

2019

Part – II

CHEMISTRY

(Honours)

Paper-III

[New Syllabus]

Full Marks - 90

Time : 4 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

[Use separate answer script for **Group-A** and **Group-B**]

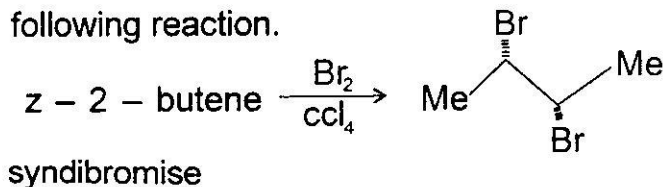
Group—A

(Organic)

Answer any one question :

15×1

1.(a) Explain the observed diastereoselectivity in the following reaction.

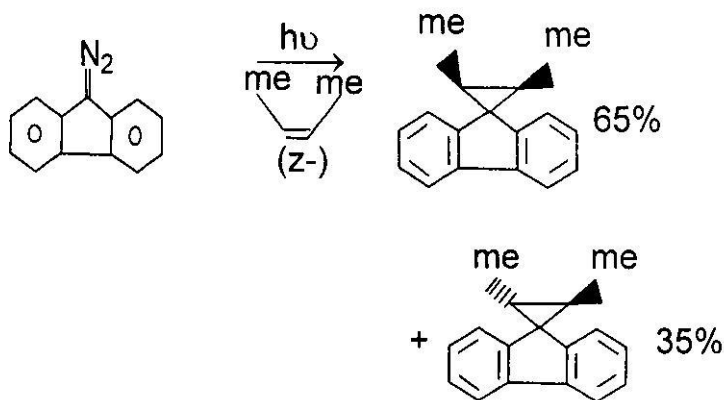


3

(b) Why tetra -t-butylallene is inert to ozonolysis? 2

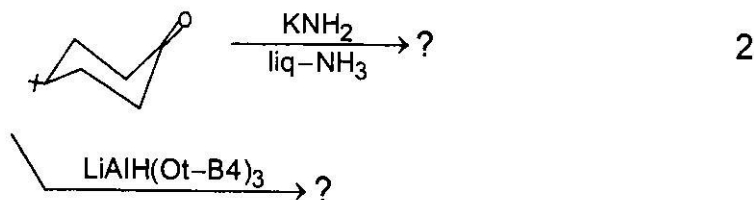
(c) Which one between cis-and trans 4-t-butylcyclohexane carboxylic acid will act as a stronger acid and why ? 3

(d) Explain the following observation.



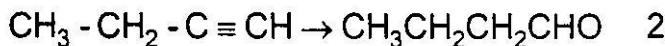
3

(e) Predict the product(s) with suitable explanation.



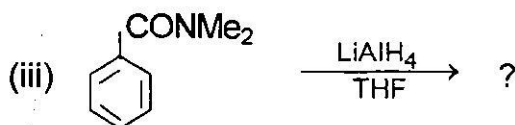
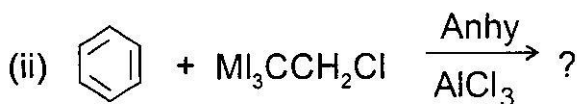
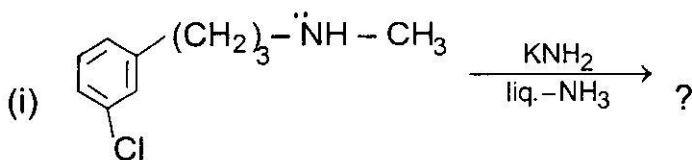
2

