Quaid-I-Azam University

Department of Chemistry

Sample Paper M.Phil Admission Test (Organic Chemistry)

Semester **Dated**

Time Allowed 1 hour 30 minutes **Maximum Marks: 40**

Note: Attempt all the questions all questions carry equal marks

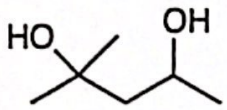
Note: MPhil. Organic Chemistry Admission test will comprise EIGHT questions (MCQs/Short question answers) from following topics.

Nomenclature of organic compounds
Basic Concepts in organic chemistry
Functional group interconversions
Reaction Mechanism
Laboratory Techniques in Organic chemistry
Organic spectroscopy
Natural products
Stereochemistry

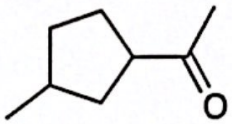
Each question will carry five marks.
Total Marks = 40 Passing marks= 20

Q 1.

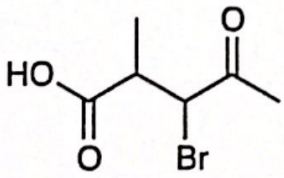
1) Give IUPAC names of the following structures.



a



b



c

2) Draw structures corresponding to following IUPAC names.

a. 2-methyl-1,3,5-triazine

b. 2-(1-aminoallyl)-3-methylcyclopropanamine

Q2.

1. The hybridization of carbon atoms in **C–C single bond** of $HC{\equiv}C{-}CH{=}CH_2$ molecule is:

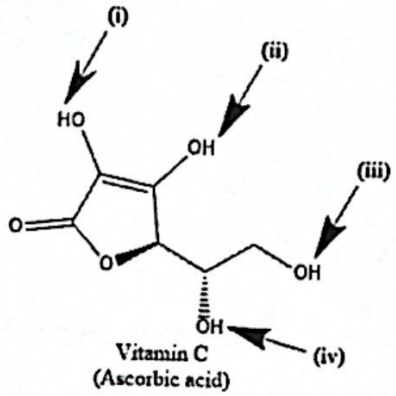
a. sp^3, sp^3

b. sp^2, sp^3

c. sp, sp^2

d. sp^3, sp

2) Which **H atom** in Vitamin C (Ascorbic acid) is most acidic?



Vitamin C
(Ascorbic acid)

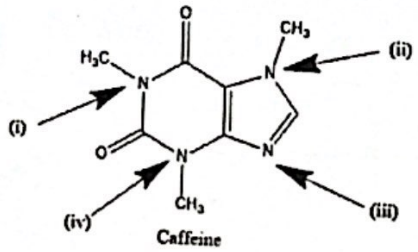
a. (i)

b. (ii)

c. (iii)

d. (iv)

3) Which **N atom** in caffeine is most basic?



Caffeine

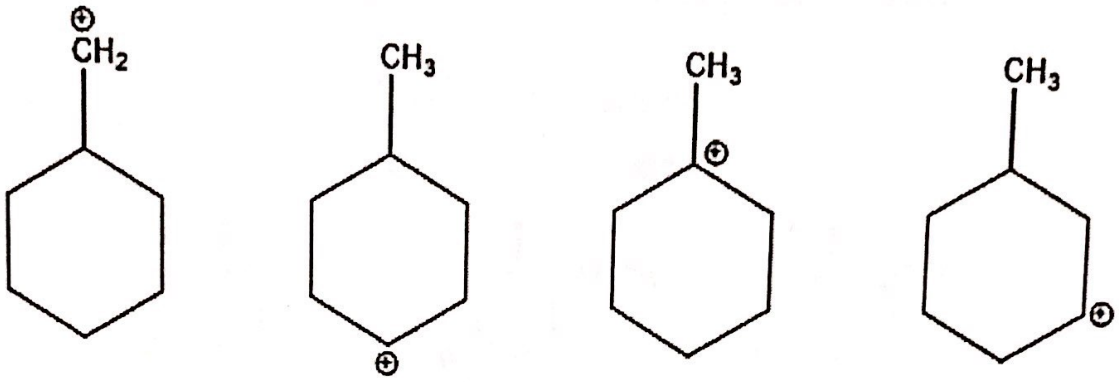
a. (i)

b. (ii)

c. (iii)

d. (iv)

