

**TDP (General) 3rd Semester Exam., 2020**  
**(Held in 2021)**

**CHEMISTRY**

**( General )**

**THIRD PAPER**

*Full Marks : 40*

*Time : 2 hours*

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

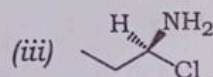
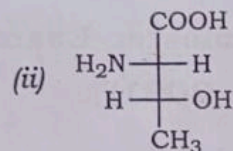
Answer **four** questions, taking **two** from each Unit

**UNIT—I**

**( Organic Chemistry )**

1. (a) Write down the structures of *E*- and *Z*-isomers of 1-bromo-1-chloropropane.
- (b) Draw the Fischer projection formula for *R*- and *S*-2-butanol.
- (c) Assign *R/S* notation for the chiral centre in the following compounds (any two) :
  - (i) D-lactic acid

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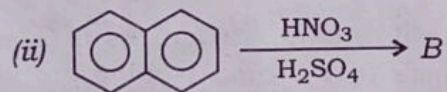
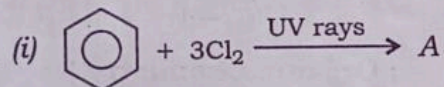


- (d) Draw the potential energy diagram of ethane and label the maxima and minima with proper configuration.

$$2+3+2+3=10$$

2. (a) Write the preparation of naphthalene by Haworth synthesis.

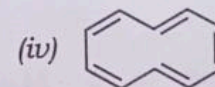
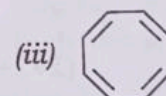
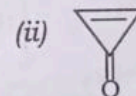
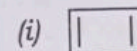
- (b) Identify A and B from the following reactions :



- (c) Out of benzene and toluene, which will undergo nitration most easily and why?
- (d) Write two limitations of Friedel-Crafts alkylation reaction.

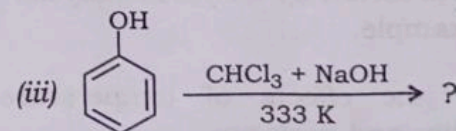
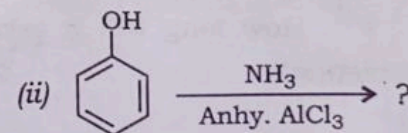
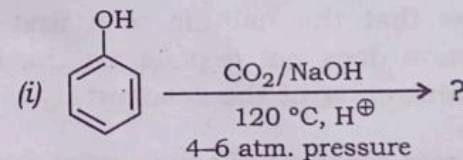
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- (e) Identify the following as aromatic/anti-aromatic/non-aromatic compounds :



$$2+2+2+2+2=10$$

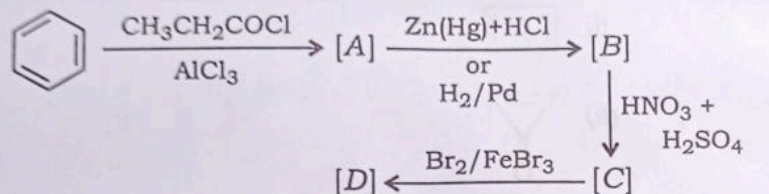
3. (a) Write down the products of the following reactions with plausible mechanisms :





( 4 )

- (b) Identify with structures of A, B, C and D of the following reactions :



$$(2+2+2)+4=10$$

## UNIT—II

### ( Physical Chemistry )

4. (a) Hydrolysis of cane sugar is a pseudo-unimolecular reaction. Explain.
- (b) Show that the half-life of a first-order reaction does not depend on the initial concentration of the reactant.
- (c) The rate constant of a first-order reaction is  $7 \times 10^{-3} \text{ s}^{-1}$ . How long will it take for 75% completion?  $2+4+4=10$
5. (a) What is meant by enzyme catalysis? Give an example.
- (b) Write the effects of temperature on molality and molarity.

