B.Sc./3rd Sem (H)/CHEM/22(CBCS)

2022

3rd Semester Examination

CHEMISTRY (Honours)

Paper : C 7-T

[Organic Chemistry - III]

(CBCS)

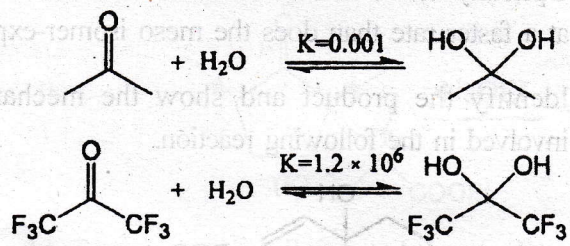
Full Marks : 40 Time : Two Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group - A

Answer any ***five*** questions. 2×5=10

1. (a) Explain the following observation for the hydration equilibrium constants.



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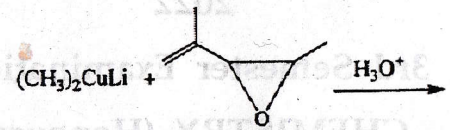
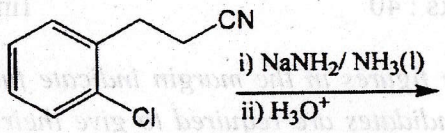
(b) Account for the product of the following reaction and suggest a suitable mechanism for it.



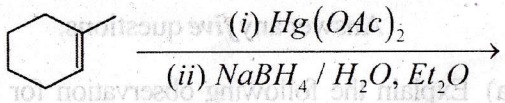
(c) Considering all possible isomers, predict how many products are formed when 1-hexene is treated with NBS in presence of peroxide in CCl_4.

(d) Predict the product and suggest a suitable mechanism for the following reaction.



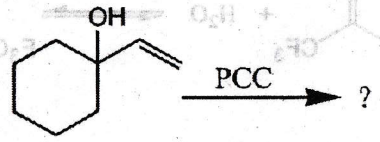
(e) How will you prepare (E)-2-butene from 2-butyne?

(f) Identify the product of the following reaction.



(g) Optically active 2, 3-butanediol reacts with HIO_4 at a faster rate than does the meso isomer-explain.

(h) Identify the product and show the mechanism involved in the following reaction.



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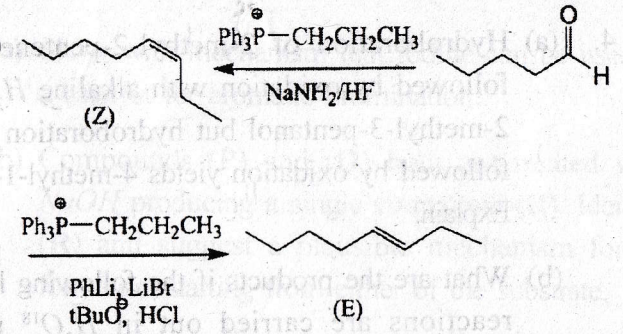
Group - B

Answer any ***four*** questions. 5×4=20

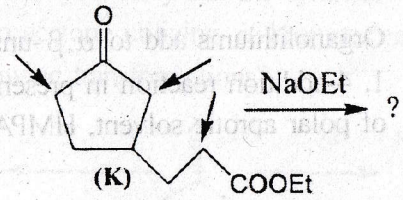
2. (a) Aldehydes reduce Tollen's reagent but ketones do not — Explain. 2

(b)



Explain the difference in the product stereoselectivity for the above reactions with suitable mechanism. 3

3. (a) There are three possible sites for enolate formation from the compound (**K**), but only one enolate is capable of forming stable product. Account for the observation. 2



(b) Two isomeric alkenes (**A**) and (**B**) give same

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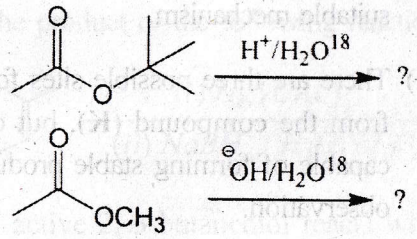
product (**C**) upon acid catalyzed hydration. Ozonolysis of (**A**) gives one mole of each butan-2-one and formaldehyde, while ozonolysis of (**B**) gives one mole of acetone and acetaldehyde. Identify (**A**), (**B**), (**C**) and outline the reaction for the formation of (**C**) from (**A**) and (**B**). 3

