

Total number of printed pages-11

3 (Sem - 3 / CBCS) CHE HC 2

2023

CHEMISTRY

(Honours Core)

Paper : CHE-HC-3026

(Organic Chemistry-II)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Answer the following questions : 1×7=7

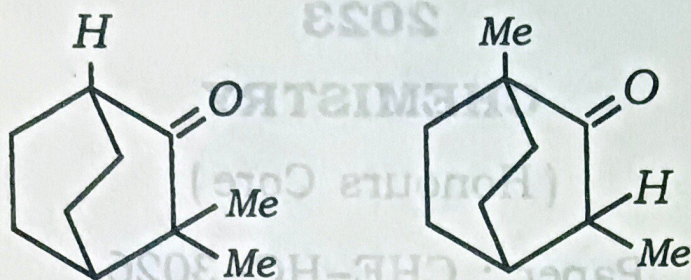
(a) Arrange the following in increasing order of basicity



(b) Draw the energy profile diagram of $E|CB$ mechanism of β -elimination reaction.

Contd.

- (c) Which one of the following bridged bicyclic compounds will exhibit Keto-Enol tautomerism.



I II

- (d) DMF and DMSO favours S_N2 reaction although they are polar solvents. Explain.

- (e) Potassium - *t*-butoxide is a widely used base in organic reactions but the corresponding sodium compound is unknown. Give reason.

- (f) Why is thioethanol more acidic than ethanol ?

- (g) Name the reagent that can be used to convert Cis - 2 - butene to racemic 2,3 - butanediol.

2. Answer the following questions : $2 \times 4 = 8$

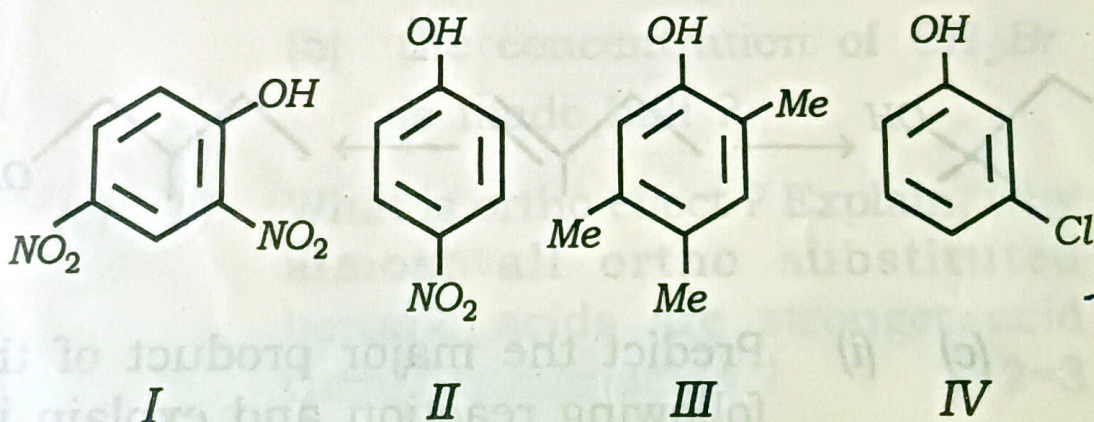
(a) Arrange the following compounds in increasing boiling point and give reason for your answer.

n -hexanol, n -butanol and t -butanol

(b) Between $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$ and

$\text{CH}_3\text{OCH}_2\text{Cl}$, which would react faster in $\text{S}_\text{N}1$ solvolysis. Explain.

(c) The phenols shown have approximate pK_a value of 4, 7, 9 and 11. Suggest with explanation which pK_a value belong to which phenol :



(d) Arrange the following carboxylic acid derivatives in order of increasing reactivity towards hydrolysis reaction and justify your answer :