(f) Convert : CH



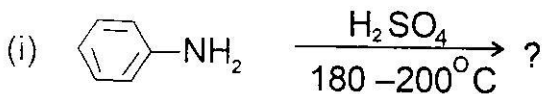
2. (a) Predict the product(s) with mechanism (any two)

$$2\frac{1}{2} + 2\frac{1}{2}$$

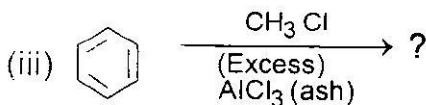
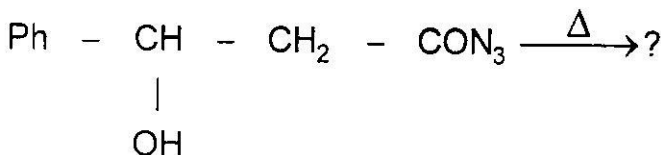


- (b) O-Hydroxybenzoic acid and P-hydroxybenzoic acid offer same product upon bromination reaction in water. Explain. 2
- (c) Methylbenzoate and methyl-4-Nitrobenzoate are hydrolysed at almost same rate by dilute mineral acid. Justify. 2

- (d) Predict the product with plausible mechanism
(any two) 2½+2½=5



(ii)

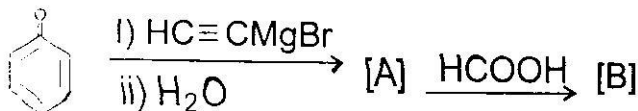


- (e) Draw the stable Conformation of 1-methyl-1-phenylcyclohexane. 1

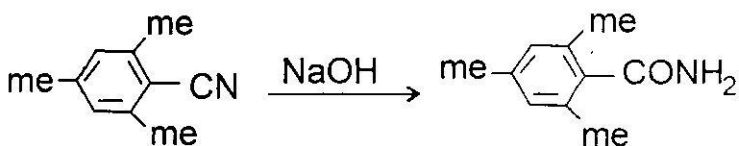
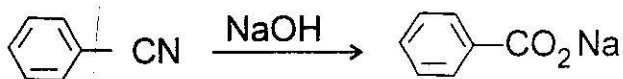
Group-A (b)

Answer any two questions 10×2

3. (a) Identify [A] and [B] in the following transformation and give the mechanism of formation of [B] from [A]. 3

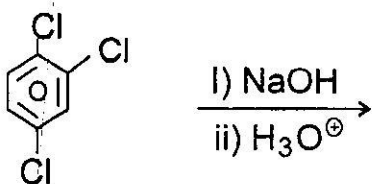


- (b) Explain the following observations. 2

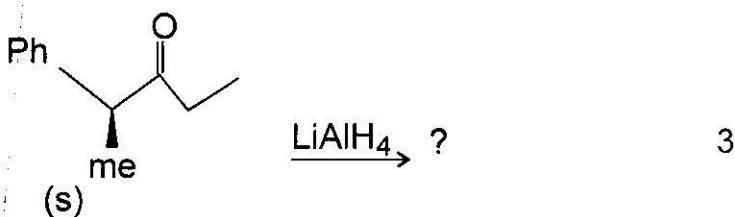


(c) Acetamide undergoes nitration by $\text{Ac}_2\text{O-HNO}_3$ predominantly at the sterically hindered ortho-position. Explain. 2½

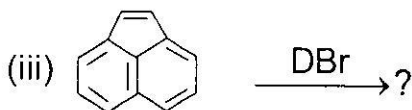
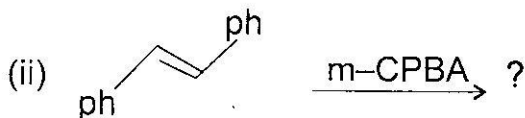
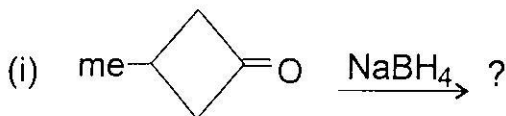
(d) Write down the product(s) with mechanism. 2½



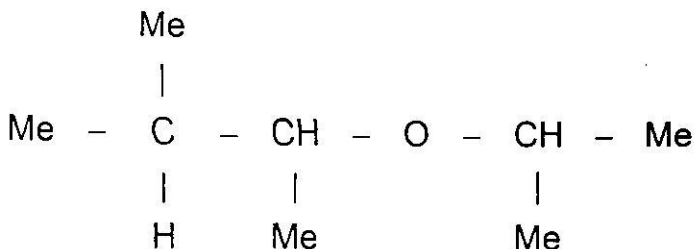
4.(a) Predict the major product and explain the diastereoselectivity.



