



**FEDERAL PUBLIC SERVICE COMMISSION**  
**COMPETITIVE EXAMINATION-2019**  
**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): MAXIMUM 30 MINUTES</b>	<b>PART-I (MCQS)</b> <b>PART-II</b>	<b>MAXIMUM MARKS = 20</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) 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 question will not be considered.</b> <b>(vii) Use of calculator is allowed.</b>		

**PART-II**

- Q. 2.** (a) Describe the assumption of Bohr's atomic model. Based on Bohr's calculation, establish the energy expression of the rotation of electrons in Hydrogen like atomic species. (8)
- (b) Derive de-Broglie's equation for the dual nature of matter. Apply this equation for microscopic and macroscopic properties of substances. (6)
- (c) What are the postulates of Quantum Mechanics? (6) **(20)**
- Q. 3.** (a) What is Third law of thermodynamics? How it is used to determine the entropies of substance. (7)
- (b) Discuss the isothermal expansion of a gas and derive the equation for the work done due to expansion of a gas. (7)
- (c) Explain the law of corresponding states. (6) **(20)**
- Q. 4.** (a) Deduce the rate expression for 2<sup>nd</sup> order reaction where both the concentration terms are same. What is the half-life period for the 2<sup>nd</sup> order reaction? (10)
- (b) What is activation energy? How it can be determined? (5)
- (c) Write a note on Transition state theory of reaction rates. (5) **(20)**
- Q. 5.** (a) Develop a relation among phase, component and degree of Freedom. Draw a complete diagram for water system. (10)
- (b) What is catalysis? Differentiate between positive and negative catalysis. (6)
- (c) What is stoichiometry? Explain it with help of examples. (4) **(20)**
- Q. 6.** (a) State and explain Lowry-Bronsted theory and Lewis theory of acids and bases. In what way Lewis theory differs from Bronsted theory. (8)
- (b) Explain with the help of examples why pH of a buffer solution does not change significantly on small addition of acids and bases. (6)
- (c) What are indicators? How a suitable indicator can be chosen? Discuss. (6) **(20)**
- Q. 7.** (a) Give an account of phenomena of isomerism in co-ordination compound with suitable example. (8)
- (b) Describe the extraction of thorium from mozite sand. (6)
- (c) Compare the properties of lanthanides and actinides? (6) **(20)**
- Q. 8.** (a) Explain Kohlrausch's Law? Give its applications. (7)
- (b) What is meant by transport number of ions? Give different methods for determination of transport number. (7)
- (c) What is specific conductance? How it can be determined by using Wheatstone bridge? (6) **(20)**