

**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**  
**End Semester Examination, December 2021**

**Course: Inorganic Chemistry - II**  
**Program: B. Sc. Chemistry**  
**Course Code: CHEM 2001**

**Semester : III**  
**Time 03 hrs.**  
**Max. Marks: 100**

**Instruction: Answer all questions. All Questions are mandatory.**

**SECTION A**

**Each question will carry 4 marks**

S. No.	Question	Marks	CO
Q 1	Below 673K, CO is a better reducing agent for reducing metal oxides but above this temperature carbon is a better reducing agent, explain.	4	CO1
Q 2	Define the following and discuss their trends in periodic table: (i) Ionization energy, (ii) Electron negativity, (iii) Atomic radius, (iv) Electron affinity	4	CO2
Q 3	Arrange the following as specified : (i) MgO, SrO, K <sub>2</sub> O and Cs <sub>2</sub> O (increasing order of basic character) (ii) KCl, KBr and KI (decreasing solubility in water)	4	CO2
Q 4	(i) BCl <sub>3</sub> is trigonal planar while AlCl <sub>3</sub> is tetrahedral in dimeric state. Explain. (ii) Why Fluorine is better oxidizing agent than Chlorine?	4	CO3
Q5	Complete the following and balance the chemical reactions: (i) $\text{BeCl}_2 + \text{LiAlH}_4 \longrightarrow$ (ii) $\text{CaC}_2 + \text{H}_2\text{O} \longrightarrow$	4	CO3

**SECTION B**

**Each question will carry 10 marks**

Q 6	Using a suitable diagram explain the extraction of Iron from its ore in a blast furnace.	10	CO1
Q 7	(i) When alkali metals are dissolved in liquid ammonia they give blue colour, but as the concentration of alkali metal increases, it turns bronze in colour. Explain this phenomenon with help of chemical equations. (ii) Explain the reason why MgCO <sub>3</sub> is thermally less stable than BaCO <sub>3</sub> .	5+5	CO2
Q 8	Draw and explain the structures of the following (i) P <sub>4</sub> O <sub>10</sub> (ii) B <sub>2</sub> H <sub>6</sub>	10	CO2

	(iii) $\text{BeCl}_2$ (iv) Ca-EDTA  <p style="text-align: center;"><b>Or</b></p> An inorganic Lewis acid (X) shows' the following reactions: (i) It fumes in moist air. (ii) The intensity of fumes increases when a rod dipped in, $\text{NH}_4\text{OH}$ is brought near to it. (iii) An acidic solution of (X) on addition of $\text{NH}_4\text{Cl}$ and $\text{NH}_4\text{OH}$ gives a gelatinous precipitate which dissolves in $\text{NaOH}$ solution. (iv) An acidic solution of (X) does not give a precipitate with $\text{H}_2\text{S}$ . Identify (X) and give chemical reactions at steps (i) to (iii).		
Q 9	What are silicones? How many types of silicones are there, discuss their synthesis and structure?	10	CO3
<b>SECTION-C</b>			
<b>Each question carries 20 marks</b>			
Q 10	(i) Discuss the synthesis and structure of borazine. Why it undergoes addition reactions readily in contrast to benzene? Explain giving two reactions. (ii) Discuss the anomalous behavior of Li among group 1 elements.  <p style="text-align: center;"><b>Or</b></p> (i) What are interhalogen compounds? Describe the synthesis of any 2 interhalogen compounds. (ii) Compare the acidic properties of oxy-acids of chlorine. Describe the synthesis and structure of perchloric acid.	10+10	CO2
Q 11	(i) How orthophosphoric acid is manufactured from bone ash? Explain its structure in details. Discuss the different reactions of orthophosphoric acid with $\text{NaOH}$ . (ii) Explain the reason why $\text{H}_3\text{PO}_2$ is monobasic, $\text{H}_3\text{PO}_3$ is dibasic and $\text{H}_3\text{PO}_4$ is tribasic acid.	12+8	CO3