CSM – 17/16
Chemistry
Paper – II

Time : 3 hours

Full Marks : 300

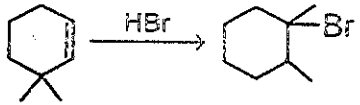
The figures in the right-hand margin indicate marks.

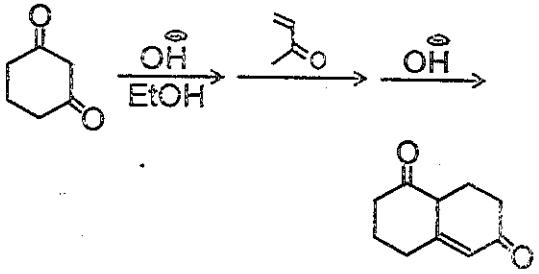
Candidates should attempt Q. No. 1 from Section – A and Q. No. 5 from Section – B which are compulsory and three of the remaining questions, selecting at least one from each Section.

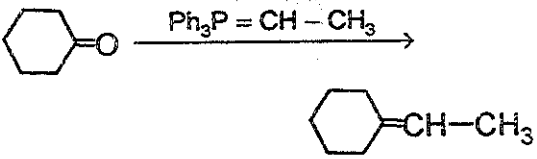
SECTION – A

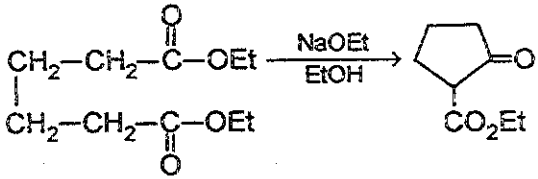
1. Answer any three of the following questions : 20×3 = 60

(a) Outline the mechanism of the following conversions :

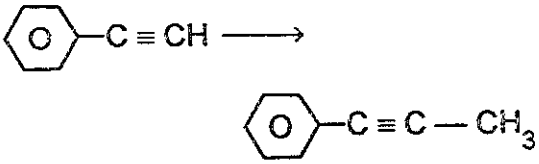
(i) 

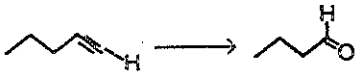
(ii) 

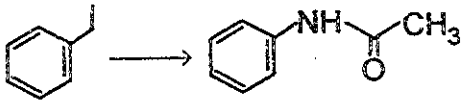
(iii) 

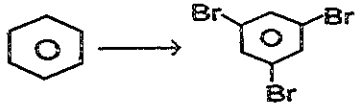
(iv) 

(b) How will you carry out the following conversions ?

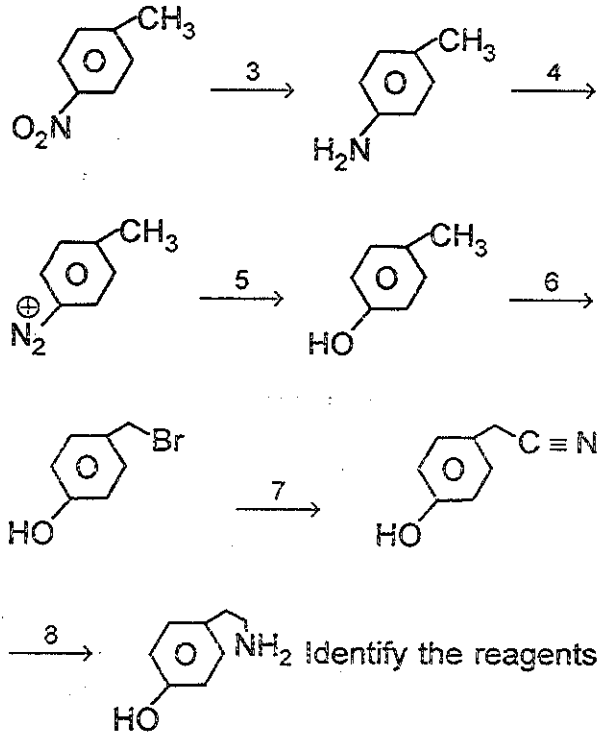
(i) 

