2022/TDC(CBCS)/EVEN/SEM/
CHMDSC/GEC-201T/338

TDC (CBCS) Even Semester Exam., 2022

CHEMISTRY

(2nd Semester)

Course No. : CHMDSC/GEC-201T

(Chemical Energetics, Equillibria and Functional 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 any *fifteen* questions : 1×15=15

1. What is chemical bond energy?

2. What is the concept of standard state in thermochemistry?

3. Give two examples of intensive property.

4. Define resonance energy.

5. What is differential enthalpy of solution?

6. Define an adiabatic process.

7. Give one example of moderate electrolyte.

8. Write the ionic product of water.

9. Define pH of an acidic solution.

10. What do you mean by free energy?

11. Write one example of basic buffer.

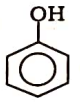
12. Define solubility product.

13. Which one of the following will undergo faster in S_N1 reaction?

14. Write one chemical test to distinguish between alcohols and phenols.

15. What is Lucas reagent?

16. Complete the reaction :



+ Dil. $HNO_3 \rightarrow ? + ?$

17. Name the reaction :

$$R—X + R—ONa \rightarrow R—O—R + NaX$$

18. Define stereoisomerism.

19. What are enantiomers?

20. What is mutarotation?

SECTION—B

Answer any *five* questions : 2×5=10

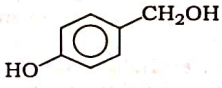
21. Write the basic rules for writing a balanced thermochemical equation.

22. State the mathematical statement for first law of thermodynamics.

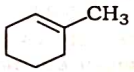
23. Distinguish between ΔG and $\Delta G°$.

24. Write a note on the application of solubility product.

25. Complete the following reactions :

(a) 

+ HCl $\xrightarrow[\Delta]{}$

(b) 

+ HI $\longrightarrow$

26. Aryl halides are extremely less reactive towards nucleophilic substitution reactions. Give two reasons.

27. Write the mechanism of the following reaction :

$$CH_3CH=CH_2 + H_2O \xrightleftharpoons{H^+} CH_3-\underset{\underset{OH}{|}}{CH}-CH_3$$

28. Phenols are stronger acids than alcohols. Explain.

29. What is racemic modification?

30. Write the structures of α-D-(+)-glucose and β-D-(+)-glucose.

SECTION—C

Answer any *five* questions : 5×5=25

31. *(a)* Define standard enthalpy of formation. 2

(b) Standard molar enthalpies of formation of ethane, carbon dioxide and water are −84·67, −393·5 and −285·8 kJ mol^{-1} respectively. Calculate the standard enthalpy of combustion of ethane. 3

32. *(a)* What are state functions and path functions? 2

(b) Bond energies for O=O, H—F and O—H are 494, 565 and 459 kJ mol^{-1} respectively. Determine the bond dissociation energy for O—F bond in OF_2 using the following equation : 3

$$OF_2(g) + H_2O(g) \rightarrow O=O(g) + 2HF(g); \quad \Delta H = -318 \text{ kJ mol}^{-1}$$

33. What is common ion effect? Explain its importance in systematic salt analysis. 2+3

34. *(a)* Derive the relationship between K_p and K_c for the reaction involving ideal gas. 3

(b) Describe two applications of Le Chatelier's principle. 2

35. *(a)* Write the equations for the preparation of 1-Iodobutane from—

(i) 1-Chlorobutane

(ii) But-1-ene 1+1=2

(b) Give the equations involved in preparation of chlorobenzene from amines by Sandmeyer's reaction. 3

36. *(a)* Although chlorine is an electron withdrawing group, yet it is *ortho-*, *para*-directing in electrophilic aromatic substitution reactions. Why? 2

(b) The treatment of alkyl chlorides with aqueous KOH leads to the formation of alcohol, but in the presence of alcoholic KOH, alkenes are major products. Explain. 3

37. *(a)* Write one example for each of allylic and benzylic alcohols and give their IUPAC names. 2

(b) What happens when phenol is treated with the following (Chemical equations only) 3

(i) Br_2 in CS_2

(ii) Bromine water

(iii) Conc. HNO_3

38. *(a)* Explain the following with equations : $1\frac{1}{2}\times2=3$

(i) Kolbe reaction

(ii) Cannizzaro reaction

(b) Write the mechanism of acid dehydration of ethanol to yield ethene. 2

(Continued)

39. *(a)* Draw R- and S-configuration for the following : $1\frac{1}{2}\times2=3$

(i) $CH_3CH(Cl)CH_2CH_3$

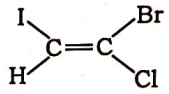
(ii) $CH_3C(Cl)(OH)(NH_2)$

(b) Discuss the structure of fructose. 2

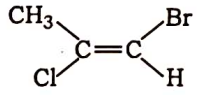
40. *(a)* What are the expected hydrolysis products of *(i)* sucrose and *(ii)* lactose? 2

(b) Assign E- and Z-configuration for the following : 3

(i)



(ii)



★★★