- (b) Write down the product (s) with stereochemistry of the following reactions (Give mechanism) (any two) 2½+2½=5

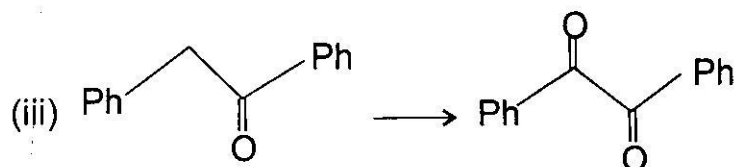
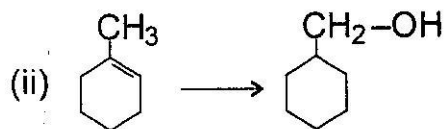
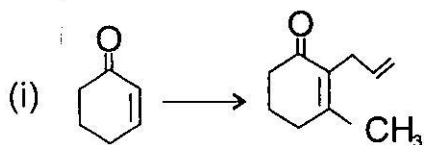


- (c) can you prepare the following compound by williamson synthesis? Explain your answer and suggest an effective synthetic route. 2



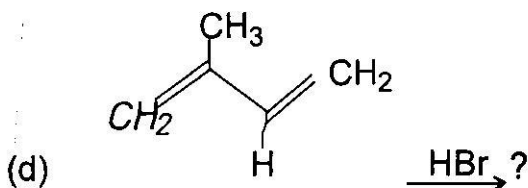
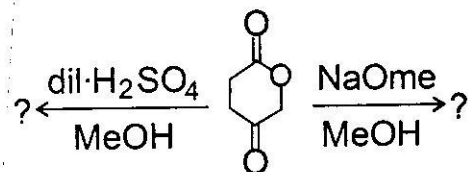
5.(a) convert (any two) :

2×2



(b) How do you separate 1-pentene and 2-pentene from their mixture by using a boron containing reagent? 2

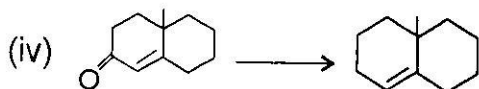
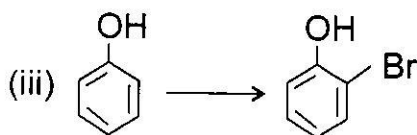
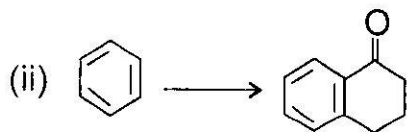
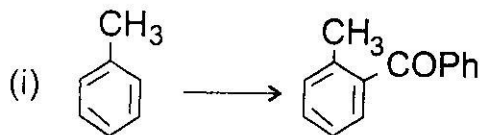
(c) Predict product(s) with mechanism



(Explain mechanistically)

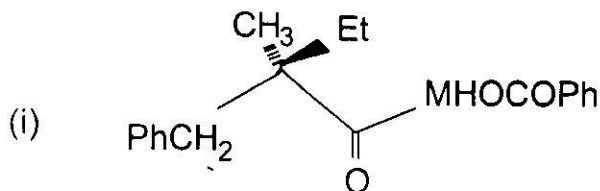
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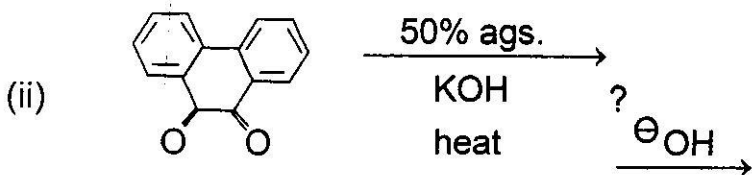
6.(a) carry out the following transformations : (any three) (mechanism is not necessary) 3×2