(ii) 

(iii) 

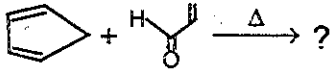
(iv) 

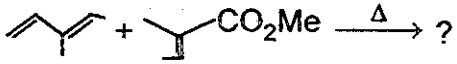
(c) Provide the missing reagents in the following synthetic scheme :

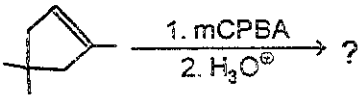


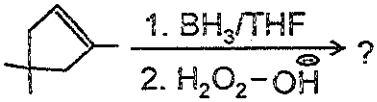
Identify the reagents 1, ... 8.

(d) Predict the products and write down the stereochemistry wherever applicable :

(i) 

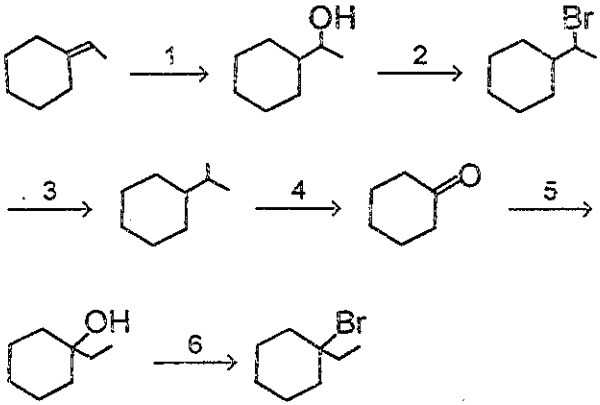
(ii) 

(iii) 

(iv) 

2. Answer the following :

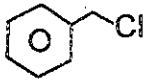
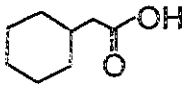
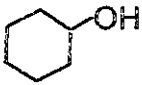
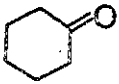
(a) Provide reagents for each of the following transformations : 15

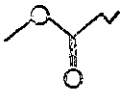


Identify the reagents from 1 to 6.

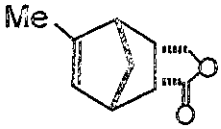
(b) Starting with ethane and using a Grignard reagent in your synthetic design, provide a synthetic scheme for 2-bromo-2-methyl butane. 10

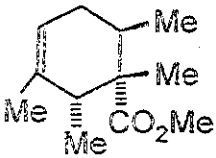
(c) Match the following structures from Column – I with their IR absorption in Column – II : 15

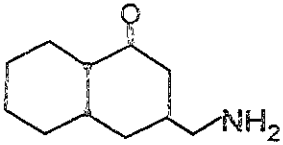
Column – I	Column – II
(A) 	(i) IR abs at 3300 and 2150 cm^{-1}
(B) 	(ii) Strong IR abs. at 1715 cm^{-1}
(C) 	(iii) Strong IR abs. at 1710 cm^{-1} and broad abs. between 3400-2500 cm^{-1}
(D) 	(iv) Strong IR abs. at 1740 cm^{-1}
(E) 	(v) Strong IR abs. at 3400 cm^{-1} (broad)
(F) 	

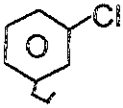
(G) 

(d) Provide synthetic routes to the following molecules : 4×5 = 20

(i) 

(ii) 

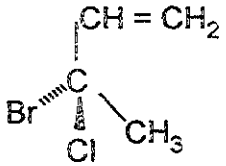
(iii) 

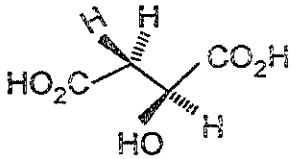
(iv) 

3. Answer the following : 15×4 = 60

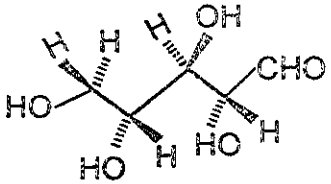
(a) Draw Fischer projection for (2R, 3S)-2-bromo-3-methyl pentane.

