



**FEDERAL PUBLIC SERVICE COMMISSION**  
**COMPETITIVE EXAMINATION FOR**  
**RECRUITMENT TO POSTS IN BS-17**  
**UNDER THE FEDERAL GOVERNMENT, 2014**  
**CHEMISTRY, PAPER-I**

Roll Number

<b>TIME ALLOWED:</b>	<b>(PART-I MCQs) 30 MINUTES</b>	<b>MAXIMUM MARKS: 20</b>
<b>THREE HOURS</b>	<b>(PART-II) 2 HOURS &amp; 30 MINUTES</b>	<b>MAXIMUM MARKS: 80</b>

- NOTE:**(i) **Part-II** is to be attempted on the separate **Answer Book**.  
(ii) Attempt **ONLY FOUR** questions from **PART-II**. **ALL** questions carry **EQUAL** marks.  
(iii) Candidate must write **Q. No.** in the **Answer Book** in accordance with **Q. No.** in the **Q. Paper**.  
(iv) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.  
(v) Extra attempt of any question or any part of the attempted question will not be considered.

**PART-II**

- Q. No. 2.** (a) What are zeolites and how can they be synthesized? Give some important applications of zeolites. (07)  
(b) Explain significance of quantum mechanical wave function. Also enlist properties of a well-behaved wave function. (07)  
(c) Write some important chemical properties of Cl<sub>2</sub>. Also give its general and industrial applications. (06)
- Q. No. 3.** (a) How are the human activities in urban areas responsible for air-pollution? What measures should be taken to minimize air-pollution? (07)  
(b) With suitable examples differentiate between internal energy change and enthalpy change. Under what conditions the two quantities have almost same value? (07)  
(c) Explain dissociation of weak acids. How can dissociation constant be determined using conductance measurements? (06)
- Q. No. 4.** (a) Many transition element complexes (TEC) exhibit their characteristic spectra in the visible-region. Give detailed account of factors which affect/modify spectra of the TEC. (07)  
(b) Explain synthesis of cement; also draw flow-chart diagram to show the significant steps. (07)  
(c) Explain significance of Gibbs expression. How can  $\Delta G$  value be utilized to predict occurrence of a chemical reaction? (06)
- Q. No. 5.** (a) How does silver exist in nature? What shape compounds are formed by Ag (I) with different ligands? (07)  
(b) Elaborate the common and different features of H<sub>2</sub> and H<sub>2</sub><sup>+</sup> molecules according to the pertinent molecular orbital theory. (07)  
(c) Enlist different oxyacids of N and P. Also explain differences in their behaviour. (06)
- Q. No. 6.** (a) Derive Schrodinger's wave equation for a particle of mass 'm' confined in a one-dimensional box of length 'l'. Also give a relationship for the zero-point energy. (07)  
(b) Define 2<sup>nd</sup> law of thermodynamics. How can the entropy change become an indicator for spontaneity of a process? (07)  
(c) How can shapes of transition element complexes (TEC) be explained on the basis of some typical hybridization by the central ion? (06)
- Q. No. 7.** (a) Describe functioning of a typical Fuel-Cell (FC). What is the role of membrane equilibria in the FC?. (07)  
(b) What is the origin of magnetic property in the complexes of transition elements? Give some factors on which magnetic property may depend. (07)  
(c) With suitable examples of multi-electron atoms, elaborate Aufbau principle in the light of Pauli's principle and Hund's rule. (06)
- Q. No. 8.** (a) 'Debye-Hueckel theory (D-HT) Works under limiting conditions'. Elaborate the statement with examples. Also give significance of D-HT. (07)  
(b) What are transition elements? Give a generalized account of physical and chemical characteristics of transition elements. (07)  
(c) With the electrochemical reaction that take place at the two electrodes, describe 'electrolysis of aqueous solutions'. (06)