2019/EVEN/CHMP–401/234

TDC Even Semester Exam., 2019

CHEMISTRY

(Pass)

(4th Semester)

Course No. : CHMP–401

(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)

(*Marks* : 11)

Answer **one** question from each Unit

UNIT—I

1. Explain, on the basis of VBT, that $[Co(CN)_6]^{3}$ is diamagnetic, while $[CoF_6]^{3}$ is paramagnetic. 2

2. Explain high and low spin complexes in terms of CFT, taking suitable examples. 2

UNIT—II

3. *(a)* What is acid rain? What are its causes? 2

(b) Name one common biodegradable detergent. 1

4. What are pesticides? Briefly describe the environmental effect of fertilizer use. 1+2=3

UNIT—III

5. Discuss the principle of colorimetric estimation of metal ion like Fe^{3} ion. 3

6. Discuss the principle of determination of Na or K ion content of a solution by flame photometric method of analysis. 3

UNIT—IV

7. What is paper? Describe one method of manufacture of pulp from wood. 1+2=3

8. What are the raw materials of Portland cement? Write the chemical reactions involved in the setting of cement. 1+2=3

GROUP—B

(Organic Chemistry)

(*Marks* : 12)

Answer **one** question from each Unit

UNIT—I

9. *(a)* Name the amine with molecular formula C_2H_7N which produces a yellow oily liquid by reacting with nitrous acid. 1

(b) How will you distinguish among primary, secondary and tertiary amines? Explain with chemical reactions. 2

10. *(a)* What happens when aniline is heated with chloroform and alcoholic KOH solution? 2

(b) Write one method of preparation of *p*-amine. 1

UNIT—II

11. *(a)* What is the difference between a protein and a polypeptide? 2

(b) Name the four bases present in RNA. 1

12. Discuss briefly the primary structure of protein. What is the denaturation of protein? 2+1=3

UNIT—III

13. How is urea manufactured? How does it react with nitrous acid? 1½+1½=3

14. What happens when *(a)* urea is heated above its melting point and *(b)* urea is treated with hydrazine? 1½+1½=3

UNIT—IV

15. *(a)* Define R_f value. 1

(b) Write a short note on thin-layer chromatography. 2

16. *(a)* Explain the principle of separation of components of a mixture by paper chromatography. 2

(b) Define the terms 'eluate' and 'eluent'. 1

GROUP—C

(Physical Chemistry)

(*Marks* : 12)

Answer **one** question from each Unit

UNIT—I

17. State Le Chatelier's principle. Predict the effect of temperature and pressure in the reaction given below : 1+2=3

$$N_2(g)\quad 3H_2(g) \rightleftharpoons 2NH_3(g), \quad H \quad 22 \text{ kcal}$$

18. *(a)* Deduce the expression for the equilibrium constant K_p for the following equilibrium : 2

$$2SO_2(g)\quad O_2(g) \rightleftharpoons 2SO_3(g)\quad Q \text{ cal}$$

(b) Show that

$$K_p \quad K_c(RT)^{\quad n}$$ 1

UNIT—II

19. *(a)* The equilibrium constant K_p for the water gas reaction

$$CO \quad H_2O \rightleftharpoons CO_2 \quad H_2$$

is 1 06 10^5 atm ^{1} at 25 °C. Calculate the standard free energy change (G) of the reaction at 25 °C. 2

(b) Write the van't Hoff's reaction isotherm. 1

20. *(a)* Show that

$$\frac{d\ln k_p}{dT} \quad H\ /RT^2$$ 2

(b) State and explain the law of mass action. 1

UNIT—III

21. Give one example of first-order, second-order and zero-order reactions. 3

22. *(a)* What is the unit of first-order reaction? 1

(b) Show that for the first-order reaction, the time required for 99% completion of a reaction is twice the time required to complete 90% of the reaction. 2

UNIT—IV

23. Deduce an expression for the rate constant of a second-order reaction considering identical initial concentration. 3

24. What is catalysis? Describe briefly the types of catalysis giving suitable examples of each type. 1+2=3

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