



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

Roll Number

**CHEMISTRY PAPER-I**

<b>TIME ALLOWED: THREE HOURS</b>	<b>PART-I (MCQS)</b>	<b>MAXIMUM MARKS = 20</b>
<b>PART-I(MCQS): MAXIMUM 30 MINUTES</b>	<b>PART-II</b>	<b>MAXIMUM MARKS = 80</b>
<b>NOTE: (i) Part-II is to be attempted on the separate Answer Book.</b>		
<b>(ii) Attempt ONLY FOUR questions from PART-II. ALL questions carry EQUAL marks.</b>		
<b>(iii) All the parts (if any) of each Question must be attempted at one place instead of at different places.</b>		
<b>(iv) Candidate must write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.</b>		
<b>(v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.</b>		
<b>(vi) Extra attempt of any question or any part of the attempted question will not be considered.</b>		
<b>(vii) Use of Calculator is allowed.</b>		

**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 3<sup>rd</sup> 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 BF<sub>3</sub> and IF<sub>5</sub>. (7)
- (c) Explain why HSH bond angle in H<sub>2</sub>S 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)
- Ni<sup>2+</sup>, Cu, Mn<sup>2+</sup>, Cr<sup>3+</sup>
- (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)