TDC Even Semester Exam., 2019

CHEMISTRY

(Honours)

(6th Semester)

Course No. : CHMH–602

(Organic Chemistry)

Full Marks : 35

Pass Marks : 12

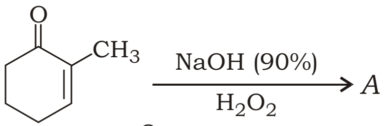
Time : 2 hours

The figures in the margin indicate full marks for the questions

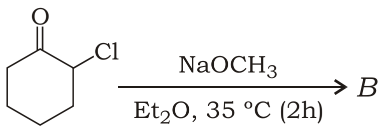
Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* Elucidate the difference between the two given synthetic schemes by predicting their products with the support of plausible mechanism for each : 1½×2=3



and



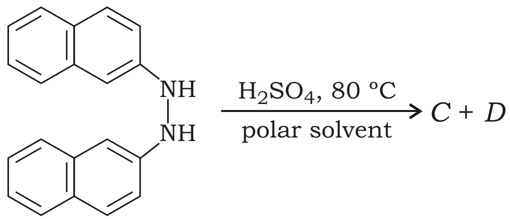
(b) Identify the type of rearrangement from the given clues and provide an example of a reaction along with mechanism : 2×2=4

(i) In the presence of alkaloid bases, cyclic ketones can be converted into a fruity smelling compound.

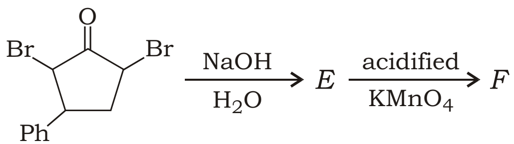
(ii) The reaction can be used to synthesize amines via an isocyanate intermediate with the release of carbon dioxide.

2. *(a)* Predict the outcome of the following reactions with the support of mechanism : 2+2=4

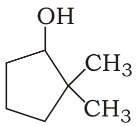
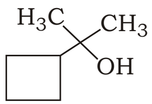
(i)

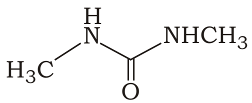
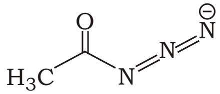


(ii)



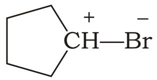
(b) How can the following be obtained? Provide reagents/conditions in support along with a plausible mechanism : 1½×2=3

(i)  from 

(ii)  from 

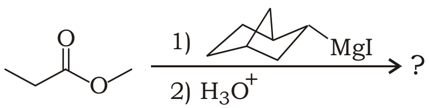
UNIT—II

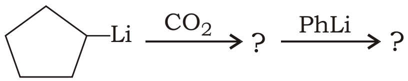
3. (a) How can the polarity of the C-atom of the given alkyl halide be reversed from an electropositive to electro-negative? Explain.

 1½

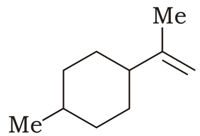
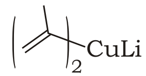
(b) Explain the difference between Gilman's reagent and Grignard's reagent with the aid of reactions as examples. 2

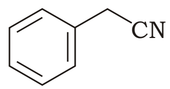
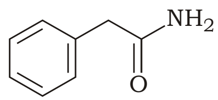
(c) Provide the mechanistic outcome of the following reactions to derive their products : 1½+2=3½

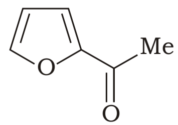
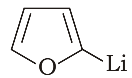
(i) 

(ii) 

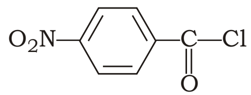
4. (a) How can the following be obtained? Provide appropriate reagents/ substrates/conditions along with mechanism in support of your answer : 2×3=6

(i)  from 

(ii)  from 

(iii)  from  (2 eq.)

(b) What happens when a diphenyl cuprate is treated with

 ? 1

UNIT—III

5. (a) Calculate the magnetic field (in tesla) required to flip a ^1H nucleus in an NMR spectrometer that operates at 360 MHz. 1½

(b) Calculate the ratios of the different kinds of protons in a compound with an integral ratio 4:18·4:6 (going from left to right across the spectrum). 1½ *(c)* Provide examples of structures of organic compounds with the following relative integrals : 1½+2½=4

(i) Ratio of protons : 1:6

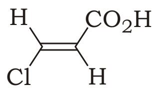
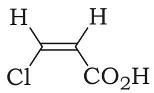
(ii) Ratio of protons : 3:2:9

(Use any example ensuring that the ratio of protons are correctly represented.)

6. *(a)* Identify the following compound (relative integrals are stated going from left to right across the spectrum) : 2

The ^1H NMR spectrum of a compound with molecular formula $C_4H_{10}O_2$ has two singlets with an area ratio 2:3.

(b) Distinguish the following pairs of compounds with ^1H NMR by using or J values (approximate values will be sufficient) : 2+2=4

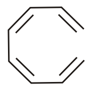
(i)  and 

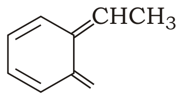
(ii) $H_3CCH_2-\overset{O}{\overset{\|}{C}}-CH_2OH$ and $H_3C-O-\overset{O}{\overset{\|}{C}}-CH_2CH_3$

(c) How can the presence of moisture in an NMR solvent like $CDCl_3$ affect the ^1H NMR spectra? Explain. 1

UNIT—IV

7. *(a)* Predict the outcome of the following pericyclic reactions. For each reaction, indicate whether it is an electrocyclic reaction or cycloaddition reaction or a sigmatropic rearrangement : 1½×2=3

(i)  $\longrightarrow$?

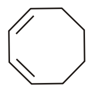
(ii)  + $H_3C-C\equiv C-CH_3 \longrightarrow$?

(b) Provide a molecular orbital description for the following : 1½×2=3

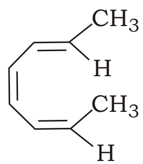
(i) 1, 4-Pentadiene

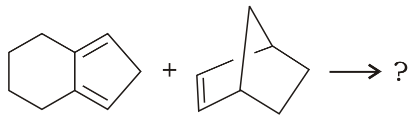
(ii) $(2E, 4Z)$-Hexadiene

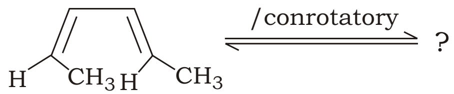
(c) What happens when compound (X) is heated

 $\longrightarrow$? 1

8. *(a)* Suggest product(s) for the following. (Support your observation with mechanism) : 2+1½+1½=5

(i) ? $\rightleftharpoons$  $\overset{h}{\rightleftharpoons}$?

(ii) 

(iii) 

(b) Explain why maleic anhydride reacts rapidly with 1,3-butadiene but does not react at all with ethene under thermal conditions. 2

UNIT—V

9. (a) "QSAR plays an essential role in pharmaceutical chemistry." Justify this statement by supportive evidence. 2

(b) Explain the role of bactericidal antibiotics on the immune system of humans. 2

(c) Provide the structure of an opium alkaloid. 1½

(d) What type of infections are caused by gram-negative bacteria? 1½

10. (a) "The effectiveness of a drug is regulated by the role of 'receptor-inhibitor relationship'." Provide an explanation with an example in support of the statement. 2½

(b) Device the necessary structural alternative in the development of procaine from cocaine. 2

(c) "Immune system is the ultimate defence against pathogens." How does this statement fit with the function of antibiotics? Explain by giving proper emphasis on their biochemical role. 2½

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