



FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION-2026 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) First attempt PART-I (MCQs) on separate OMR Answer Sheet which shall be taken back after 30 minutes. (ii) Overwriting/cutting of the options/answers will not be given credit. (iii) There is no negative marking. All MCQs must be attempted.	

PART-I (MCQs)(COMPULSORY)

Q.1. (i) Select the best option/answer and fill in the appropriate Box ☐ on the OMR Answer Sheet.(20x1=20)
(ii) Answers given anywhere else, other than OMR Answer Sheet, will not be considered.

- Which of the following groups, would have the highest –I effect, relative to hydrogen atom?
(A) – COOH (B) – CN (C) – NO₂ (D) None of these
- Which molecule would have the highest dipole moment among the given series?
(A) Aniline (B) 4-Nitroaniline (C) 3-Nitroaniline (D) None of these
- Cyclobutane is an example of which type of hydrocarbons?
(A) Aromatic (B) Acyclic (C) Alicyclic (D) None of these
- The alpha(α)-elimination in a molecule can be regarded as:
(A) 1,1-Elimination (B) 1,2-Elimination (C) 1,3-Elimination (D) None of these
- Which one, among the given molecules, would require drastic conditions (highest temperature) for nitration? (A) Phenol (B) Nitrobenzene (C) Toluene (D) None of these
- The greater percentage of *para*-substituted product would be obtained in which of the electrophilic aromatic substitution reactions on chlorobenzene?
(A) Methylation (B) Nitration (C) Sulfonation (D) None of these
- When phenol is subjected to a typical Kolbe's reaction, at 125 °C under a pressure of 5 atm, the main product obtained is:
(A) Salicylic acid (B) Picric acid (C) Carboic acid (D) None of these
- Dow process was introduced by Dow Chemical Company in 1928 to synthesize phenol by hydrolysis of which molecule?
(A) Cumene (B) Chlorobenzene (C) Sodium benzenesulfonate (D) None of these
- Which of the following items does not affect the mechanism of a nucleophilic substitution reaction in a significant fashion?
(A) Intensity of light present (B) Reactivity of the nucleophile
(C) Structure of the alkyl halide (D) None of these
- Which rate law describes the unimolecular nucleophilic substitution reactions?
(A) Rate = k [nucleophile] (B) Rate = k [alkyl halide]²
(C) Rate = k [alkyl halide] (D) None of these
- Which of the following compounds will exhibit the geometrical isomerism?
(A) (CH₃)₂C=CH-CH₃ (B) CH₃-CH=CH-CH₃ (C) CH₃-CH₂-CH=CH₂ (D) None of these
- In which of the following derivative of cyclohexane carboxylic acid, the plane of symmetry is not present?
(A) 4-Methyl derivative (B) 2-Methyl derivative (C) 2-Carboxy derivative (D) None of these
- Which of the following bonds shows the stretching absorption in the 3700-2500 cm⁻¹ region in its IR spectrum? (A) C-C (B) C-O (C) C-N (D) None of these
- The base peak in the molecule of benzoic acid appears by the loss of –OH radical. At which *m/z* it will appear? (A) 105 (B) 77 (C) 45 (D) None of these
- In a glyceryl tristearate molecule, the fatty acid involved has a chain length of how many carbon atoms? (A) 10 (B) 12 (C) 06 (D) None of these
- The diploid number of chromosomes contained in the each human cell is:
(A) 26 (B) 40 (C) 48 (D) None of these
- The coenzyme or metal ion that is covalently bound to the enzyme protein is called a:
(A) Neighboring group (B) Dummy group (C) Prosthetic group (D) None of these
- The mineral present in urease enzyme is:
(A) Nickel (B) Zinc (C) Chromium (D) None of these
- Cement's strength is due to:
(A) Tricalcium aluminate (B) Tricalcium silicate (C) Dicalcium silicate (D) None of these
- The type of glass used in making the lenses and prisms is:
(A) Flint glass (B) Soft glass (C) Pyrex glass (D) None of these

PART-II

- 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.**

- Q.2.** (a) How the Resonance Effect plays a significant role to conclude the basic and acidic strengths of molecules. Discuss with relevant examples. (12)
 (b) How the Hyperconjugation alters the properties of molecules? Discuss. (8)
- Q.3.** (a) Outline the following reactions of alkenes with suitable examples. (4 each) (16)
 i) Hydrohalogenation ii) Hydration
 iii) Epoxidation iv) Free-radical Polymerization
 (b) Although the halogens are deactivator for electrophillic aromatic substitution but still they are *ortho* and *para* directors. Explain. (4)
- Q.4.** (a) How primary, secondary and tertiary amines can be differentiated by the Hinsberg's method? (9)
 (b) Ethanol is the only primary alcohol which gives a positive iodoform test. Outline the mechanism of this reaction. (6)
 (c) Phenol is converted to salicylaldehyde by the famous Reimer-Tiemann reaction. Draw the mechanism of this reaction. (5)
- Q.5.** (a) Discuss various classes of compounds which do not have any chiral carbon atoms but still they show chirality. (9)
 (b) Why 1,2- and 1-3-methylcyclohexanecarboxylic acid are optically active but 1-4-methylcyclohexanecarboxylic acid is not? Elaborate. (5)
 (c) Allocate the priority to various groups with the help of sequence rules and then assign R or S configuration (whichever is applicable) to the following molecules. (6)
- i)

$$\begin{array}{c} \text{Ph} \\ | \\ \text{H} - \text{C} - \text{Cl} \\ | \\ \text{CH}_2\text{OH} \end{array}$$

ii)

$$\begin{array}{c} \text{Vinyl} \\ | \\ \text{H}_2\text{N} - \text{C} - \text{Et} \\ | \\ \text{CH}_3 \end{array}$$
- Q.6.** (a) Elucidate a structure that is consistent with each set of ^1H -NMR data. (10)
 i) $\text{C}_{11}\text{H}_{12}\text{O}_4$: δ 10.1 (1H, br s), 7.75 (1H, d, $J = 16$ Hz), 7.13 (1H, dd, $J = 2.1, 8.1$ Hz), 7.08 (1H, d, $J = 2.1$ Hz), 6.89 (1H, d, $J = 8.1$ Hz), 6.36 (1H, d, $J = 16$ Hz), 3.92 (3H, s) and 3.87 (3H, s).
 ii) $\text{C}_{10}\text{H}_{10}\text{O}_5$: δ 7.71 (1H, d, $J = 16$ Hz), 6.76 (2H, s), 6.38 (1H, d, $J = 16$ Hz), and 3.78 (3H, s).
 (b) Sketch out the mass fragmentation pattern in $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_2\text{CH}_3$ molecule. (6)
 (c) How can you distinguish between following pairs of compounds with the help of IR spectroscopy? PhCONH_2 and PhCH_2NH_2 (4)
- Q.7.** (a) Discuss the chemistry of fatty acids and glyceryl trialkanoates in detail. (10)
 (b) How the numbering in steroids is carried out? Discuss the reactions and biological functions of cholesterol. (10)
- Q.8.** (a) Draw a flow-sheet diagram and elaborate the manufacturing and processing of paper in the paper industry. (16)
 (b) Elaborate why the fertilizers are necessary for proper plant growth. (4)