4) Correct order of stability of following carbocations is:



(i) (ii) (iii) (iv)

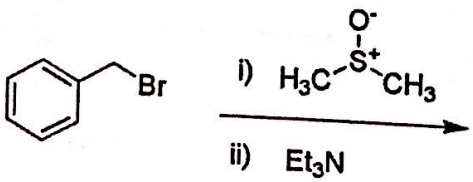
a. (i) < (ii) < (iii) < (iv)
b. (iii) < (iv) < (i) < (ii)
c. (i) < (ii) < (iv) < (iii)
d. (iv) < (ii) < (iii) < (i)

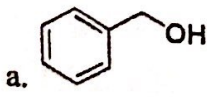
5) Which of the following belongs to primary source of chemical literature?

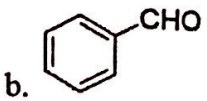
a. Patents
b. Reviews
c. Chemical Abstracts
d. Textbooks

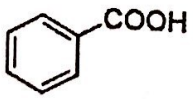
Q3.

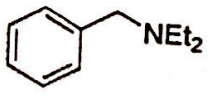
1) Which of the following is the major product of the reaction shown below?



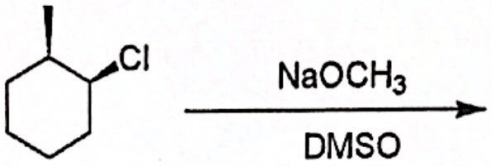
a. 

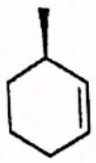
b. 

c. 

d. 

2) Which of the following is the major product of the reaction shown below?



a. 

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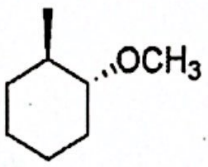
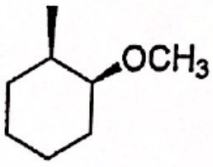
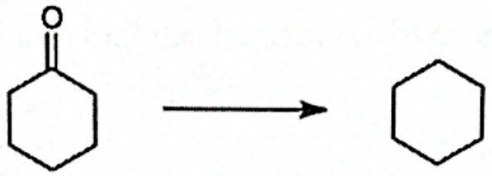
c. 

d. 

3) Which reaction conditions are not appropriate for the following transformation?



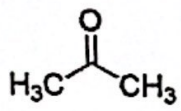
a. Zn (Hg) / HCl

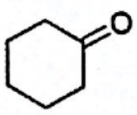
b. H_2NNH_2 / NaOH

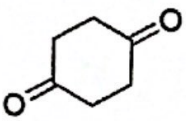
c. $LiAlH_4$ / Et_2O

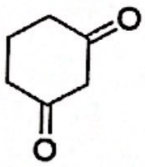
d. $HSCH_2CH_2CH_2SH$ / H^+, then H_2 / Ni

4) Of the following, which compound is in equilibrium with the greatest percentage of its enol isomer?

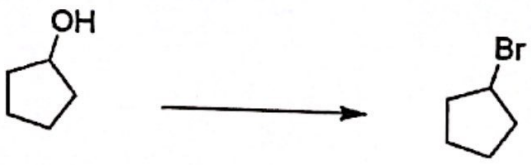
a. 

b. 

c. 

d. 

5) Which of the following reagents can be used to convert cyclopentanol to bromocyclopentane as shown below?



a. NaBr

b. PBr_3

c. Br_2, CCl_4

d. NBS, light

Q4.