(b) Determine the abs. configuration(s) of the Chirality Centres in each of the following molecules :

(i) 

(ii) 

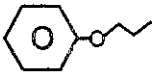
(c) How many Chirality Centres (Stereogenic Centres) are present in the following molecule ? What is/are the hybridisation of the Chirality Carbons ? Determine the abs configuration (R/S) of the Chirality Centres :

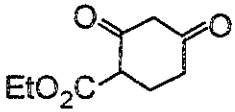


(d) What do you mean by Prochiral molecules and Prochirality Carbons ? What are Re-face and Si-face ? Illustrate with examples.

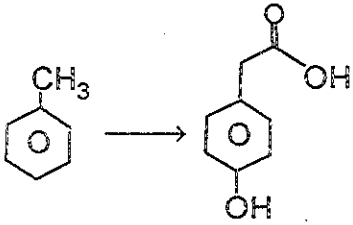
OR

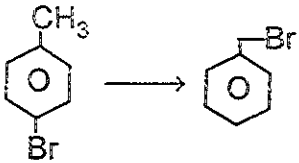
Suggest reagents/conditions for the following conversions (any ten) : 6×10 = 60

(a) Phenol ⟶ 

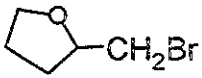
(b) Malonic ester ⟶ 

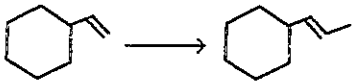
(c) 

(d) 

(e) 

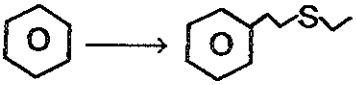
(f) $CH_2 = CH - CH_2 - CH_2 - CH_2 - OH$

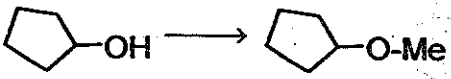
⟶ 

(g) 

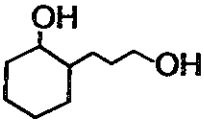
(h) Acetylene → 2-dodecanone

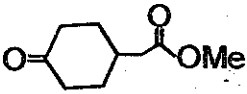
(i)  → 1-bromo-2-chloro-4-propyl benzene

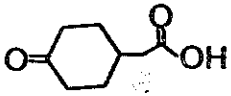
(j) 

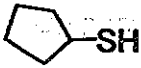
(k) 

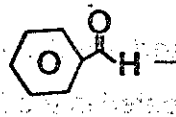
4. Predict the product(s) on any ten of the following reactions : 6×10 = 60

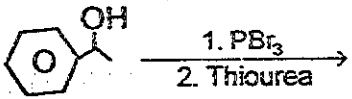
(a)  $\xrightarrow[H_2O,\ Warm]{CrO_3,\ H_2SO_4}$?

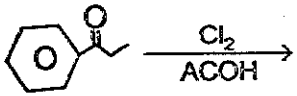
(b)  $\xrightarrow[2.\ H_3O^{\oplus}]{1.\ NaBH_4,\ ether}$?

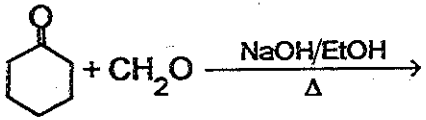
(c)  $\xrightarrow[2.\ H_2O]{1.\ LAH,\ ether}$?

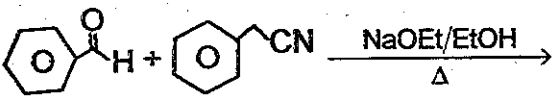
(d)  $\xrightarrow{Br_2}$?

