CENTRAL LIBRARY N.C.COLLEGE

TDC (CBCS) Even Semester Exam., 2024

CHEMISTRY

(2nd Semester)

Course No. : CHMDSC/GEC-201T

(Chemical Energetics, Equilibria and Functional Organic Chemistry)

Full Marks : 50
Pass Marks : 20

Time : 3 hours

The figures in the margin indicate full marks for the questions

UNIT—I

1. Answer any *three* questions from the following : 1×3=3

(a) What do you mean by standard enthalpy of formation?

(b) What is inversion temperature?

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(c) Write the mathematical expression of first law of thermodynamics.

(d) What do you mean by differential enthalpy of solution?

2. Answer any *one* question from the following : 2

(a) Define the terms 'bond dissociation energy' and 'resonance energy'.

(b) Explain the terms 'isolated system' and 'isothermal process'.

3. Answer any *one* question from the following : 5

(a) (i) What is Joule-Thomson coefficient? Why is Joule-Thomson coefficient of an ideal gas zero? 1+2=3

(ii) Enthalpies of formation of $C_2H_5OH(l)$, $CO_2(g)$ and $H_2O(l)$ are –277·0 kJ/mol, –393·5 kJ/mol and 285·8 kJ/mol respectively. Calculate the enthalpy change for the reaction—

$$C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$$ 2

(b) (i) Define intensive and extensive properties of a system with one example of each. 1+1=2

(ii) Discuss in detail the variation of enthalpy of a reaction with temperature. 3

UNIT—II

4. Answer any *three* questions from the following : 1×3=3

(a) What is the effect on the rates of forward and backward reactions, when the equilibrium is attained?

(b) What is buffer capacity of a solution?

(c) Define the term pH of a solution.

(d) What is the sign of ΔG° for a spontaneous chemical reaction?

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5. Answer any *one* question from the following : 2

(a) What do you mean by strong and weak electrolytes? Explain by taking one example of each. 1+1=2

(b) What is common ion effect? Mention one application of common ion effect. 2

6. Answer any *one* question from the following : 5

(a) *(i)* Deduce the relationship between K_p and K_c for the reaction—

$$aA + bB \rightleftharpoons cC + dD$$ 3

(ii) What do you mean by acidic and basic buffer solutions? Give one example of each. 2

(b) *(i)* State and explain the Le-Chatelier's principle by taking appropriate examples. 3

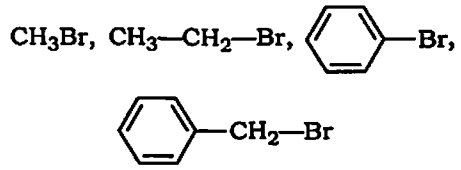
(ii) Define solubility product of a sparingly soluble salt. Mention one application of solubility product. 2

UNIT—III

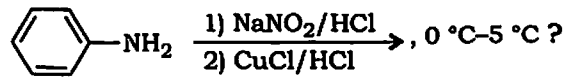
7. Answer any *three* questions from the following : 1×3=3

(a) How will you prepare ethyl bromide from ethylene?

(b) Which one of the following compounds will favour S_N1 reaction?



(c) Predict the product of the following chemical reaction :



(d) Arrange the following compounds in ascending order of their reactivity towards nucleophilic substitution reaction :

$CH_3—Cl$, $CH_3—Br$, $CH_3—F$, $CH_3—I$

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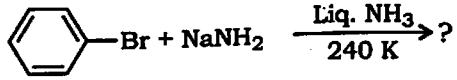
8. Answer any *one* question from the following : 2

(a) Explain Williamson's ether synthesis by taking one appropriate example.

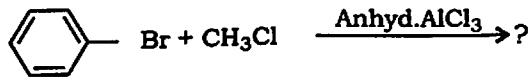
(b) Aryl halides are less reactive than alkyl halides towards nucleophilic substitution reactions. Justify this statement with proper reasons.

