TDC (CBCS) Odd Semester Exam., 2023

CHEMISTRY

(3rd Semester)

Course No. : CHMDSC/GE-301T

(Physical and Organic Chemistry)

Full Marks : 50
Pass Marks : 20

Time : 3 hours

The figures in the margin indicate full marks for the questions

SECTION—A

Answer *fifteen* questions, selecting *three* from each Unit : 1×15=15

UNIT—I

1. Define azeotrope.

2. Explain the term 'phase' with an example.

3. What is triple point?

4. Write an expression of Gibbs' phase rule.

UNIT—II

5. Define molar conductivity.

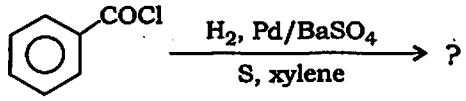
6. What is standard electrode potential?

7. Write two characteristics of reversible cell.

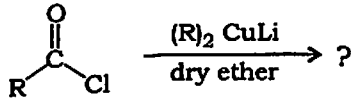
8. What is transport number?

UNIT—III

9. Write the product of the following reaction :



10. Write the product of the following reaction :



11. Write the product of the following reaction :

$$CH_3CHO \xrightarrow{NaOH\ (aq)} ?$$

12. Write the product of the following reaction :

$$Ph—CH=CH—CHO + NaBH_4 \longrightarrow ?$$

UNIT—IV

13. Write the product of the following reaction :

$$CH_3C{\equiv}N \xrightarrow{LiAlH_4/H_2O} ?$$

14. Write the product of the following reaction :

$$CH_3CONH_2 \xrightarrow{LiAlH_4/H_2O} ?$$

15. Write the product of the following reaction :

$$R—NH_2 + HNO_2 \xrightarrow[0\ °C–5\ °C]{NaNO_2 + HCl} ?$$

16. Write the product of the following reaction :

$$CH_3—COCl \xrightarrow[Br_2/KOH]{NH_3} ?$$

UNIT—V

17. What is a peptide linkage?

18. What is reducing sugar?

19. Write the zwitterion form of amino acid.

20. What is isoelectric point?

SECTION—B

Answer *five* questions, selecting *one* from each Unit : 2×5=10

UNIT—I

21. Explain the term 'degree of freedom' with suitable examples as used in phase rule.

22. Explain graphically the positive and negative deviations of liquid mixtures from ideal behaviour.

UNIT—II

23. Discuss how the conductance of strong and weak electrolytes varies with concentration.

24. Point out the differences between electrochemical cell and electrolytic cell.

UNIT—III

25. Write the product of the following reactions : 1×2=2

(i) $CH_3COCH_3 + \begin{matrix} CH_3 \\ \diagdown \\ C=PPh_3 \\ \diagup \\ CH_3 \end{matrix} \xrightarrow{THF} ?$

(ii) $C_6H_5CHO \xrightarrow[2)\ H^+/H_2O]{1)\ LiAlH_4} ?$

26. Identify *A* and *B* of the following reactions : 1×2=2

(i) $\begin{matrix} CH_3 \\ \diagdown \\ C=O \\ \diagup \\ CH_3 \end{matrix} + NH_2—NH_2 \xrightarrow{DMSO} A + N_2 + H_2O$

(ii) $CH_3CHO + (CH_3)_2CH—OH \xrightarrow{[(CH_3)_2CH—O]_3\ Al} B + CH_3\overset{O}{\overset{\|}{C}}—CH_3$

UNIT—IV

27. Give reason, why aniline is less basic than ethylamine.

28. Explain Schotten-Baumann reaction with a suitable example.

UNIT—V

29. What do you mean by C-terminal and N-terminal of a protein chain?

30. What is 'mutarotation'? Give a suitable example.

SECTION—C

Answer *five* questions, selecting *one* from each Unit : 5×5=25

UNIT—I

31. Draw the phase diagram of water system and explain the curves therein.

32. *(a)* Distinguish between ideal and non-ideal solutions. 2

(b) Draw the boiling point composition diagrams for binary mixtures of liquids miscible in all proportions. 3

UNIT—II

33. *(a)* A zinc electrode is placed in 0·1 *M* solution of zinc sulphate at 25 °C. If the degree of dissociation of salt at this concentration is found to be 0·95, calculate the electrode potential of the electrode at 25 °C. Given that $E^{\circ}_{Zn^{2+}/Zn} = -0{\cdot}76\ V$. 3

(b) Draw a galvanic cell with proper labelling. 2

34. Draw free hand graphs of the following : 1×5=5

Conductometric titrations between—

(a) strong acid vs. strong base;

(b) weak acid vs. strong base;

(c) strong acid vs. weak base;

(d) weak acid vs. weak base;

(e) $AgNO_3$ vs. KCl (precipitation reaction).

UNIT—III

35. *(a)* How can you distinguish acetaldehyde and benzaldehyde? Write the reactions. 3

(b) What happens when benzaldehyde is treated with concentrated NaOH? Write the reactions. 2

36. *(a)* Illustrate benzoin condensation with an example along with mechanism. 3

(b) Propose a suitable mechanism for the acidic hydrolysis of ester. 2

UNIT—IV

37. *(a)* How can you distinguish 1°, 2° and 3° amines? (Write the reactions only) 3

(b) With a suitable example, explain the Hofmann degradation of amide. 2

38. *(a)* Illustrate the Gabriel phthalimide synthesis of primary amine. 3

(b) Give one example of each of Saytzeff and Hofmann elimination reactions. 2

UNIT—V

39. *(a)* How will you convert aldopentose to aldohexose? 3

(b) Write a short note on electrophoresis. 2

40. *(a)* Define essential and non-essential amino acids. 2

(b) Discuss Gabriel phthalimide synthesis of an amino acid. 3

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