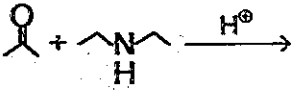
(e)  $\xrightarrow[H_2O,\ EtOH]{Ag_2O,\ NH_4OH}$

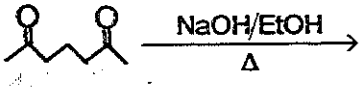
(f) 

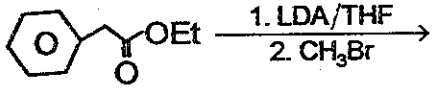
(g) 

(h) 

(i) 

(j) 

(k) 

(l) 

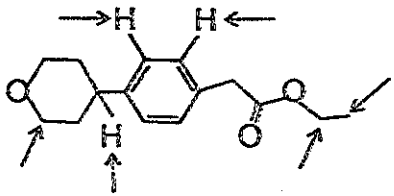
SECTION – B

5. Answer any three of the following questions :

20×3 = 60

(a) What is the expected multiplicity for proton resonance indicated in the following

molecule ? Explain the reason for your answer :



(b) The mass spectral data $\left(\frac{m}{z}\right)$ are 120 $\left(\overset{+}{M}\right)$, 105, 77, 43. Suggest a structure consistent with the spectral data.

(c) Propose a structure consistent with the following NMR data of the two molecules given below :

(A) M. F. $C_7H_{12}O_3$

PMR : δ 2·11 ppm, s, 3H
2·82 ppm, t, 2H
3·00 ppm, t, 2H
4·00 ppm, q, 2H
1·22 ppm, t, 3H

(B) M. F. $C_3H_6O_3$

PMR : δ 5·5 ppm, s, 6H

What are (A) and (B) and explain the spectral observations ?

(d) Propose structure for the following compounds :

(i) $C_5H_{10}O$ with only two PMR signals

(ii) $C_{12}H_{18}$ with only one PMR signal

(iii) C_3H_6O with only a triplet and a quintet in the PMR signal

(iv) $C_7H_{14}O$ with three singlets in PMR

6. Write short notes on any **five** of the following : 12×5 = 60

(a) McLafferty rearrangement

(b) Norrish-Type II reaction

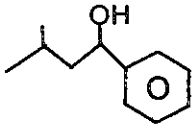
(c) di-π-Methane rearrangement

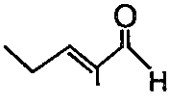
(d) Silicones

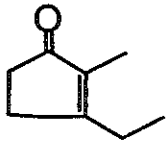
(e) Bischler-Napieralski reaction

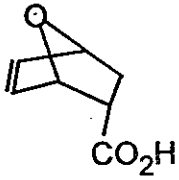
(f) Borazine

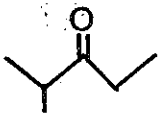
7. Suggest Synthetic Schemes for any ten of the following molecules : 6×10 = 60

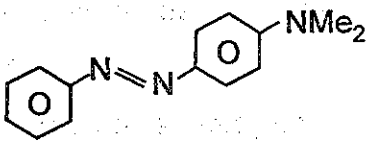
(a) 

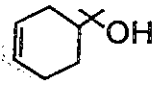
(b) 

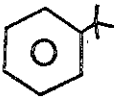
(c) 

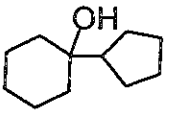
(d) 

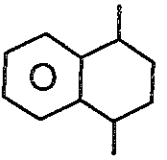
(e) 

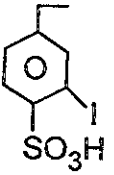
(f) 

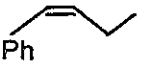
(g) 

(h) 

(i) 

(j) 

(k) 

(l) 

8. Write short notes on any **six** of the following : 10×6 = 60

(a) End group analysis of a polymer

(b) Teflon

(c) Inorganic polymer

(d) Fisher Indole Synthesis

(e) Von-Richter reaction

(f) Number Average mol.wt. of polymer

(g) ESR spectra for methyl radical