(b) Predict the product with mechanism :

2×2

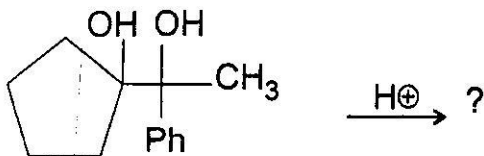




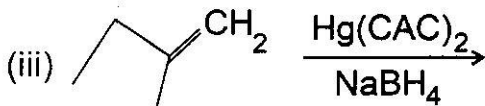
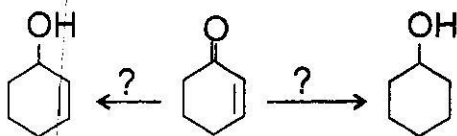
Group—A(c)

7. Answer any five question 5×2

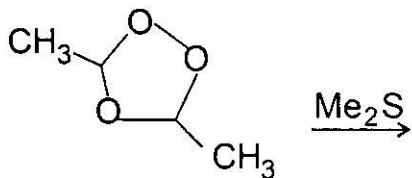
(i) Predict the product and explain its formation mechanistically



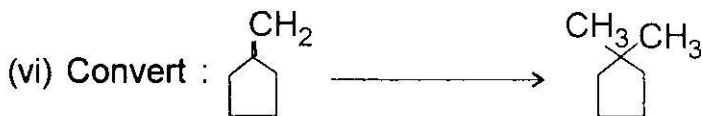
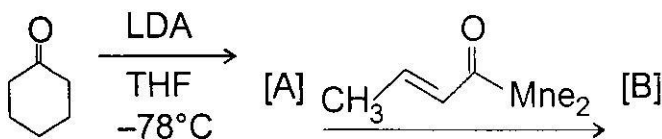
(ii) How can you carry out the following transformation.



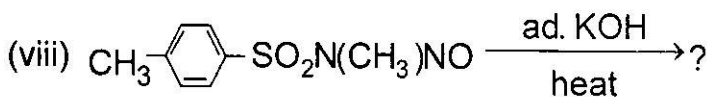
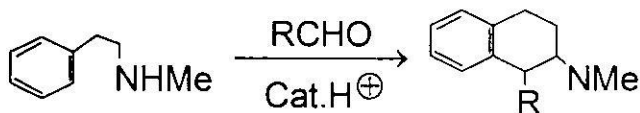
(iv) Write down the product with mechanism.



(v) Identify the products [A] and [B].

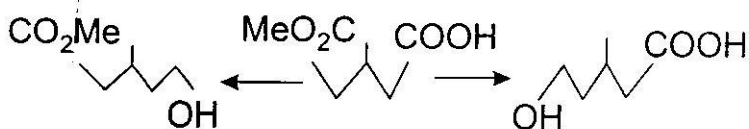


(vii) Suggest a mechanism for the following conversion.



Shows mechanism.

(ix) Give suitable reagent(s) in the following conversion.



- (x) For anti-addition of HBr to alkenes the rate law is $\text{Rate} = K [\text{alkene}] [\text{HBr}]^2$. Explain.

Group-B

(Inorganic)

Group—B(a)

Answer any one question: $15 \times 1 = 15$

- 8.(a) Mention the drawbacks of VBT. 2
- (b) compare the coordinating properties of NO^+ , Cu^+ , CO in light of MO theory. 3
- (c) Prepare a molecular orbital diagram for the cyanide ion. Use sketches to show clearly how the atomic orbitals interact to form MOs. 3
- (d) What is the bond order and how many unpaired electron does cyanide ion has? 2
- (e) Which molecular orbital of CN^- would you predict to interact most strongly with a hydrogen 1s orbital? Discuss with proper reason. 2
- (f) How many maximum electron can be added to O_2 molecule. Explain with reason. 2