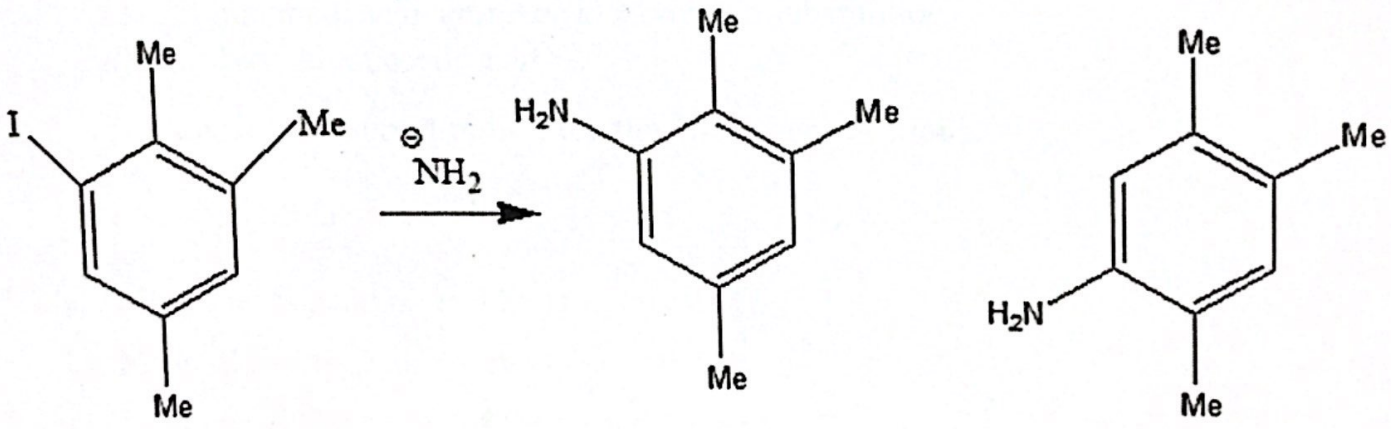
1) The order of the reaction and molecularity for a S_N1 mechanism is:

a) First order and unimolecular
b) Second order and bimolecular
c) Pseudo-first order and unimolecular
d) Pseudo-second order and bimolecular

2) The rate of an aliphatic nucleophilic substitution reaction occurring by Neighboring Group Participation as compared to a S_N2 mechanism is observed to be:

a) Slower
b) Faster
c) No difference
d) Slower in beginning and faster toward the middle.

3) The unusual product ratio in the following reaction is explained on the basis of:



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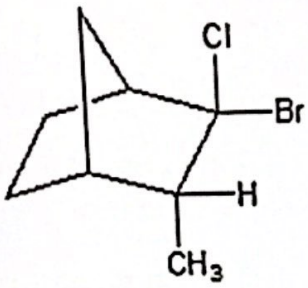
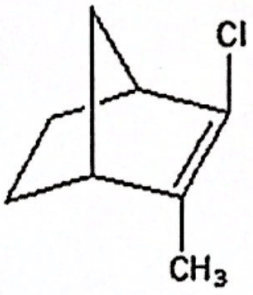
a) Benzyne mechanism
b) S_NR mechanism
c) S_NAr mechanism
d) Simultaneous mechanism

4) The elimination product from the following compound would be:

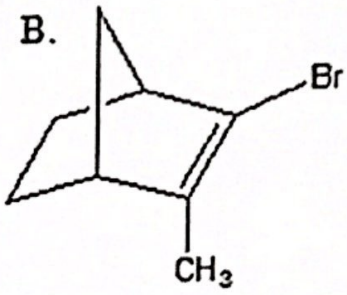


NaOH →

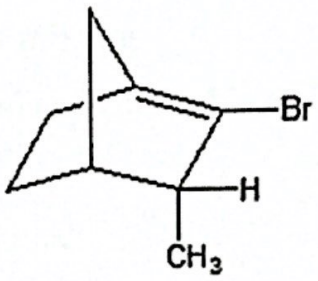
A.



B.



C.



D.