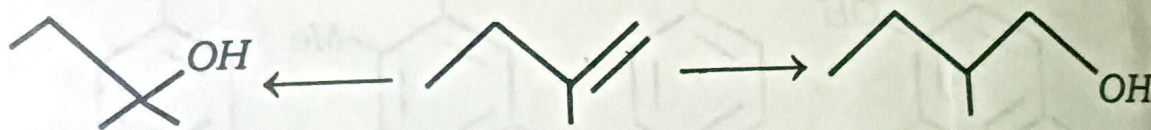


3. Answer **any three** questions : $5 \times 3 = 15$

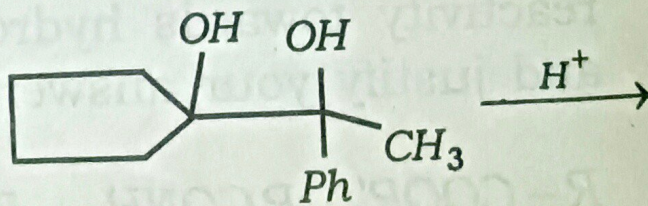
(a) Write the mechanism of Benzoin condensation. Explain why *p*-dimethylaminobenzaldehyde fails to undergo benzoin condensation but when mixed with benzaldehyde the condensation occurs. $3+2=5$

(b) (i) Explain why alcohols are weaker acids than phenols but phenols are stronger nucleophiles. 2

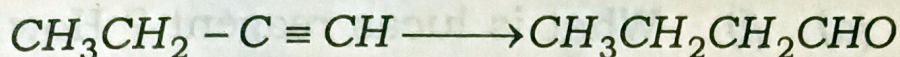
(ii) Provide the required reagents and conditions for the following conversion : $1\frac{1}{2} \times 2 = 3$



(c) (i) Predict the major product of the following reaction and explain its formation mechanistically. 3

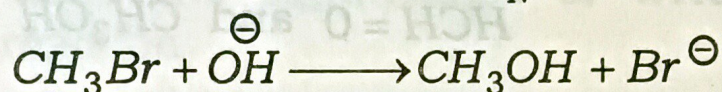


(ii) How do you carry out the following conversion ? 2



(d) (ii) Why are vinylic and aryl halides unreactive towards both S_N1 and S_N2 reactions ? 3

(ii) The rate equation of S_N2 reaction



$$\text{Rate} = k[\text{CH}_3\text{Br}][\text{OH}^-]$$

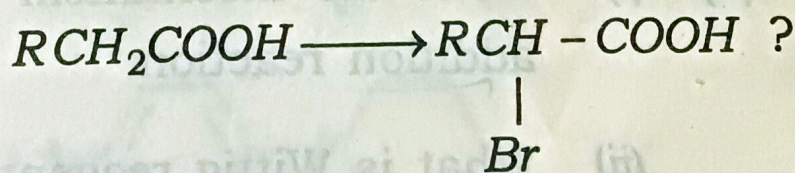
What type of changes are expected in the rates of the reaction if

(a) the concentration of each of the reactants is made double ?

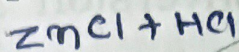
(b) the concentration of CH_3Br is made half ?

(e) (i) What is ortho effect ? Explain, why almost all ortho substituted benzoic acids are stronger acid than benzoic acids ? 1+2=3

(ii) How can you convert : 2



Answer **any three** questions : $10 \times 3 = 30$



(a) (i) What is Lucas reagent ? How is it used to distinguish between 1° , 2° and 3° alcohols ? $1+2=3$

(ii) Methyl chloromethyl ether is readily hydrolysed by water to $HCHO$ and CH_3OH but $CH_3OCH_2CH_2Cl$ does not. Explain. 2

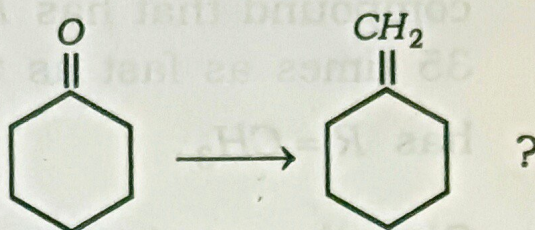
(iii) Picric acid liberates CO_2 from aqueous Na_2CO_3 but phenol does not. Explain. 2

(iv) Give the products of Reimer-Tiemann reaction on *p*-Cresol. Explain the reaction with mechanism. 3

