

Subject Code.—58453

B. Sc. EXAMINATION

(Main/Re-appear) (Batch 2018 Onwards)

(Fifth Semester)

CHEMISTRY

CCL-503 (ii) Paper I

Chemistry of Main Group Elements, Theories
of Acids and Bases-I

Time : 3 Hours

Maximum Marks : 80

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 (short answer type) is compulsory.

Compulsory Question

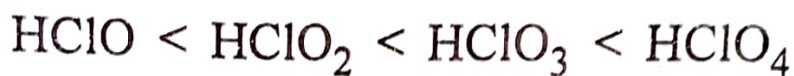
1. (a) Calculate pK_a value of HClO₄ and
× H₃PO₄ according to Ricci equation.

- (b) Classify the following as hard and soft acid and bases :
- Cu^+ , PO_4^{3-} , ClO_4^- , N_2H_4 , I^- , Sn^{2+} , CN^- and Pd^{2+}
- (c) Out of N and P which has higher electron affinity and why ?
- (d) Define electronegativity. How does it affect the nature of bonding between two atoms ?
- (e) What is a mineral ? How does it differ from an ore ?
- (f) Out of coke and CO, which is better reducing agent for reduction of ZnO and why ?
- (g) Why is Li_2CO_3 unstable while other alkali metal carbonates are relatively more stable ?
- (h) Why do alkaline earth metals have greater tendency to form complexes than alkali metals ?

$8 \times 2 = 16$

Unit I

2. (a) Explain the acid strength order for oxoacids of chlorine as : 4



- (b) What is front strain or F-strain ? Explain basicity order of Pyridine, 2-methyl pyridine and 4-methyl pyridine. 4

- (c) Explain mechanism for hydrolysis of Lewis acid BCl_3 and SiCl_4 . 4

- (d) What are levelling and differentiating solvents ? How do they affect the strength of acids and bases ? 4

3. (a) Explain briefly how the following factors affect the strength of acids and bases with examples : 8

(i) Inductive effect

(ii) Resonance

(iii) Steric effect. 4

- (b) What is Pearson's HSAB Principle
Write down its applications
limitations.

Unit II

4. (a) Explain Ellingham diagrams used for reduction of metal oxides by using carbon and carbon monoxide as reducing agent. 8
- (b) Explain briefly vapor phase refining and Von Arkel method used for purification of metal. 8
5. (a) Explain the chief mode of occurrence of metals on the basis of their standard reduction potentials. 8
- (b) Write down brief notes on the following : 8
- (i) Mond process and Kroll process
 - (ii) Zone refining and parting process.

Unit III

6. (a) Define electronegativity. Discuss Pauling scale of electronegativity. Why fluorine has higher electronegativity than chlorine whereas chlorine has higher electron affinity than fluorine ? Explain it. 8

(b) Explain why alkali metals or their salts imparted colour to flame when they are heated and also explain why Be and Mg do not impart colour to the flame ? 8

7. (a) What is inert pair effect ? Write down its consequences. Explain it by taking examples. Is the inert pair effect valid for transition elements also ? 8

(b) What is allotropy ? Explain main allotropic forms of carbon. 8

Unit IV

8. (a) Discuss the following structures briefly :

(i) Basic beryllium acetate

(ii) Crown ether complexes of Alkali metals ions 8

(b) Explain why stability of peroxides and superoxides increases as the size of alkali metals increases ? Write down the method of preparation of oxides of alkali and alkaline earth metals also. 8

9. (a) What are cryptates ? Explain their complexity behaviour with alkali and alkaline metal ions with examples. 8
- (b) Explain the solubility and thermal stability of carbonates and sulphates of Group 1 and Group 2 metal ions. 4
- (c) Why does the solution of alkali metals in ammonia is blue in colour and conducting in nature ? 4