FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION-2020
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) 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 question will not be considered.
(vii) **Use of calculator is allowed.**

PART-II

Q. 2. **(a)** Write two equations of state for real gases and compare them high lighting their important features. (10)

(b) **(i)** Explain Heisenberg's uncertainty principle. (05)
(ii) Discuss Born's interpretation of wave function. (05) (10) **(20)**

Q. 3. **(a)** Explain the Kohlrausch law. Why do the real solution should deviate from the law? (10)

(b) Compare Langmuir's and Freundlich's adsorption isotherms. (10) **(20)**

Q. 4. **(a)** Explain the Arrhenius equation. Also high light its applications and limitations. (10)

(b) Explain various acid-base theories. What are hard and soft acids and bases? (10) **(20)**

Q. 5. **(a)** Make a comparison of column chromatography and thin layer chromatography (TLC) by highlighting merits and demerits of the both. (10)

(b) Explain Werner's theory of coordination complexes. Give examples from d-block transition metals. (10) **(20)**

Q. 6. **(a)** Give a comprehensive classification of various chromatographic techniques. Also mention potential application of each. (10)

(b) **(i)** What is Hydrogen bonding. Explain. (05)
(ii) Describe Hybidization in p-block elements. (05) (10) **(20)**

Q. 7. **(a)** Explain crystal Field Theory (CFT) for d-block elements. (10)

(b) Write an extensive essay on types of chemical bonding giving examples. (10) **(20)**

Q. 8. Write short notes on the following: (5 each) **(20)**

(i) Liquid junction potential
(ii) Potentiometry
(iii) Collision theory of Chemical reactions.
(iv) Transition state theory.

****

FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION-2020
FOR RECRUITMENT TO POSTS IN BS-17
UNDER THE FEDERAL GOVERNMENT

Roll Number

CHEMISTRY, PAPER-II

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.

PART-II

Q.No. 2. Explain the difference between**:** **(5 each) (20)**

(i) Inductive and Field effects
(ii) Inductive and Resonance effects
(iii) Localized and Delocalized bonding
(iv) Conjugation and Hyperconjugation

Q.No. 3. (a) " The resonance effect has an appreciable influence on physical characteristics and the chemical reactivity of organic molecules". Elaborate the statement with the help of examples. (10)

(b) Outline the EAS mechanism (Electrophilic Aromatic Substitution) through which aromatic compounds react with electrophiles. (5)

(c) Discuss factors which favour an elimination reaction occurring over a substitution reaction. (5) **(20)**

Q.No. 4. How would you carry out the following conversions? Account for your answer with mechanism in each case. **(4 each) (20)**

(i) $(CH_3)_3CCH{=}CH_2 \rightarrow (CH_3)_2C(OH)CH(CH_3)_2$
(ii) $(CH_3)_3CCH{=}CH_2 \rightarrow (CH_3)_3CCH(OH)CH_3$
(iii) $(CH_3)_3CCH{=}CH_2 \rightarrow (CH_3)_3CCH_2CH_2OH$
(iv) $(CH_3)_3CC{\equiv}CH \rightarrow (CH_3)_3CCOCH_3$
(v) $(CH_3)_3CC{\equiv}CH \rightarrow (CH_3)_3CCH_2CHO$

Q.No. 5. The following reactions can be used for the preparation of alkanes or cycloalkanes. Elaborate them with the help of reaction mechanisms. **(5 each) (20)**

(i) Corey House reaction (ii) Wurtz reaction
(iii) Kolbe reaction (iv) Simmons - Smith Reaction

Q.No. 6. How would you convert cyclohexanone into the following compounds? Write down the mechanisms of the reactions. **(4 each) (20)**

(a) Caprolactone (b) Caprolactam (C) Cycloheptanone
(d) Cyclohexa-1,2-dione (f) Cyclohexane

Q.No. 7. (a) How can a racemic mixture be separated into its components? Describe different methods. (16)

(b) (-)-Lactic acid has a specific rotation of – 3.8°. What will be the specific rotation of a solution containing 7.5g of (-)-lactic acid and 2.5 g of (+)-lactic acid? (4) **(20)**

Q.No. 8. (a) Starch, glycogen and cellulose are polymers of glucose. How will you differentiate among these three both structurally and functionally. (12)

(b) Explain precisely the following terms. (8) **(20)**
(i) Glycolysis (ii) Glycogenolysis (iii) Glycogenesis (iv) gluconeogenesis

****