TDC (CBCS) Odd Semester Exam., 2021
held in March, 2022

CHEMISTRY

(3rd Semester)

Course No. : CHMHCC–301T

(*s*-, *p*-block Elements and Metallurgy)

Full Marks : 50
Pass Marks : 20

Time : 3 hours

The figures in the margin indicate full marks for the questions

SECTION—A

Answer any *ten* questions : 2×10=20

1. What is inert pair effect? Illustrate with an example.

2. Draw and discuss the resonance structures of chlorine dioxide.

3. What do you mean by interhalogen compounds?

4. State with equations, what happens when XeF_6 is treated with aqueous NaOH.

5. Which of the noble gases is most abundant in the universe? Mention two uses of the gas.

6. Explain the shape of XeF_4.

7. Arrange the following in order of increasing base strength and explain reasons :

NH_3, NCl_3, NF_3

8. What is soft base? What are its characteristics?

9. Which of the following is Bronsted acid and/or Bronsted base? 1+1=2

(a) NH_3

(b) $H_2PO_4^-$

10. What are inorganic chain compounds?

11. What are phosphazenes? Give one example.

12. What is the valence state of P in P_4O_6? Depict its structure.

13. Define gangue.

14. Write an application of Ellingham diagram.

15. What is meant by the term 'concentration of the ore'?

SECTION—B

Answer any *five* questions : 6×5=30

16. (a) Arrange the oxyacids of chlorine in the increasing order of their acidity and oxidizing power. Justify your answer. 3

(b) Discuss the structure of diborane molecule. 3

17. (a) How is IF_5 prepared? Explain its structure on the basis of hybridization of I-atom. 2+2=4

(b) How is Caro's acid synthesized? 2

18. (a) Name the first real compound of any of the noble gases. Discuss the preparation and properties of XeF_2 and establish its linear structure with the help of hybridization of orbitals of xenon and fluorine. 1+1+1+1=4

(b) Write the important uses of clathrates. 2

19. *(a)* Draw and discuss the structure of xenon oxide difluoride ($XeOF_2$). 3

(b) The 'xenate' ion disproportionates in basic solution to yield xenon, perxenate ion and oxygen. Give a balanced equation for this reaction. 3

20. *(a)* Explain why hard acids coordinate with hard bases and soft acids coordinate with soft bases. 3

(b) Discuss Cady and Elsey concept of acids and bases citing illustrative examples. 3

21. *(a)* What are protic and aprotic solvents? Is liquid NH_3 a protic or an aprotic solvent? Give reasons. 1+1=2

(b) Applying the HSAB principle, complete the following reactions and give reasons : 2+2=4

(i) $CuI_2 + CuF \longrightarrow ?$

(ii) $CdCl_2 + H_2S \longrightarrow ?$

22. *(a)* How SiH_4 may be synthesized? What is its structure? How does it react with *(i)* O_2 and *(ii)* heat? 2+1+1=4

(b) How is P_4O_4 prepared? What happens when it reacts with water? 2

23. *(a)* Write the preparation and structure of a cage compound of each of P and B. 4

(b) Draw the open and closed structures of silicons. 2

24. *(a)* Explain the electrolytic process for the extraction of zinc. 3

(b) Discuss the principle of extraction of nickel by Mond's process from purified matte. 3

25. Name the principal ore of chromium and give its chemical formula. Give an outline of extraction of chromium from its ore. 2+4=6

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