



**PUNJAB PUBLIC SERVICE COMMISSION**  
**COMBINED COMPETITIVE EXAMINATION**  
**FOR RECRUITMENT TO THE POSTS OF**  
**PROVINCIAL MANAGEMENT SERVICE, ETC -2022**  
**CASE NO. 2C2023**

**SUBJECT: CHEMISTRY (PAPER-I)**

**TIME ALLOWED: THREE HOURS**

**MAXIMUM MARKS: 100**

**NOTE:**

- I. All the parts (if any) of each Question must be attempted at one place instead of at different places.
- II. Write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.
- III. No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
- IV. Extra attempt of any question or any part of the question will not be considered.

**NOTE:** **Attempt Any FIVE Questions. All Questions Carry Equal Marks. Attempt in English or Urdu.**

- Q No. 1:** Write brief note on the following: **(6+7+7=20 Marks)**  
a) Photoelectric effect                      b) Compton Effect                      c) De Broglie Wavelength
- Q No. 2:** a) Explain the entropy change in reversible and irreversible processes.  
b) Describe the applications of Gibbs free energy as useful work.  
**(12+8=20 Marks)**
- Q No. 3:** a) Briefly describe the Debye-Huckel theory and its applications for strong electrolytes.  
**(15+2=17 Marks)**  
b) Justify how Galvanic cell or Daniel cell is reversible one? **(3 Marks)**
- Q No. 4:** a) Describe the non-integrating type ionization chamber for measuring the radioactivity.  
b) Explain nuclear fusion reaction. Give examples.  
**(12+8=20 Marks)**
- Q No. 5:** a) Elaborate the rules/principles for filling electrons in the orbitals with the help of suitable examples. **(8 Marks)**  
b) How will you compare VBT with MOT? **(5+5=10 Marks)**  
c) Write down the postulates of VSEPR theory. **(2 Marks)**
- Q No. 6:** a) Describe the similarities and dissimilarities of valance bond and molecular orbital theories.  
b) What are the applications of chelates compounds?  
**(12+8=20 Marks)**
- Q No. 7:** a) Discuss the process of manufacture of urea with flow sheet diagram.  
b) Compare wet and dry processes of Cement Industry. What are their advantages and disadvantages?  
**(10+10=20 Marks)**
- Q No. 8:** a) Explain, how acid rain and smog pollute the environment?  
b) What is the role of ozone on the environment?  
**(12+8=20 Marks)**
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**CASE NO. 2C2023**

**SUBJECT: CHEMISTRY (PAPER-II)**

**TIME ALLOWED: THREE HOURS**

**MAXIMUM MARKS: 100**

**NOTE:**

- i. All the parts (if any) of each Question must be attempted at one place instead of at different places.
- ii. Write Q. No. in the Answer Book in accordance with Q. No. in the Q. Paper.
- iii. No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
- iv. Extra attempt of any question or any part of the question will not be considered.

**NOTE: Attempt any FIVE Questions in all. Attempt in Urdu or English.**

- Q.No.1** a) Differentiate between (1) Conjugation and hyper conjugation  
(2) Covalent bond and hydrogen bond (3) Localized and delocalized bond  
(4) Resonance effect and Inductive effect (5) Inter and Intra molecular hydrogen bonding.  
(10 Marks)
- b) Compare the basicity of (1) aniline and amine, (2) Primary, secondary, and tertiary alcohol and acidity of (1) phenol and alcohol (2) Fluorochloro, and bromo acetic acid (3) 1-chloro, 2-chloro and 3-chloro butanoic acid  
(10 Marks)
- Q.No.2** a) Write short notes on the following:  
(i) Finger print region (ii) Chromophores
- b) Discuss the principle of IR spectroscopy. How will you distinguish between following pairs of compounds on the basis of IR spectroscopy:  
(i) Ethyl alcohol and diethyl ether (ii) Acetic Acid and Ethyl acetate  
(8+12=20 Marks)
- Q.No.3** a) How will you prepare the following compounds starting from alcohol?  
(1) Pentanal (2) 2-Butanone (3) 3-pentanone (4) Cyclohexanone (5) Benzyl isopropyl ketone  
(6) 2,2 dimethyl 2-pentanone
- b) Write the expected products of aldol condensation between  
(1) Acetaldehyde and formaldehyde (2) Acetaldehyde and acetone  
(12+8=20 Marks)
- Q.No.4** a) How aromatic compounds are being prepared by following methods:  
(i) Wurtz-Fittig method (ii) Friedel-Crafts reactions
- b) Discuss the following electrophilic reactions of Benzene:  
(i) Halogenation (ii) Nitration and (iii) sulphonation  
(10+10=20 Marks)
- Q.No.5** a) What are Lipids? How you can classify them. Discuss their importance.
- b) What are Proteins? Discuss the structure and general properties of proteins.  
(10+10=20 Marks)
- Q.No.6** a) Explain the difference between; (1) Stationary phase and mobile phase (2) Retention time and retention volume (3) Adsorption and partition chromatography (4) Liquid liquid chromatography and liquid solid chromatography.
- b) How the Thin layer chromatography is performed?  
(16+4=20 Marks)
- Q.No.7** a) What are semi-conductors? How they can be classified?
- b) What is PET? Discuss its manufacturing and applications.  
(10+10=20 Marks)
- Q.No.8** a) Discuss inorganic Pigments in detail.
- b) Define Detergents. Discuss the classification of Detergents.  
(8+12=20 Marks)