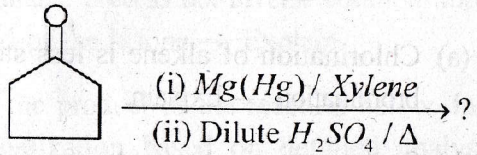
4. (a) Hydroboration of 2-methyl-2-pentene at 25°C followed by oxidation with alkaline H_2O_2 yields 2-methyl-3-pentanol but hydroboration at 160°C followed by oxidation yields 4-methyl-1-pentanol-Explain. 2

(b) What are the products if the following hydrolysis reactions are carried out in H_2O^{18} medium? Elaborate the mechanism of the reaction in each case. 3



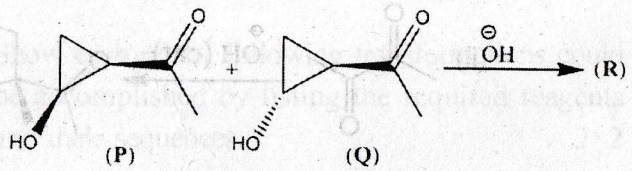
5. (a) Organolithiums add to α,β-unsaturated ketones by 1, 4-addition reaction in presence of small amount of polar aprotic solvent, HMPA — Explain. 2

(b) Identify the products of the following reaction with mechanism. 3



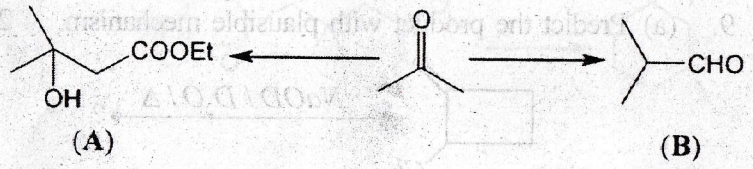
6. (a) Show with mechanism that iodine can be used as a catalyst for aromatic bromination. 2

(b) Compounds (**P**) and (**Q**) both are treated with *NaOH* producing a single compound (**R**). Identify (**R**) and suggest a plausible mechanism for its formation starting from either of the substrate. 3



7. (a) Write any four principles of green chemistry. Give an example of Michael addition reaction under solvent free condition. 2+1

(b) How would you carry out the synthesis of (**A**) and (**B**) from acetone utilizing α-bromoester in each of the following transformations? 2



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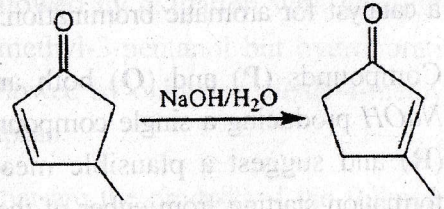
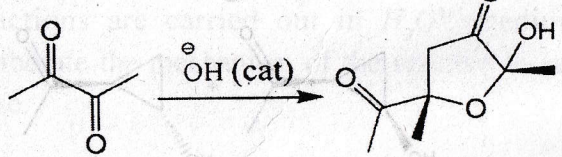
Group - C

Answer any *one* question. 10×1=10

8. (a) Chlorination of alkene is less stereospecific than bromination — Explain. 2

(b) Suggest mechanism for the following transformations : 2×2

(i) 

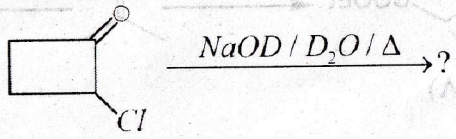
(ii) 

(c) Nitration of dimethyl aniline gives mainly *m*-nitro derivative when concentrated nitric and sulfuric acids are used but mainly *o*-and *p*-nitro derivatives in less acidic conditions — Explain. 2

(d) Carry out the following transformation. 2

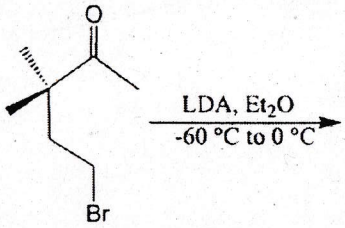
$$Br-CH_2CH_2CHO \rightarrow EtC\equiv C-CH_2CH_2CHO$$

9. (a) Predict the product with plausible mechanism. 2

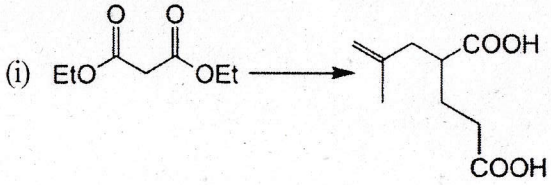


(b) Preparation of a ketone by addition of one equivalent of an ester to Grignard reagent is usually not a suitable process but reverse addition improves the yield of the ketone — Explain. 2

(c) Predict the product of the reaction below. Include a rationalization based on detailed analysis of competing transition state geometries. 2



(d) Show each of the following transformations could be accomplished by listing the required reagents and their sequences. 2×2

(i) 

(ii)