A and B both

5) A Meisenheimer salt is:

a) A common name for tetramethaylammonium bromide
b) An intermediate in tetrahedral mechanism
c) An intermediate in aromatic electrophilic substitution
d) A silver salt of acetic acid

Q. No. 5: Choose the correct option for the following questions.

1) What does the MSDS stands for?

a) Medicinal Separation and Drug Synthesis
b) Material Safety Data Sheets
c) Mechanical Separation of Drugs and Solvent
d) My Sample, Don't Store

2) Sodium hydroxide is usually weighed quickly for the following reason.

a) It is highly basic
b) It is extremely caustic in nature
c) It is hygroscopic
d) Water repellent

3) *tert*-Butyl methyl ether is considered a safer solvent than diethyl ether for the following reason?

a) It is less reactive than any other solvent
b) It is not miscible with water
c) It does not form peroxides
d) All of the above

4) Trituration is the following process.

a) Evaporation of the solvent from reaction mixture
b) A solvent is use in which the desired product is insoluble and the undesired by-products as soluble
c) Separation of two solids mixture by sublimation
d) None of the above

5) Which of the following is a technique to increase the distillate purity in a fractional distillation process?

a) Increase the temperature of the heat source
b) Operate under low pressure
c) Add a second condenser beyond the receiving flask
d) Increase the surface area of the column

Q6. Consider a molecule with the formula $C_{10}H_{12}O$ and encircle the most appropriate answer in the following questions:

1) The index of hydrogen deficiency (IHD or DBE) for the molecule is:
   a. 5
   b. 4
   c. 3
   d. 1

2) The Infrared spectrum of the compound shows major band at: 3067, 2962, 2874, 1680, 1577, 1532, 1462, 1369, 1213, 737 and 691 cm^{-1}. These absorption band (from higher to lower wave numbers) indicate which major functional groups in the molecule:

a. sp^2 C-atoms, sp^3 C-atoms, a C-O group, a mono-substituted benzene

b. sp^2 C-atoms, sp^3 C-atoms, a carbonyl group, a mono-substituted benzene

c. sp^2 C-atoms, a carbonyl group, a C-O group, a mono-substituted benzene

d. sp^2 C-atoms, sp^3 C-atoms, a C-O group, a *para*-disubstituted benzene

3) The ^1H NMR spectrum of the compound shows following signals:

1.0 (3H, t); 1.80 (2H, sextet); 2.9 (2H, t); 7.4 (2H, t), 7.6 (1H, t); 7.9 (2H, d)

Which of the following fragments may be written for the molecule on the basis of its ^1H NMR spectrum?

a. An isopropyl group, a mono-substituted benzene, and a methylene group

b. An *n*-propyl group, a *para*-disubstituted benzene, and two methylene groups

c. An *n*-propyl group, and a mono-substituted benzene

d. An *n*-propyl group, a *para*-disubstituted benzene, and two methylene groups

4) The mass spectrum of the molecule shows the major peaks at: 148 (M^+), 133, 120, 105 (100%), and 77. The base peak in the spectrum belongs to the fragment:

a. $C_6H_5CO^+$

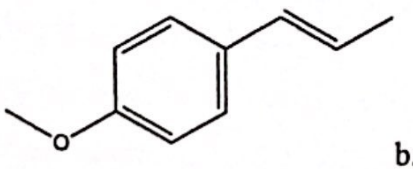
b. $C_6H_5CH{=}CH_2^{\bullet+}$

c. $C_6H_5C{\equiv}CH^+$

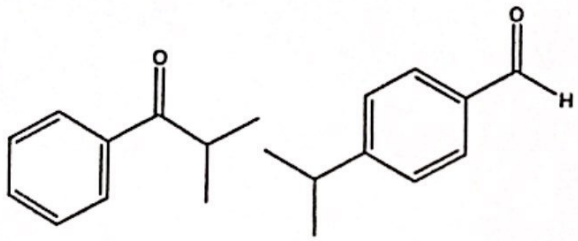
d. $C_6H_5CH^+CH_3$

5) Based on your answers in MCQs 1-4 above, the most likely structure of the compound is:

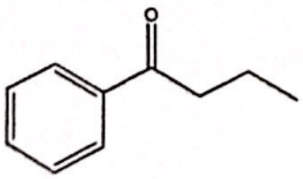
a.



b.



d.



