[Time: $2\frac{1}{2}$ Hours] **[Total Marks: 60]**

Please check whether you have got the right question paper.

NB: 1. **All** questions are **compulsory**.
2. **Figures** to the **right** indicate **full** marks.

Q.1(A) Attempt any **two** of the following :

(a) Why does Nitration of naphthalene give two different products at different temperatures? Explain. **4**

(b) Explain **4**

i) Nitration of benzene does not follow the primary kinetic isotope effect

ii) Use of stereochemical evidances in determining mechanism.

(c) Explain the following:- **4**

i) Trifluoroactic acid is stronger acid than acetic acid

ii) Salicylic acid is more acidic than p-hydroxybenzoic acid.

(d) What is general and specific catalysis? Explain its mechanism with a suitable example. **4**

(B) Attempt any **one** of the following:

(a) What is the principle of microscopic reversibility? Explain its significance in the kinetic vs thermodynamic control of organic reactions with the help of a potential energy diagram **4**

(b) Explain how primary and secondary kinetic isotope effects are used in determining reaction mechanism with one example each. **4**

Q.2(A) Attempt any **two** of the following :

(a) Explain **4**

i) $(CH_3)_3CCH_2Br$ undergoes $\mathbf{S_N2}$ reactions very slowly.

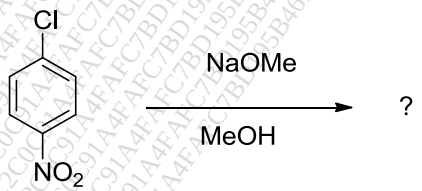
ii) $I^{\ominus}$ is a good nucleophile and a good leaving group.

(b) Explain **4**

i) Nucleophilic substitution on vinylic carbon does not occur.

ii) Ipso substitution

(c) Give the mechanism of the following reaction. **4**

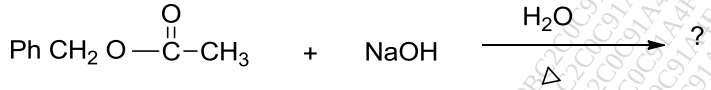


(d) Compare the aromaticity of [10] annulene and [14] annulene. **4**

(B) Attempt any **one** of the following:

(a) Draw Frost musulin diagram with electron distribution for i) Cyclobutadiene ii) Benzene **4**

(b) Complete the following reaction. Give the mechanism and type of reaction **4**



Q.3(A) Attempt any **two** of the following :

(a) i) What is the principle axis of symmetry in a molecule? Draw and label the principle axis of symmetry in ethylene. **4**
ii) Explain the *syn-anti* system of nomenclature with suitable example.

(b) Explain the chirality of spiranes. Write the structure of a pair of enantiomeric spiranes with their configurational descriptors. **4**

(c) i) Write one example of erythro-threo system. **4**
ii) Draw the structures of (R)-BINAP and (S)-6,6'-dinitrobiphenyl-2,2'-dicarboxylic acid.

(d) Draw the structure of the four stereoisomers of 2,3,4-trihydroxyglutaric acid. Label one asymmetric and one pseudoasymmetric centre in any of the stereoisomers and assign appropriate configurational descriptors to these centres. **4**

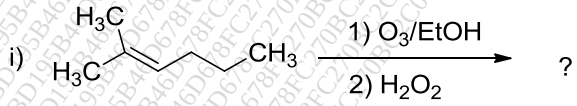
(B) Attempt any **one** of the following:

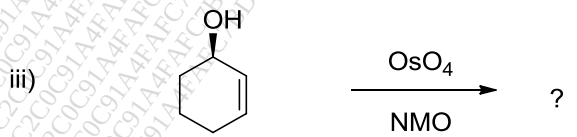
(a) Explain the stereochemistry of tri- and tetra- coordinate sulphur compounds. **4**

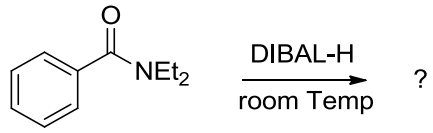
(b) Explain the following with one example each. **4**
i) Enantiotopic ligand and faces
ii) Diastereotopic ligand and faces

Q.4(A) Attempt any **two** of the following :

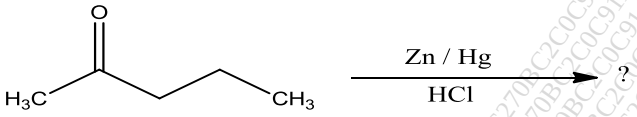
(a) Predict the products in the following reactions: **4**



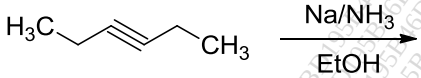


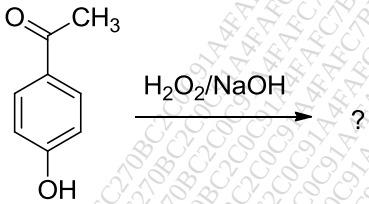
iv) 

(b) Complete the following reaction, name it and give its mechanism. **4**



(c) Complete the following reactions and name them: **4**

i) 

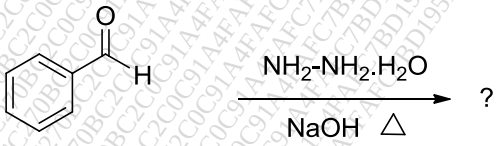
ii) 

(d) What is Corey-Kim oxidation? Give two applications. **4**

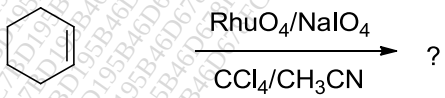
(B) Attempt any **one** of the following:

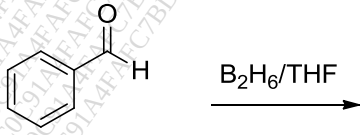
(a) Complete the following reactions and give the mechanism of **any one.** **4**

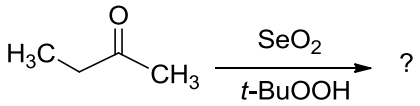
i) 

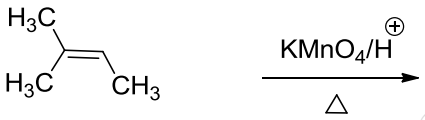
ii) 

(b) Complete the following equations. **4**

i) 

ii) 

iii) 

iv) 

Q.5 Attempt any **four** of the following :

A Distinguish between kinetic and thermodynamically controlled products in a reaction. **3**

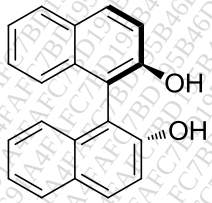
B Compare the basicity of pyrrole , pyridine and piperidine. **3**

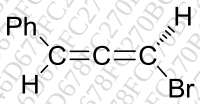
C Explain the mechanism of **BAc2** ester hydrolysis. **3**

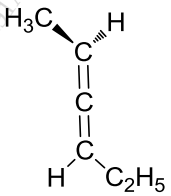
D Explain whether the following are aromatic or not. **3**
i) Cyclopentadienyl anion ii) Cyclopropenyl radical iii) Furan

E Explain the optical activity of cyclophanes. **3**

F Assign configuration descriptor to the following molecules. **3**

i) 

ii) 

iii) 

G What is K selectrides? Give two applications. **3**

H Explain with examples oxidation reactions using DMSO. **3**