactions? List how they are classified? Explain Electrocyclic reactions with a suitable example. **5**

E What is photoreduction? Explain the mechanism of photoreduction of benzophenone. **5**

F Distinguish between the following:
i) acidity and electrophilicity **3**
ii) transition state and reaction intermediate **2**

Q.2 Answer **ANY FOUR** of the following:

A Write a note on the following- **5**
a. Centre of symmetry,
b. Plane of symmetry
c. Atropisomerism

B Write a note on stereochemistry of allenes. **5**

C Define: Agrochemicals. Give advantages and disadvantages of Agrochemicals. **5**

D (a) Give synthesis of indole-3-acetic acid. **3**
(b) Give preparation of pyridine-N-oxide from pyridine. **2**

E Write the reaction of following reagents with quinoline- **5**
(a) bromine in concentrated H_2SO_4 at 75°C,
(b) fuming HNO_3 and concentrated H_2SO_4 at 0°C
(c) H_2, Pt in methanol

F Write Bischler-Napieralski synthesis for 1-methyl isoquinoline. **5**

Q.3 Answer any four of the following :

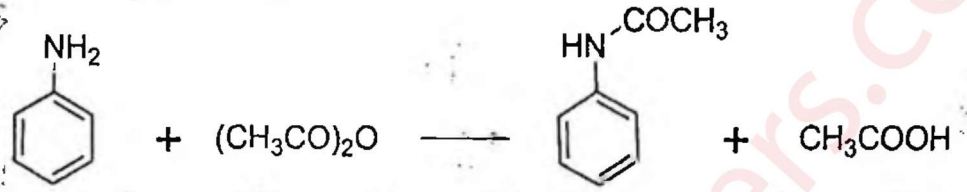
A a. Define Regioselectivity? Give an example of Chemoselectivity? **3**

b. What is E-factor? Give its significance. **2**

B a. Give an example of Multicomponent synthesis? **3**

b. Give the preparation of adipic acid from D-glucose using green chemistry reactions? **2**

C Define Atom economy? Calculate the percentage atom economy of the following reaction? **5**



Atomic Weights: C=12, H=1, O= 16, N=14

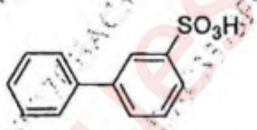
D Give the synthesis of the following from a suitable starting compound: **5**

1) 2-pentanol using a suitable Grignard reagent
2) p-nitroaniline

E Write the structural formula for each of the following compounds: **5**

1) 4,4'- dimethyl diphenyl
2) 4-chloro-benzo[b] pyridine
3) Penta-2,3-diene-1-oic acid
4) Spiro [4.4] non-1-ene
5) 2-methyl bicyclo [4.2.0] oct-3-ene

F Give IUPAC names for each of the following compounds: **5**

1) 

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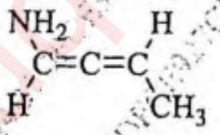
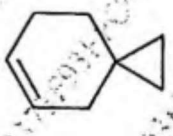
3) 

4) 

5) 

Q.4 Answer **any four** of the following:

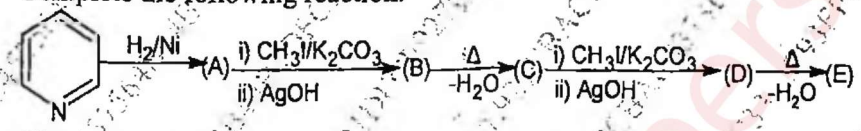
A Explain the following terms used in uv-visible spectroscopy with example: **5**
a) Chromophore- Chromophore interactions
b) Various possible electronic transitions

B a) Explain the mass spectral fragmentation pattern of 2-methyl pentane. **3**
b) Discuss in brief the principle of mass spectrometry. **2**

C Give the synthesis of: **5**
a) Adrenaline by Ott's synthesis method
b) Citral from 6-Methyl hept-5-en-2-one

D a) What are alkaloids? Write any two class of alkaloids with suitable example. **3**
b) State isoprene rule. **2**

E Complete the following reaction. **5**



F Give analytical evidence to prove the following: **5**
a) Citral is acyclic monoterpenoids.
b) Presence of isopropylidine group in citral.

Q.5 **Do as Directed**

A Choose the most appropriate option (answer **any 5**): **5**

i) Which of the following reactions is a thermal decomposition of xanthate esters?
a) Cope elimination b) Chugaev reaction
c) Sigmatropic reaction d) Pyrolysis of acetates

ii) How is an electrophile defined?
a) Electron deficient species b) Negatively charged species
c) Electron rich species d) Lewis base

iii) Which of the following is not a nucleophile?
a) $\overset{\ominus}{O}H$ b) $R\ddot{O}H$
c) $R_3\overset{\oplus}{C}$ d) $H_2\ddot{O}$

iv)

Identify the reaction.
a) Cheletropic reaction b) $(2\pi + 2\pi)$Cycloaddition
c) Group Transfer reaction d) $(4\pi + 2\pi)$Cycloaddition

v) $CH_3COOH + C_2H_5OH \xrightleftharpoons{\text{dry HCl (g)}} CH_3COOC_2H_5 + H_2O$

Classify the above reaction.
a) Acyl Electrophilic substitution b) Alkyl Electrophilic substitution
c) Acyl Nucleophilic substitution d) Alkyl Nucleophilic Substitution

vi) In which of the following reactions is carbon monoxide eliminated as a by-product?

a) Norrish Type I at room temperature
b) Norrish Type I at elevated temperature
c) Norrish Type II
d) Cope Elimination

vii) What does ISC stand for?

a) Internal System Crossing
b) Inter-System Crossing
c) Internal Sensitised Crossover
d) Intra-System Crossing

viii) Pick the correct statement with respect to photoisomerisation of stilbene.

a) It is a direct reaction that takes place via the Singlet state.
b) It is a direct reaction that takes place via the Triplet state
c) It is a photosensitised reaction that takes place via the Singlet state
d) It is a photosensitised reaction that takes place via the Triplet state

B State whether following are True or False- **(ANY FIVE)** **5**

(a) Always an optically active compound must contain at least one chiral carbon atom.
(b) Alternating axis of symmetry is also known as rotation-reflection axis.
(c) Endosulfan is a plant growth regulating hormone.
(d) Fungicides are the chemicals that destroy, prevent or inhibit the growth of weeds.
(e) Electrophilic substitution reactions on isoquinoline takes place preferably at positions 5 and 8.
(f) Isoquinoline is also known as 2-azanaphthalene.
(g) Pyridine-N-oxide is less basic than pyridine.

C Fill in the blanks (Answer **any five**) **5**

1 There are _____ principles of Green Chemistry
2 The concept of Atom economy was developed by _____
3 In a greener pathway to synthesize Adipic acid , the starting material used is _____.
4 Synthesis of p-bromoaniline from Aniline is a _____ synthesis.
5 In the reduction of m-dinitrobenzene to m-nitroaniline the chemoselective reagent used is _____.
6 In spiro [2.3] hexane, the smaller ring contains _____ number of carbon atoms.
7 To name the fused and bridged ring systems the numbering starts from the _____ carbon atom.
8 Two phenyl rings bonded by a single covalent bond is called a _____

D Match the following columns. **(Attempt any five)** **5**

Column P	Column Q
a. Codenine	1. Insulin
b. Citral	2. Mass spectrometry
c. Peptide	3. Endocrine glands
d. Adrenaline	4. Lemon grass oil
e. Hormones	5. $-NH_2$ group
f. Auxochrome	6. Epinephrine
g. m/z value	7. Opium poppy