(b) (i) Write the mechanism of Michael addition reaction. 3

(ii) What is Wittig reagent ? 1

(iii) How will you convert



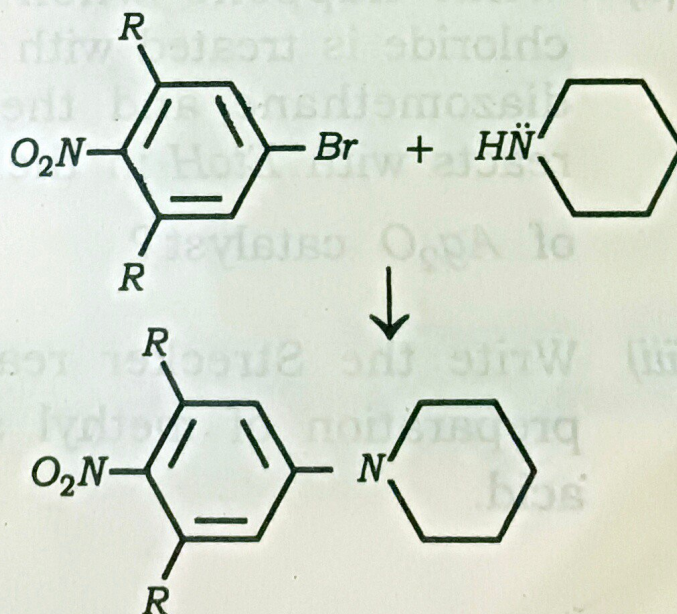
Write the mechanism of the reaction involved. 3

(iv) Write the significance of Wittig reaction. 2

(v) What do you mean by ylides ? 1

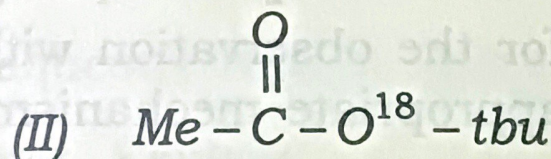
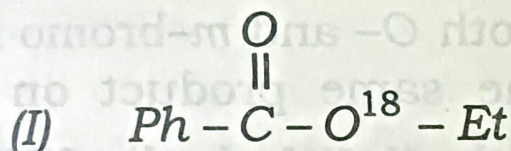
(c) (i) Both *o*- and *m*-bromo nitrobenzene give the same product on treatment with NaNH_2 in liq. NH_3 . Account for the observation with appropriate mechanism. 5

(ii) Write down the mechanism of the following reaction :



Account for the fact that the compound that has $R = H$ reacts 35 times as fast as the one that has $R = CH_3$. $3+2=5$

- (d) (i) Give the mechanism of alkaline hydrolysis of the following ester in ordinary water (H_2O^{16}) and indicate the distribution O^{18} is the products in each case. 4



- (ii) What happens when an acid chloride is treated with excess of diazomethane and the product reacts with $EtoH$ in the presence of Ag_2O catalyst? 2

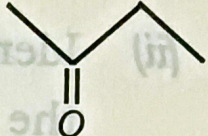
- (iii) Write the Strecker reaction for preparation of methyl sulphonic acid. 2

(iv) How can CH_3CH_2SH be prepared from thiourea? Write the reactions.

2

(e) (i) What are active methylene compounds?

1

(ii) Convert EAA to 

3

(iii) 7-chloro cyclohepta-1, 3, 5-triene readily forms white $AgCl$ ppt.

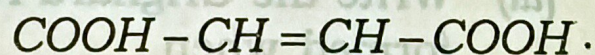
When boiled with $AgNO_3$ solution

but 5-chlorocyclopenta-1, 3-diene

does not give reason.

2

(iv) Two dicarboxylic acids have the general formula



On treatment with cold dil.

$KMnO_4$ solution, they yield two

diastereomeric tartaric acids. Show

how this information allows one

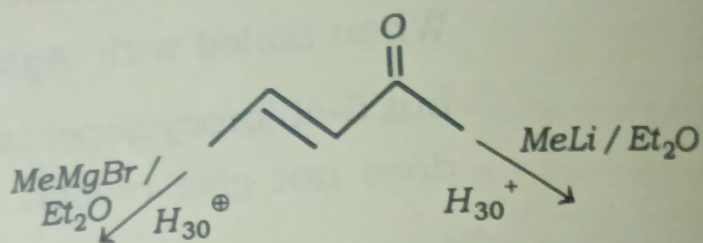
to write the stereochemical formula

for two acids.

