

**RANI RASHMONI GREEN UNIVERSITY**

**DEPARTMENT OF CHEMISTRY**

**M.Sc. Course in Chemistry**

**Semester IV Examination**

**Course ID: CHEM-CB 430**

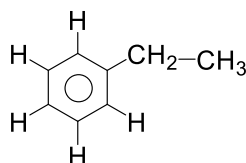
**Full Marks: 40**

**Time: 2h**

Answer **any one** question from **each unit** in your own words with proper scientific justification.

**Unit-1: NMR Spectroscopy-2**

**Q-1.** The following are proton chemical shift values of the compound below:



$\delta$ : 1.2, 2.8, 7.1, 7.2 ppm.

(i) Identify each of them and draw the ROESY spectrum.

(ii) Write the full form of ROESY and NOESY?

(iii) Write the main difference between them in principle in 2D-NMR.

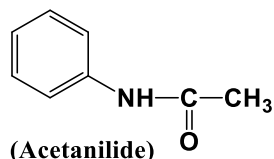
**2+4+1+1 = 8**

**Or**

**Q-2.** (i) Write the full form 'COSY' and 'TOCSY' and distinguish between them.

(ii) Draw the diagram of 'COSY' and 'TOCSY' of the following A-B-C-D and the cross peaks arising from them.

(iii) Write cross-peak (NOESY) of the following compound:



**2+2+2+2 = 8**

**Unit 2: Bio-Organic Chemistry**

**Q-3.** Design a synthetic route to ApU using the following steps:

(a) Synthesize partially protected adenosine derivative.

(b) Synthesize partially protected uridine derivative.

(c) Synthesize the fully protected dinucleotide ApU using phosphoramidite chemistry.

(d) Deprotect the dinucleotide to generate ApU.

3+2+2+1 = 8

Or

**Q-4. (a)** Schematically represent the degradation of D-glucose to pyruvate mentioning the enzymes involved in each step.

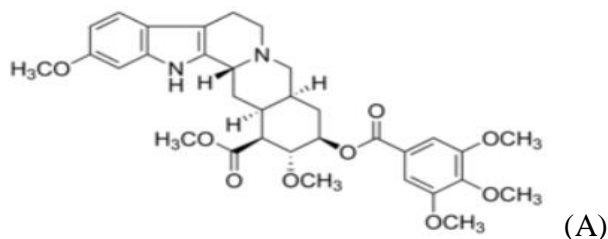
(b) Write short notes on: (i) replication; (ii) transcription

(c) How does an amino acid attach itself to tRNA?

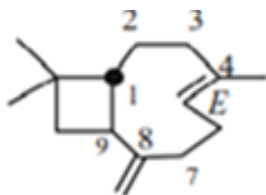
3+3+2 = 8

### Unit 3: Natural Products-3

**Q-5. (a)** What happens when Compound A is refluxed with collidine? Identify the products formed and explain the mechanism of their formation.



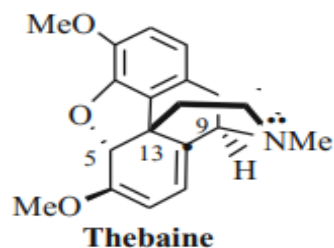
(b) Compound B is a sesquiterpene obtained from Clove oil. It rearranges to two important Compounds when treated with sulphuric acid. Write down the structures of the rearranged products explaining the pathway involved.



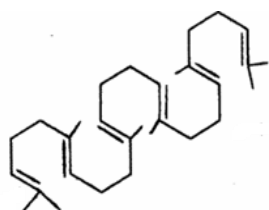
4+4 = 8

Or

**Q-6. (a)** Thebaine rearranges to Morphothebaine when heated with conc. HCl but when a reducing agent SnCl<sub>2</sub> is added to reaction mixture the product Metathebainone is obtained. Give the structures of the products and explain the pathway involved in their formation.



(b) Squalene reacts with NBS in aqueous glyme to give two bromohydrins affecting only the terminal olefinic bonds. Give the structures of two products and mechanism of bromohydrin formation. Why only the terminal olefinic bonds are attacked by NBS?



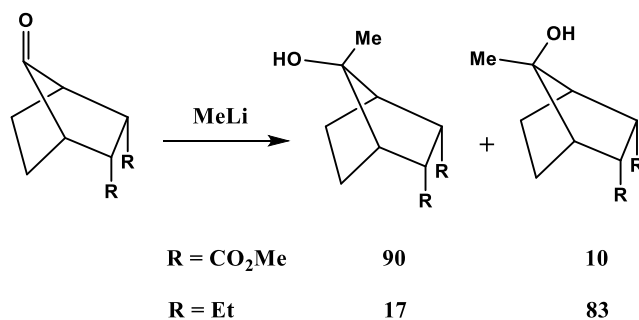
**Squalene**

4+4 = 8

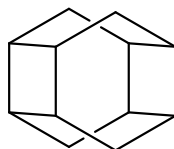
#### Unit-4: Application of MO Theory

Q-7. (a) Draw the Walsh orbitals of cyclopropane indicating HOMO and LUMO.

(b) Give explanation for the formation of major products from the following reaction.



(c) Describe the synthesis of following strained compound.



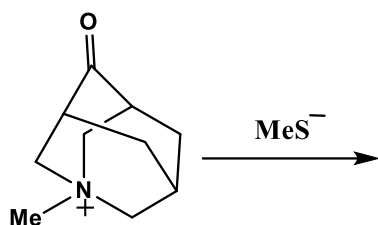
**Tetraasterane**

2.5+3.5+2 = 8

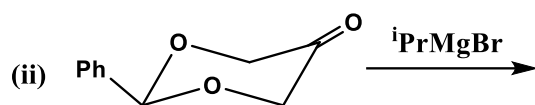
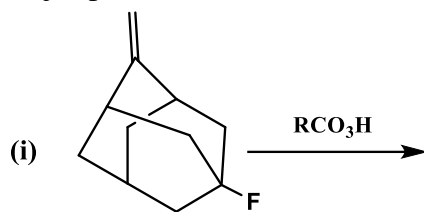
**Or**

Q-8. (a) Construct the molecular orbital ( $\pi$ ) diagram of cyclobutadiene indicating HOMO and LUMO.

(b) Identify the major product formation from the following reaction with explanation.



(c) Identify the major product formation from the following reactions with explanation.



2.5+2+3.5 = 8

### Unit-5: Nucleoside and Nucleotide

Q-9. (a) Describe biosynthesis of pyrimidine nucleotide.

(b) Describe the biosynthesis of adenosine mono phosphate (AMP) from inosine mono phosphate (IMP).

(c) Write the name and structure of heterocyclic part in folic acid.

4.5+2+1.5 = 8

Or

Q-10. (a) Define central dogma of genetics.

(b) Describe biosynthesis of active form of folic acid.

(c) What is oligonucleotide? Draw the structure of the complementary sequence of the given DNA fragment: 3'-ATGCCG-5'

(d) Write the chemical synthesis of guanosine.

1.5 + 2.5 + 2 + 2 = 8