



**FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION-2016
FOR RECRUITMENT TO POSTS IN BS-17
UNDER THE FEDERAL GOVERNMENT**

Roll Number

CHEMISTRY PAPER-I

TIME ALLOWED: THREE HOURS	PART-I (MCQS)	MAXIMUM MARKS = 20
PART-I(MCQS): MAXIMUM 30 MINUTES	PART-II	MAXIMUM MARKS = 80

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) All the parts (if any) of each Question must be attempted at one place instead of at different places.
(iv) Candidate must write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.
(v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
(vi) Extra attempt of any question or any part of the attempted question will not be considered.
(vii) **Use of Calculator is allowed.**

PART-II

- Q. No. 2.** (a) What is Schrodinger wave equation? Discuss its importance in quantum chemistry. (6)
(b) Solve the Schrodinger wave equation for a particle in three-dimensional box and find the expression for the energy and wave function. (8)
(c) What is a well-behaved function? What are the requirements of a physically acceptable wave function? (6)
- Q. No. 3.** (a) What is Gibbs free energy? Discuss its significance in chemistry. (6)
(b) Give a brief account of transition state theory indicating its advantages over collision theory. (8)
(c) Explain 3rd law of thermodynamics. How this law is useful to determine the absolute value of entropy? (6)
- Q. No. 4.** (a) Define and explain Langmuir adsorption isotherm. What are its limitations? (8)
(b) What is acid-base catalysis? Discuss its significance in chemistry. (6)
(c) What is Phase rule? Discuss its application in one component system. (6)
- Q. No. 5.** (a) What are solubility product and common ion effect? Discuss their significance in chemical analysis (8)
(b) Valence shell electron pair repulsion theory can be used to predict the shapes of molecules. Using this theory explain the shapes acquired by BF₃ and IF₅. (7)
(c) Explain why HSH bond angle in H₂S is slightly less than the tetrahedral angle 109.5 (5)
- Q. No. 6.** (a) Describe main features of crystal field theory, How this theory explains colour of coordination complexes? (10)
(b) Write the electronic configuration for each of the following: (4)
Ni²⁺, Cu, Mn²⁺, Cr³⁺
(c) What is John-Teller theorem? Explain its significance in coordination chemistry. (6)
- Q. No. 7.** (a) What are lanthanides? How are these extracted from their ores? (10)
(b) What is decay law? How half-life and decay constant are related with each (5)