Q. No. 7: Choose the correct option for the following questions.

1) How easily the Alkaloid natural products could be isolated from the crude extract?

a) Through solvent-solvent extraction
b) Through flash column chromatography
c) Through acid-base extraction
d) Through distillation

2) Which one is the best method to establish the absolute stereochemistry of the natural product?

a) Raman spectroscopy
b) NMR spectroscopy
c) Single crystal X-day diffraction
d) Optical rotations

3) Ambrein is a perfume isolated from whale digestive system. It has the molecular formula $C_{30}H_{52}O$. It belongs to which of the following class of the compound?

a) Flavonoid b)Triterpenoid
c) Steroid d) Fatty acid

4) Which of following is NOT a property of essential oils?

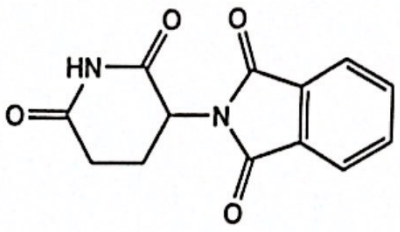
a) Characteristic odor
b) Soluble in common organic solvent
c) Rotate plane of polarized light
d) None of the above

5) The chemical synthesis of a complex natural product in laboratory in which compounds isolated from natural sources are used as starting materials is known as:

Complete synthesis b)Formal synthesis
c) Total synthesis d)Partial synthesis

Q. No. 8 **05 Points**

1) How many stereoisomers are possible for the following compound?



a) two b) three c) four d) none

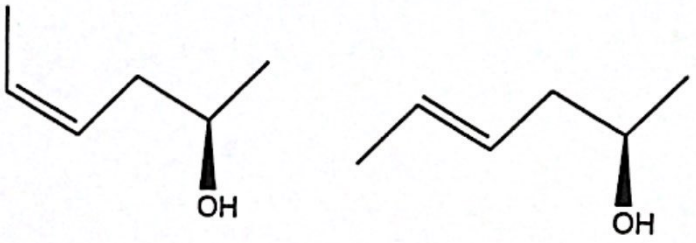
2) What will be the product of reaction of (*R*)-1-bromo-2-methylbutane with potassium iodide

a) (*R*)-1-iodo-2-methylbutane
b) (*S*)-1-iodo-2-methylbutane
c) (*R*)-1-bromo-2-iodobutane
d) (*S*)-1-sodium-2-methylbutane

3. Which of the following compounds can rotate the plane polarized light?

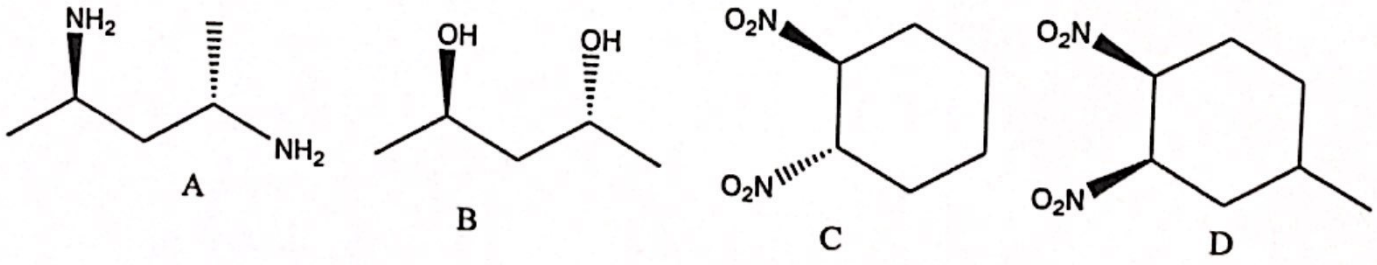
a) Neopentane b) Isopentane c) 3–Methyl pentane d) 3–Methyl hexane

4) Which term best describes the relationship between the following pair of compounds?



a) Homomers (identical)
b) Enantiomers,
c) Diastereomers
d) Epimers

5) Which of the following compounds is a *meso* compound?



a)A b) B c) C d) D