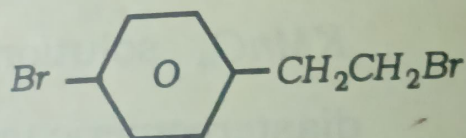
4

(i) (i) When an alkyl halide is converted to a Grignard reagent then the carbon atom linked to halogen atom changes its polarity. Justify this statement with an example. 3

(ii) Identify the product/products for the following reaction and offer explanation : 3



(iii) Write the Grignard reagent that is formed when

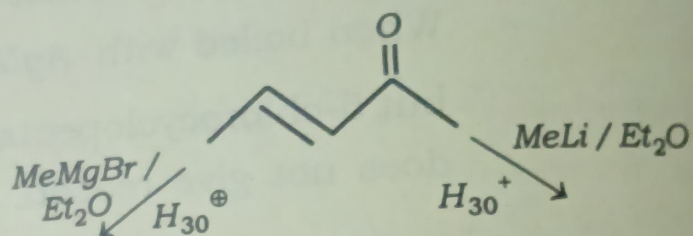


is treated with one mole of Mg in dry ether. 2

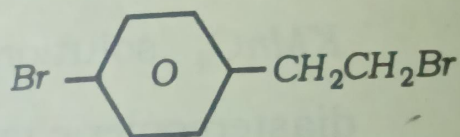
RMgX

(i) (i) When an alkyl halide is converted to a Grignard reagent then the carbon atom linked to halogen atom changes its polarity. Justify this statement with an example. 3

(ii) Identify the product/products for the following reaction and offer explanation : 3



(iii) Write the Grignard reagent that is formed when

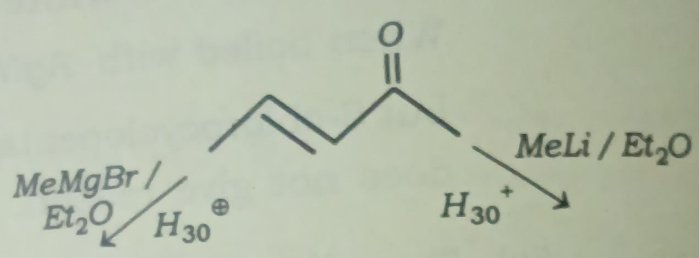


is treated with one mole of Mg in dry ether. 2

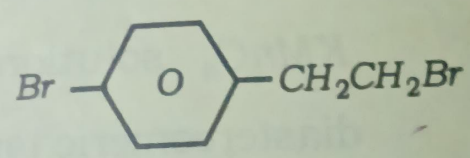
RMgX

(i) (i) When an alkyl halide is converted to a Grignard reagent then the carbon atom linked to halogen atom changes its polarity. Justify this statement with an example. 3

(ii) Identify the product/products for the following reaction and offer explanation : 3



(iii) Write the Grignard reagent that is formed when

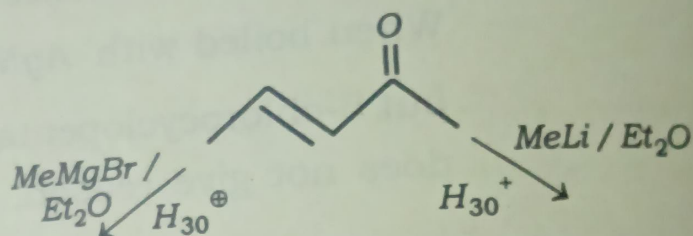


is treated with one mole of Mg in dry ether. 2

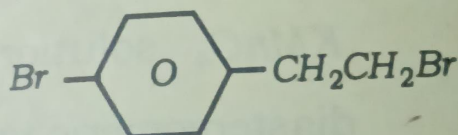
RMgX

(f) (i) When an alkyl halide is converted to a Grignard reagent then the carbon atom linked to halogen atom changes its polarity. Justify this statement with an example. 3

