TDC (CBCS) Odd Semester Exam., 2020
held in March, 2021

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

1. Answer any *ten* of the following questions : 2×10=20

(a) Write one method of preparation of $HClO_2$. Draw its structure. 1+1=2

(b) What are cage compounds? Cite one example. 1+1=2

(c) How many terminal hydrogen atoms and banana bonds are there in diborane? 1+1=2

(d) Define catenation. Cite one example. 1½+½=2

(e) What are noble gases? Which of the noble gases is radioactive? 1+1=2

(f) Explain why it is difficult to liquefy helium (He).

(g) Write two applications of noble gas compounds.

(h) Which of the following is Bronsted acid and/or Bronsted base? 1+1=2

(i) NH_3

(ii) $H_2PO_4^-$

(i) Find the Lewis acids and bases from the following : ½×4=2

BF_3; CO_2; NH_2^-; Ag^+

(j) Why is HNO_3 stronger acid than HNO_2?

(k) Define HSAB principle with appropriate example.

(l) What are the inorganic polymers? Write the different types of inorganic polymer. 1+1=2

(m) Draw the layer structure of boron nitride.

(n) Write two examples of silicon-based polymer. 1+1=2

(o) Write a short note on 'borazine'.

(p) Define gangue with suitable example.

(q) What is an Ellingham diagram?

(r) Distinguish between calcination and roasting.

(s) What is hydrometallurgy?

(t) How will you explain the inertness of noble gases?

SECTION—B

Answer *any* **five** questions

2. (a) What are carboranes? How are boranes and carboranes classified? 1+2=3

(b) How can Marshall's acid be prepared? Write the structure and applications of Marshall's acid. 1+2=3

3. *(a)* What are pseudohalogen compounds? How are they prepared? 1+2=3

(b) Furnish the structure of closo-, nido- and archno-type of boron compounds or ions with suitable examples. 1+1+1=3

4. *(a)* How is XeF_4 prepared? Draw the shape of the molecule and the state of hybridization of Xe-atom in it. 1+1+1=3

(b) Discuss the position of noble gases in the periodic table. 3

5. *(a)* What are clathrate compounds of noble gases? Cite an example. 2+1=3

(b) Explain why the shape of XeF_2 is linear. What happens when XeF_2 reacts with iodine molecule? 2+1=3

6. *(a)* Explain the amphoteric behaviour of H_2SO_4. 2

(b) Which one is a stronger base, NH_3 or $(CH_3)_3N$ and why? 2

(c) Mention the limitations of HSAB principle. 2

7. *(a)* What do you mean by levelling effect of a solvent? 2

(b) How does HSAB principle give account on the stability of product formed in a reaction? 2

(c) What are the characteristics of hard metals? 2

8. *(a)* What are phosphazenes? How is cyclic $(NPCl_2)_3$ prepared? Draw its structure and explain the bonding in it. 1+1+2=4

(b) Draw the structure of $[Si_2O_7]^{6-}$. 2

9. *(a)* What are silicones? How are cross-linked silicones prepared? 1+2=3

(b) What happens when diborane reacts with excess of ammonia at high temperature? 1

(c) Write a brief note on silicone rubber. 2

10. *(a)* What is metallurgy? How is the metal obtained from its oxide ores electrolytically? 1+3=4

(b) Explain the basic principle of zone refining. 2

11. *(a)* What is pentlandite ore? Explain how nickel (Ni) can be extracted from the pentlandite ore by Mond process. 1+3=4

(b) Name two important ores of zinc with formulas. 2

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