

2018

CHEMISTRY – HONOURS

First Paper

(Group - A)

Full Marks : 50

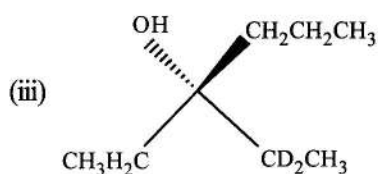
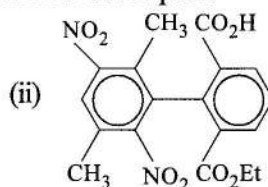
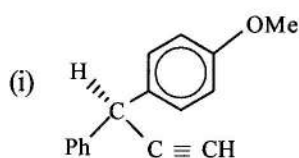
*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

CHT - 12a

Unit - I

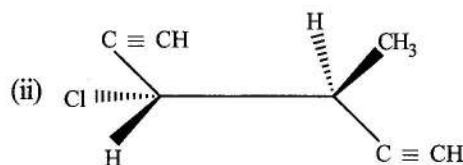
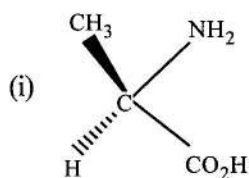
Answer *any three* questions.

1. (a) Assign the following compounds with R/S descriptor:



- (b) Convert the following Flying-Wedge projections to Fischer Projections :

3+2



2. (a) Optically pure S (+)-2-bromooctane, $[\alpha]_D^{25} = +36^\circ$, reacts with aqueous NaOH in acetone to give optically pure R(-)-2-octanol, $[\alpha]_D^{25} = -10.3^\circ$, with partially racemised 2-bromooctanol whose $[\alpha]_D^{25}$ is $+30^\circ$. If the specific rotation of the alcohol (product) $[\alpha]_D^{25} = 6^\circ$, calculate:

- % of inversion on and racemisation
- % composition of each product

Please Turn Over

- (b) The pro-R hydrogen of chloroacetic acid is substituted by bromine with inversion of configuration. Predict the configuration of the final product showing the pro-R hydrogen of the original substrate.

3+2

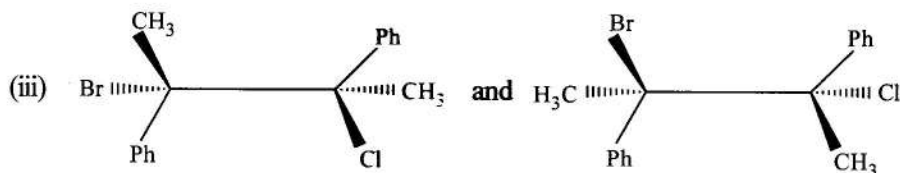
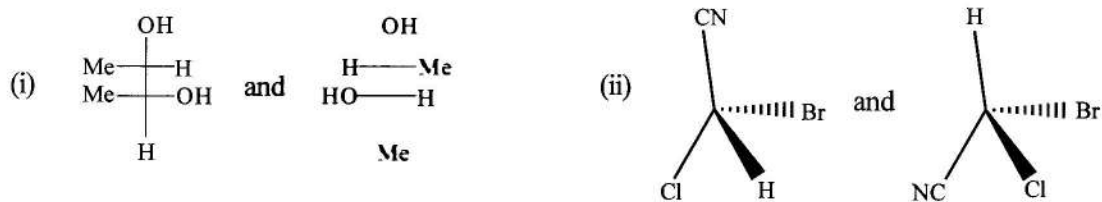
3. (a) Give example/write down the structures of the following:

- (i) a chiral molecule having a C_2 axis.
 (ii) 2R, 3R*, 4S - 1, 2, 3, 4, 5 pentachloropentane.
 (iii) syn- $CH_3CH(OH)CH(CH_3)COPh$

- (b) Depict the most stable conformers of 1, 2-dichloroethane and 1, 2-difluoroethane and give reason of your answer.

3+2

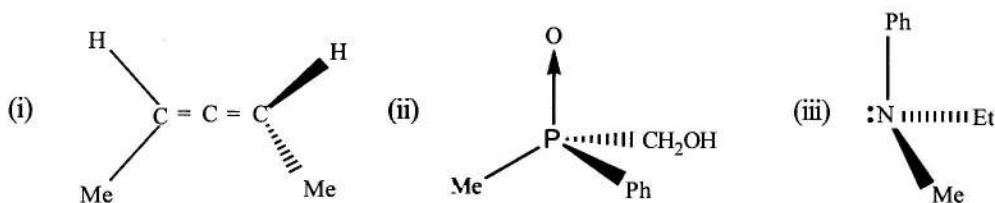
4. (a) Label the following pairs of molecules as homomers, enantiomers and diastereoisomers.