( 5 )

- (c) What is meant by partition coefficient?
- (d) Calculate the number of phases, number of components and number of degrees of freedom for the following reaction :
- $$\text{CaCO}_3(\text{s}) \rightleftharpoons \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$$
- (e) Explain why electrolytes have abnormally high values of colligative properties.  $(1+1)+(1+1)+1+3+2=10$

6. (a) 18.2 g of a non-volatile solute when dissolved in 100 g of water at  $50^\circ\text{C}$  lowers the vapour pressure by 5 mm-Hg. Vapour pressure of pure water at  $50^\circ\text{C}$  is 92 mm-Hg. Find the molar mass of the solute.
- (b) Show that  $\Delta T_f = K_f \cdot C_m$ , where the terms have their usual meanings.
- (c) Define ebullioscopic constant and state its unit.  $4+4+(1+1)=10$

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**TDP (General) 3rd Semester Exam., 2018**

**CHEMISTRY**

( General )

**THIRD PAPER**

*Full Marks : 40*

*Time : 2 hours*

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*Answer each Unit in separate answer script*

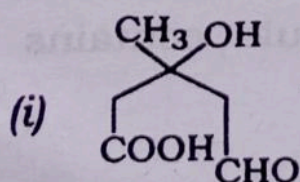
Answer **four** questions, taking **two** from each Unit

**UNIT—I**

**( Organic Chemistry )**

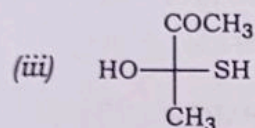
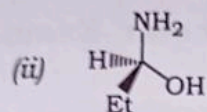
( Marks : 20 )

1. (a) What is the necessary and sufficient condition for a molecule to be optically active?
- (b) Define eclipsed and staggered conformation. Give example.
- (c) Assign R/S notation for the chiral centre in the following compounds :





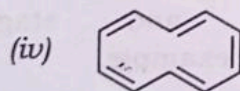
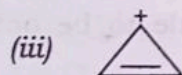
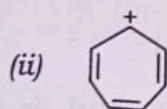
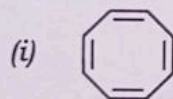
( 2 )



(iv) meso-tartaric acid

(d) Define racemic resolution.  $2+3+4+1=10$

2. (a) Which of the following compounds are aromatic, anti-aromatic or non-aromatic compounds? Justify :



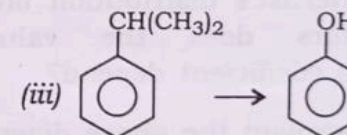
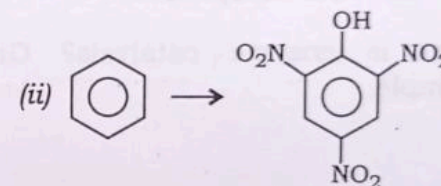
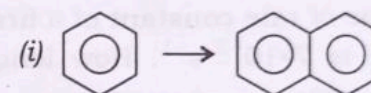
(b) Write the experimental evidences to show that benzene molecule contains three double bonds.

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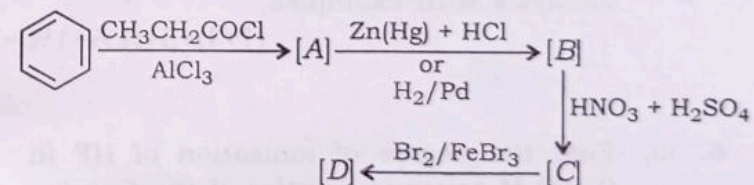
(c) Naphthalene when reduced with  $H_2$  and Ni, gives two isomeric products. What are they? Write down their structures and conformations.

(d) Write down the mechanism of nitration of benzene.  $4+2\frac{1}{2}+2+1\frac{1}{2}=10$

3. (a) Carry out the following transformations :



(b) Identify with structure of A, B, C and D of the following reactions :



$(2 \times 3) + 4 = 10$

( 4 )

UNIT—II

( Physical Chemistry )

( Marks : 20 )

4. (a) Derive the rate constant for a second-order reaction by considering two different reactants.
- (b) The value of rate constant of a first-order reaction is  $7 \times 10^{-3} \text{ s}^{-1}$ . How long will it take for 75% completion?
- (c) What is enzyme catalysis? Give an example.  $4+4+(1+1)=10$
5. (a) State the Nernst's distribution law. On what factors does the value of distribution coefficient depend?
- (b) Draw and explain the phase diagram of carbon dioxide system.
- (c) Define homogeneous and heterogeneous catalysis with examples.  $(1+1)+5+(1\frac{1}{2}+1\frac{1}{2})=10$
6. (a) Find the degree of ionization of HF in 0.100 M aqueous solution if the freezing point depression of the solution is  $-0.197^\circ\text{C}$ . ( $K_f$  for water =  $1.86^\circ\text{C}$ )

( 5 )

- (b) Derive thermodynamically  $\Delta T_f = K_f \times m$ .
- (c) Calculate the osmotic pressure of a 5% sugar solution at  $27^\circ\text{C}$ .  $3+4+3=10$