- (g) What do you infer when bond order is zero 1
- 9.(a) What do you mean by nuclear binding energy? Discuss the important features of the nuclear binding energy curve. 1+2
- (b) Due to the surface energy, large and small nuclides become unstable—Justify. 3
- (c) Predict the mode of decay in the following nuclides in the light of n/p ratio
- (i) ${}^{14}_8\text{O}$ (ii) ${}^{66}_{29}\text{Cu}$ (iii) ${}^{228}_{88}\text{Ra}$ 3
- (d) On analysis, an ore of uranium shows the mass ratio for ${}^{238}\text{U}$ to ${}^{206}\text{Pb} = 6.08$. All ${}^{206}\text{Pb}$ atoms are supposed to appear from the disintegration of ${}^{238}\text{U}$. Find the age of the ore. (Given, $t_{1/2}$ for ${}^{238}\text{U} = 4.5 \times 10^9 \text{ yr}$, the next longest lived nuclide ${}^{234}\text{U}$ in the series shows $t_{1/2} = 2.5 \times 10^5 \text{ yr}$)
- (e) With suitable example discuss the role of radioisotope in determining organic reaction mechanism. 2

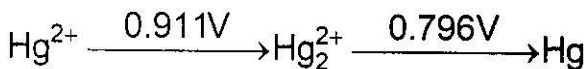
Group - B(b)

Answer any two question 10×2=20

10. (a) "1(N) KMnO_4 may mean either 0.33M or

0.20M or 0.20M KMnO_4 — comment 3

- (b) Draw a Frost diagram for mercury in acid solution from the given Latimer diagram :

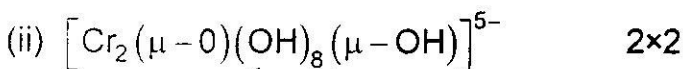
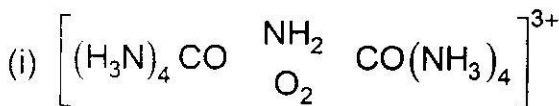


Comment on the tendency if any of the species to undergo disproportionation. 2+1

- (c) A solution of $\text{K}_3[\text{Fe}(\text{CN})_6]$ can not oxidise iodide to iodine but can oxidise in presence of zinc ion. Explain. 3

- (d) What do you mean by formal potential of a redox couple? 1

11. (a) Write IUPAC name the following specimen



- (b) Discuss the estimation of Zn^{2+} and Mg^{2+} separately from the mixtures of both by complexometric titration with EDTA. 3

- (c) cite an example of non-innocent ligand. Point

out the criteria of a ligand to behave as non innocent ligand 1+2

12. (a) suggest probable structure of I_4Cl^- and ICl_4^- with reason. Explain the differences in structures. 2+1
- (b) What will happen when a solution of X_cO_3 in NaOH is treated with ozone? Give the chemical reaction. 1
- (c) Give the products of stepwise dehydration of H_3PO_4 and compare the acidic properties of the products. 3
- (d) A number of silicon hydrides analogous to hydrocarbons are known but there are no reports for silicon analogues of olefins or aromatics— Discuss. 3
13. (a) Write short notes on (any four) : $2\frac{1}{2} \times 4$
- (i) $(SN)_x$
 - (ii) Pseudohalogen
 - (iii) Nuclear hazards
 - (iv) Pourbaix diagrams
 - (v) Nuclear isomerism
 - (vi) Catenation

Group— B(c)

14. Answer any five questions : 2×5

- (a) What happens when an excess of Na_2SO_3 reacts with HIO_3 in acidic solution in presence of starch..
- (b) Why electrical conductivity of metal decreases with the rise in temperature?
- (c) CaO is harder and has higher melting point than KF , although both have NaCl type structure—comment.
- (d) Comment on the structure of XeF_6 .
- (e) show that the oxidising power of $\text{K}_2\text{Cr}_2\text{O}_7$ depends on the pH of the medium.
- (f) H_2Se can be prepared by direct combination of the elements but H_2Te can not be prepared in the same way comment.
- (g) SO_3 is planar but SO_3^{2-} is pyramidal Explain.
- (h) Solubility of silver halide in water decreases from chloride to iodide— Explain.
-