(ii) Identify the product/products for the following reaction and offer explanation : 3



(iii) Write the Grignard reagent that is formed when

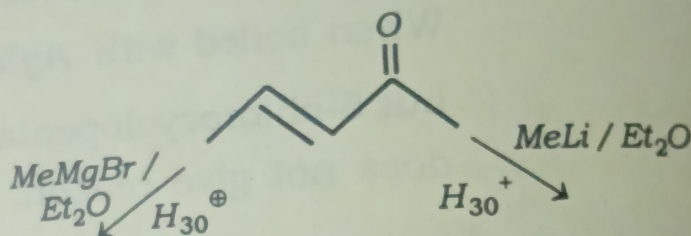


is treated with one mole of Mg in dry ether. 2

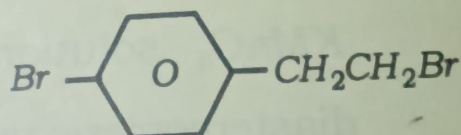
RMgX

- (i) (i) When an alkyl halide is converted to a Grignard reagent then the carbon atom linked to halogen atom changes its polarity. Justify this statement with an example. 3

- (ii) Identify the product/products for the following reaction and offer explanation : 3



- (iii) Write the Grignard reagent that is formed when

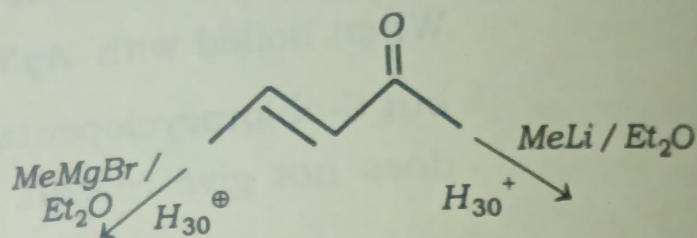


is treated with one mole of Mg in dry ether. 2

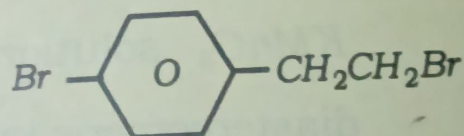
RMgX

- (i) (i) When an alkyl halide is converted to a Grignard reagent then the carbon atom linked to halogen atom changes its polarity. Justify this statement with an example. 3

- (ii) Identify the product/products for the following reaction and offer explanation : 3



- (iii) Write the Grignard reagent that is formed when

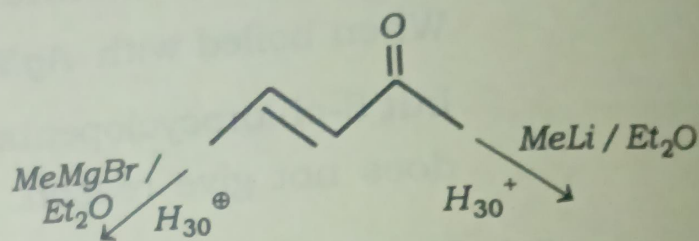


is treated with one mole of Mg in dry ether. 2

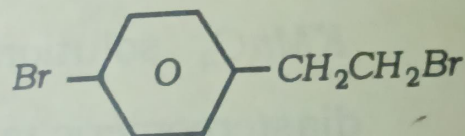
RMgX

(i) (i) When an alkyl halide is converted to a Grignard reagent then the carbon atom linked to halogen atom changes its polarity. Justify this statement with an example. 3

(ii) Identify the product/products for the following reaction and offer explanation : 3



(iii) Write the Grignard reagent that is formed when

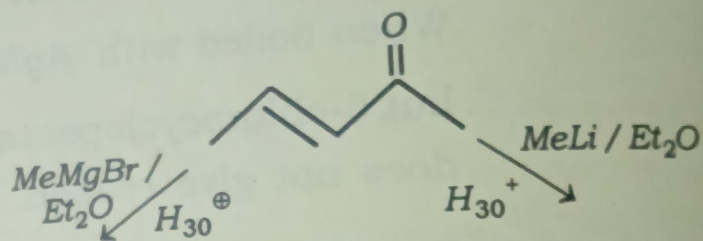


is treated with one mole of Mg in dry ether. 2

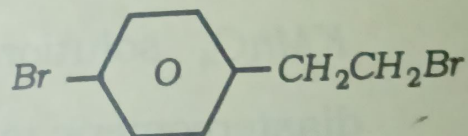
RMgX

(i) (i) When an alkyl halide is converted to a Grignard reagent then the carbon atom linked to halogen atom changes its polarity. Justify this statement with an example. 3