- (b) Write down the configuration of final product when R-2-hydroxypropanal is allowed to react with CH_3MgBr where attack takes place from the Re-face and the immediate product thus formed is hydrolysed.

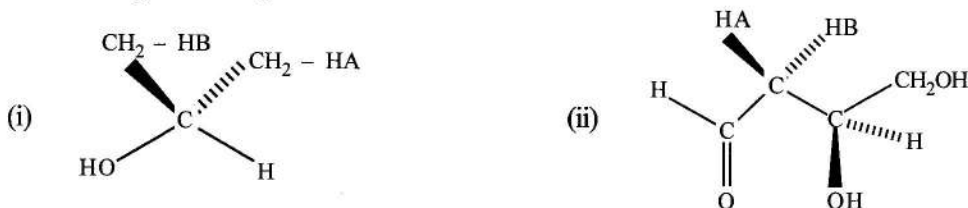
3+2

5. (a) Explain whether the following compounds are resolvable or not.



- (b) Designate H_A and H_B in each of the following compounds as homotopic, enantiotopic or diastereotopic and explain :

3+2



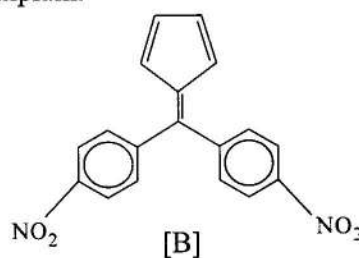
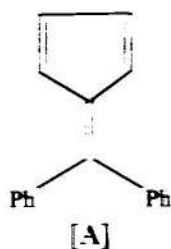
(3)

K(I)-Chemistry-H-1A

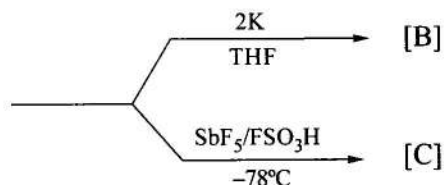
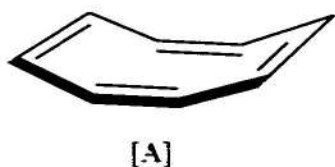
Unit - II

Answer *any two* questions.

6. (a) Draw the M.O.S of 1,3-cyclobutadiene showing the nodes. Mention HOMO and LUMO in ground state.
(b) Compare the melting and boiling temperature of n-pentane and neopentane. 3+2
7. (a) Which method between heat of hydrogenation and heat of combustion is more susceptible to get the relative stabilities among 1-butene, E and Z-2-butene and isobutene? Justify your answer.
(b) Dipole moment of [A] is higher than [B]. Explain. 3+2



8. (a) Identify [B] and [C] and comment on aromaticity of [A], [B] and [C]



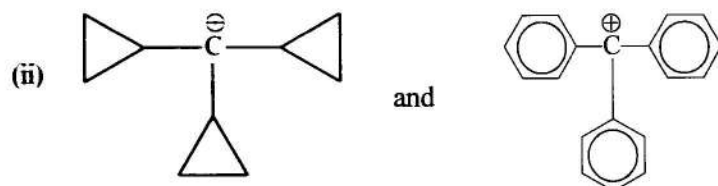
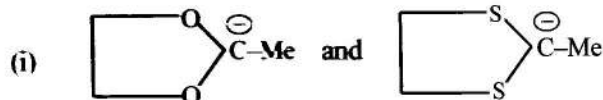
- (b) Which diastereoisomer of stilbene dichloride shows higher dipole moment and why? 3+2

CHT - 12b

Unit - I

Answer *any three* questions.

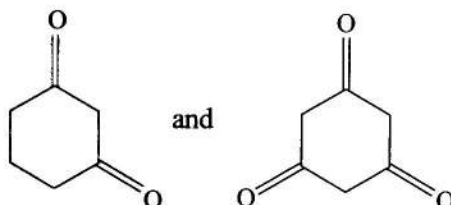
9. (a) Comment on the stability of the following pairs with reason.