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**TDP (General) 3rd Semester Exam., 2017**

**CHEMISTRY (General)**

**THIRD PAPER**

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*Answer each Unit in separate answer script*

Answer **four** questions, taking **two** from each Unit

**UNIT—I**

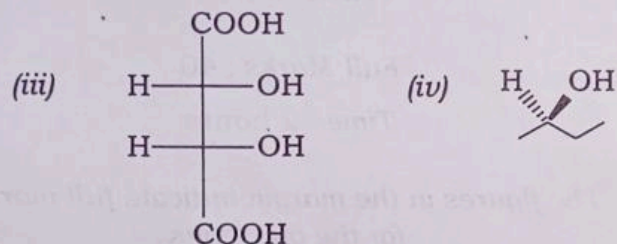
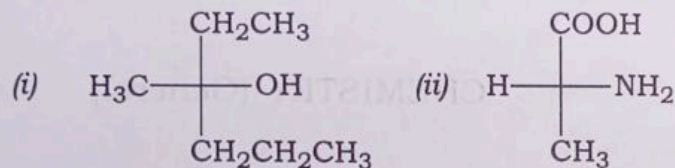
**( Organic Chemistry )**

*( Marks : 20 )*

1. (a) Define enantiomers and diastereomers with examples.
- (b) Draw the energy diagram of *n*-butane as function of rotation about C<sub>2</sub>-C<sub>3</sub> bond and explain it.

( 2 )

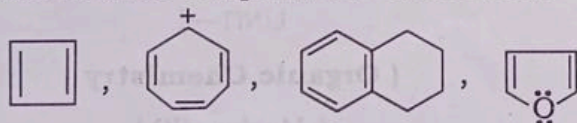
- (c) Assign *R/S* notation for the chiral centre in the following compounds :



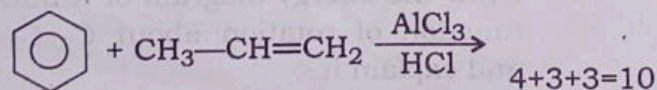
- (d) Draw the structure of *meso*-tartaric acid.

2+3+4+1=10

2. (a) Indicate the following species as aromatic, non-aromatic, anti-aromatic or homoaromatic compounds. Give reason.

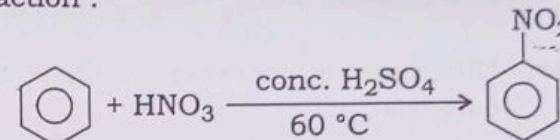


- (b) Write the preparation of naphthalene by Haworth synthesis.  
(c) Write the product(s) and suggest plausible mechanism(s) :

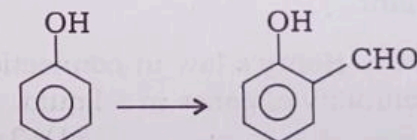


( 3 )

3. (a) Discuss the mechanism of the following reaction :



- (b) What are the limitations of Friedel-Crafts alkylation reaction?  
(c) Write the preparation of phenol from cumene with mechanism.  
(d) Carry out the following transformation with mechanism :



3+2+3+2=10

## UNIT—II

## ( Physical Chemistry )

( Marks : 20 )

4. (a) For a second-order reaction  $2A \rightarrow P$ , the half-life is  $t_{1/2}$  and the initial concentration of the reactant is  $a$ . Find the relation between  $t_{1/2}$  and  $a$ .  
(b) A first-order reaction goes to 50% completion in 50 minutes. How long will it take for 80% completion?

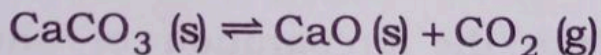


- (c) Give an example of catalysis in (i) industry and (ii) daily life.

$$4+4+(1+1)=10$$

5. (a) Differentiate between diffusion and osmosis.

- (b) Find the number of phases, number of components and number of degrees of freedom for the following equilibrium :



- (c) What is meant by triple point of a one-component system? Show that for a one-component system, the triple point is invariant.

- (d) State the Henry's law in connection with the solubility of gases in a liquid.

$$(1+1)+3+(1+2)+2=10$$

6. (a) Derive thermodynamically,  $\Delta T_b = k_b \times m$ .

- (b) A 5.13% solution of sugarcane is isotonic with 0.9% solution of an unknown solute. Calculate the molecular weight of the unknown solute.

- (c) What is meant by 'intensive property' of a solution? Give a suitable example.

$$4+4+2=10$$

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