(ii) Identify the product/products for the following reaction and offer explanation : 3



(iii) Write the Grignard reagent that is formed when

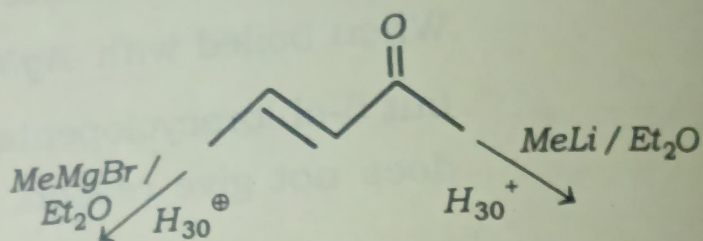


is treated with one mole of Mg in dry ether. 2

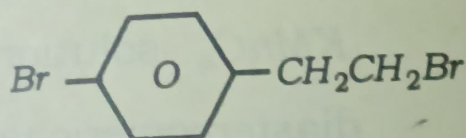
RMgX

(i) (a) When an alkyl halide is converted to a Grignard reagent then the carbon atom linked to halogen atom changes its polarity. Justify this statement with an example. 3

(ii) Identify the product/products for the following reaction and offer explanation : 3



(iii) Write the Grignard reagent that is formed when

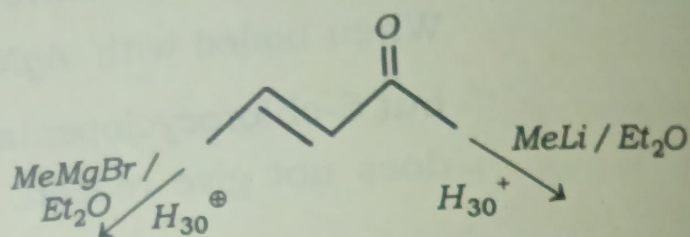


is treated with one mole of Mg in dry ether. 2

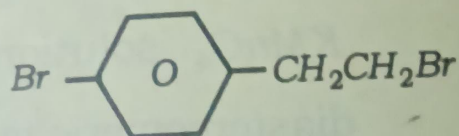
RMgX

- (i) (a) When an alkyl halide is converted to a Grignard reagent then the carbon atom linked to halogen atom changes its polarity. Justify this statement with an example. 3

- (ii) Identify the product/products for the following reaction and offer explanation : 3



- (iii) Write the Grignard reagent that is formed when

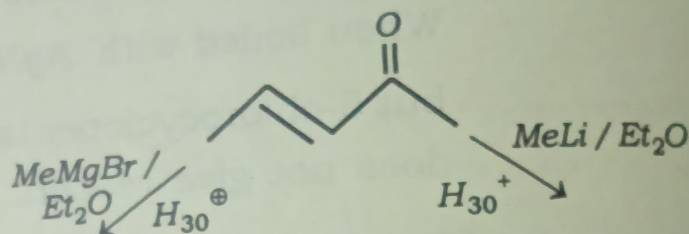


is treated with one mole of Mg in dry ether. 2

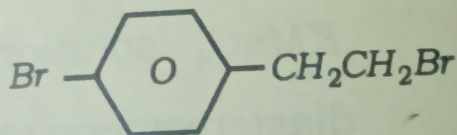
RMgX

(i) (i) When an alkyl halide is converted to a Grignard reagent then the carbon atom linked to halogen atom changes its polarity. Justify this statement with an example. 3

(ii) Identify the product/products for the following reaction and offer explanation : 3



(iii) Write the Grignard reagent that is formed when



is treated with one mole of Mg in dry ether. 2

RMgX

(iv) Why Clemmensen reduction of 4-methyl-5-hydroxyhexan-3-one to 3-methylhexan-2-ol cannot be carried out ? 2