9. Answer any *one* question from the following : 5

(a) *(i)* Complete the following chemical reaction with appropriate mechanism : 1+2=3



(ii) Predict the products of the following reactions : 1+1=2

(1) 

(2) $CH_3CH_2—Br + AgNO_2 \longrightarrow ?$

(b) *(i)* Complete the following reaction and propose plausible mechanism of the following reaction : 1+2=3

$(CH_3)_3C—Br + KOH(aq) \longrightarrow ?$

(ii) Predict the products of the following reactions : 1+1=2

(1) $CH_3—CH_2—OH + SOCl_2 \xrightarrow{\text{Pyridine}} ?$

(2) $CH_3—CH_2—Br + NaOH\ (alc) \longrightarrow ?$

UNIT—IV

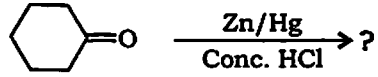
10. Answer any *three* questions from the following : 1×3=3

(a) How will you prepare secondary alcohols from aldehydes?

(b) What happens when phenol is treated with zinc dust?

(c) What is Lucas reagent?

(d) Predict the product of the following chemical reaction :



11. Answer any *one* question from the following : 2

(a) Explain the Schotter-Baumann reaction of phenol by taking one appropriate example.

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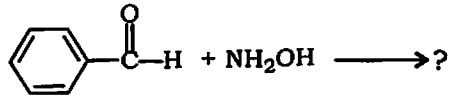
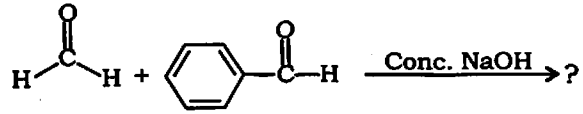
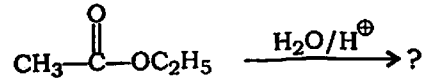
(b) How will you prepare alkenes from carbonyl compounds? Explain by taking one appropriate chemical reaction.

12. Answer any *one* question from the following : 5

(a) *(i)* Predict the products of the following chemical reactions : 1+1+1=3

(1) 

(2) 

(3) 

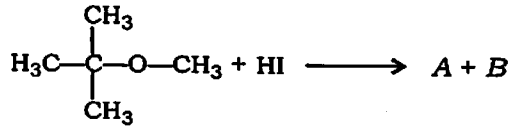
(ii) What is pinacol-pinacolone rearrangement? Explain with one chemical reaction. 2

(b) *(i)* Explain the following with appropriate chemical reactions : 2+2=4

(1) Reimer-Tiemann reaction of phenol

(2) Aldol condensation reaction of carbonyl compounds

(ii) Identify the compounds *A* and *B* in the following chemical reaction : 1



UNIT—V

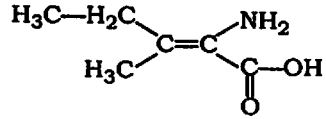
13. Answer any *three* questions from the following : 1×3=3

(a) What is mutarotation?

(b) What are meso compounds?

(c) What are the expected hydrolysis products of sucrose?

(d) Assign *E* / *Z* designation to the following compound :



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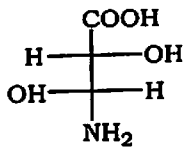
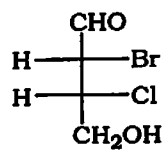
14. Answer any *one* question from the following : 2

(a) Designate *R* / *S* configuration to the following compounds : 1+1=2

(i)



(ii)



(b) Draw the open-chain and cyclic structures of glucose. 1+1=2

15. Answer any *one* question from the following : 5

(a) *(i)* Define enantiomerism and diastereomerism with appropriate examples. 1+1=2

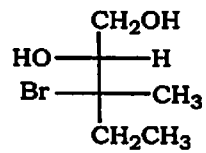
(ii) What are reducing and non-reducing sugars? Give one example of each. 1+1=2

(iii) Draw the closed ring structure of starch. 1

(Continued)

(b) *(i)* Assign *R* / *S* configuration to the chiral carbons of the following compounds : 1+1=2

(1)



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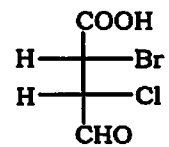

(ii) What is racemic mixture? Discuss one method of resolution of racemic mixture. 1+2=3

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