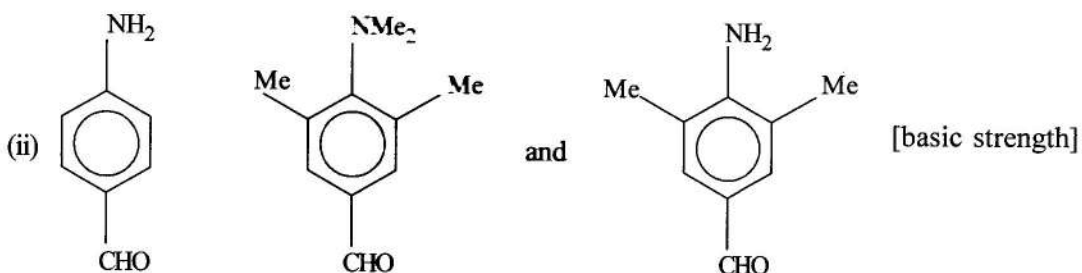
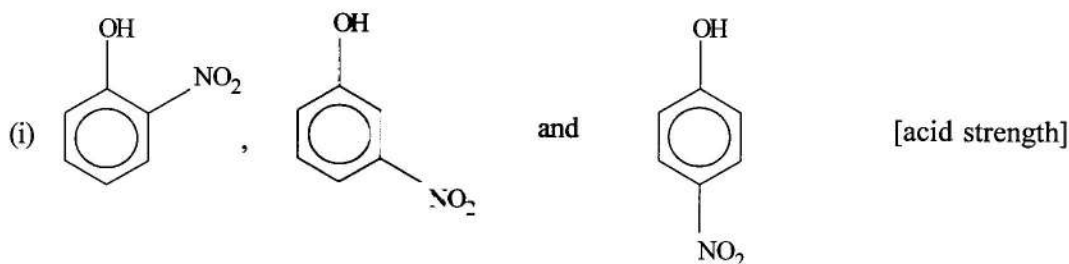
- (b) Any ortho hydroxy benzoic acid is stronger acid than benzoic acid. Explain. 3+2

Please Turn Over

10. (a) Draw the energy profile diagram of a two-steps exothermic reaction where activation energy of the 1st step is greater than that of 2nd step but the 2nd step is rate determining step. Justify your drawing.
- (b) Compare the enol content of the following two compounds.— Justify. 3+2



11. (a) Compare the strength of the following compounds. Give reasons.

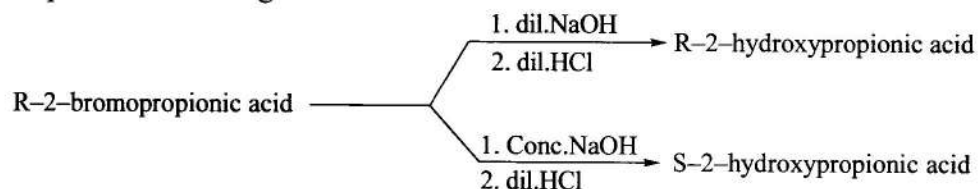


- (b) Give an example each of electrophilic carbene and nucleophilic carbene. 3+2
12. (a) What do you mean by PKIE? How PKIE helps us to determine the source of 2nd hydrogen of the product alcohol in Cannizzaro reaction?
- (b) What is captidative radical? Explain with an example. 3+2
13. (a) When cis-2-butene and trans-2-butene separately react with CH_2I_2 in presence of Zn-Cu couple, both cis - and trans - products are obtained. Predict the products and give reason.
- (b) Arrange F^- , Cl^- , Br^- and I^- ions in decreasing order of their basicity and nucleophilicity (both in protic and aprotic solvents). 3+2

Unit - II

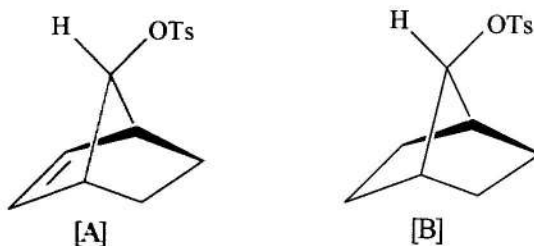
Answer *any two* questions.

14. (a) Explain the following observation :

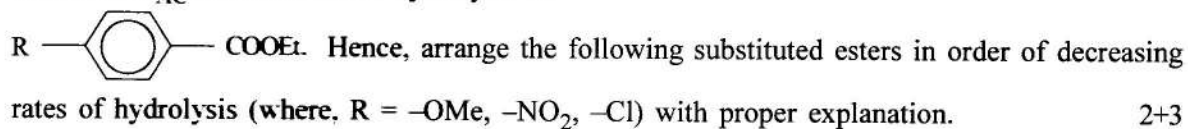


- (b) Which one will react faster in
- S_N1
- reaction,
- $CH_2 = CHCH_2Cl$
- or,
- Ph_3C-Cl
- ? Why? 3+2

15. (a) Compound [A] undergoes acetolysis at a rate
- 10^{11}
- times faster than compound [B] with retention of configuration. Explain.



- (b) Write the
- $B_{AC}2$
- mechanism of hydrolysis of



16. (a) What are the possible reactive sites of the bromoester,
- $BrCH_2CH_2COOEt$
- , with respect to a nucleophile? With diethylamine as nucleophile suggest the structure of the major product.

- (b) Identify [A], [B] and [C] with reasons, in brief: 2+3

