2020/TDC/ODD/SEM/
CHMP–501/290

TDC Odd Semester Exam., 2020
held in July, 2021

CHEMISTRY

(Pass)

(5th Semester)

Course No. : CHMP–501

(Inorganic, Organic and Physical Chemistry)

Full Marks : 35
Pass Marks : 12

Time : 2 hours

The figures in the margin indicate full marks for the questions

GROUP—A

(Inorganic Chemistry)

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

UNIT—I

1. *(a)* Draw the potential energy curve for hydrogen molecule. 1

(b) Explain the term 'resonance'. Draw the resonance structure of NO_3. 1+1=2

2. Using Fajan's rule, explain why—

(a) $AlCl_3$ has lower melting point than NaCl;

(b) KI is soluble in alcohol but KCl is not. 1½+1½=3

UNIT—II

3. Draw the MO energy-level diagram for O_2 molecule. Calculate bond order and predict its magnetic property. 2+½+½=3

4. *(a)* With the help of MOT, show that He_2 molecule does not exist but He_2 exists. 2

(b) Calculate bond order of NO and N_2. ½+½=1

UNIT—III

5. Define hydrogen bond. Explain the types of hydrogen bond with suitable examples. 1+2=3

6. *(a)* Define crystal lattice and unit cell. 1+1=2

(b) Calculate the number of atoms per unit cell of b.c.c. lattice. 1

UNIT—IV

7. *(a)* Why is $K_2Cr_2O_7$ solution called primary standard? 1

(b) Write the principle involved in the estimation of Fe^{2} ion using $K_2Cr_2O_7$. 2

8. *(a)* What is meant by iodometric estimation? 1

(b) Write the theory and chemical reactions involved in the estimation of Cu^{2} ion by using standard sodium thiosulphate solution. 2

GROUP—B

(Organic Chemistry)

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

UNIT—V

9. Taking a suitable example, write the mechanism of Mannich reaction. 2

10. Write a short note on Wittig reaction. 2

UNIT—VI

11. *(a)* Write one method for the synthesis of thiophene. 1

(b) What happens when furan is treated with—

(i) a mixture of HCN and HCl;

(ii) maleic anhydride? 1+1=2

12. *(a)* Why is pyrrole an aromatic compound? 1

(b) Pyrrole undergoes electrophilic substitution at 2-position. Explain. 2

UNIT—VII

13. Discuss Fischer indole synthesis. 3

14. *(a)* Explain why pyridine is less reactive than benzene in electrophilic substitution reaction. 1

(b) What happens when—

(i) indole is treated with $CHCl_3$ and NaOH;

(ii) pyridine is heated with sodamide and the product is treated with water? 1+1=2

UNIT—VIII

15. Write the basic principle of UV-visible spectroscopy. 3

16. *(a)* With the help of IR spectroscopy, distinguish between the following : 1+1=2

(i) $CH_3—O—CH_3$ and CH_3CH_2OH

(ii) CH_3COCH_3 and CH_3CHO

(b) How many normal vibration modes are possible in IR absorption spectrum of H_2O? 1

GROUP—C

(Physical Chemistry)

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

UNIT—IX

17. Write Debye-Hückel-Onsager equation and explain the terms involved. 3

18. *(a)* What is meant by equivalent conductance at infinite dilution? 1

(b) Describe briefly the variation of equivalent conductance of both strong and weak electrolytes with dilution. 2

UNIT—X

19. *(a)* Define e.m.f. of a cell. 1

(b) Given

$E^{\circ}_{Zn|Zn^2}$ 0·762 V

$E^{\circ}_{Pb^2|Pb}$ 0·126 V

Construct a cell by using these two electrodes. Write the cell reaction and calculate the standard e.m.f. of the cell. 2

20. *(a)* Write the Nernst equation for Daniell cell. 1

(b) What are reversible and irreversible cells? Give examples. 2

UNIT—XI

21. *(a)* State and explain the Einstein-Stark law of photochemical equivalence. 2

(b) What is phosphorescence? 1

22. *(a)* What is photosensitized reaction? 1

(b) Explain the primary and secondary processes in photochemical reactions. 2

UNIT—XII

23. *(a)* Write one method for the preparation of lyophilic colloid. Define 'gold number'. 1+1=2

(b) What is peptization? 1

24. *(a)* Write two differences between physisorption and chemisorption. 1

(b) Discuss briefly Langmuir adsorption isotherm. 2

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