



ROLL NO

PUNJAB PUBLIC SERVICE COMMISSION
COMBINED COMPETITIVE EXAMINATION
FOR RECRUITMENT TO THE POSTS OF
PROVINCIAL MANAGEMENT SERVICE, ETC -2023
CASE NO. 1C2024

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) Explain the rules of resonance with examples. Discuss the contribution of different canonical forms.
(20 Marks)
- Q.No.2** a) Describe various types of electronic transition and types of absorption bands which arise as a result of electronic transition in compounds.
- b) Explain the difference between:
(1) Red shift and blue shift (2) Transmittance and absorbance
(3) Chromophore and auxochrome (4) Allowed and forbidden transition
(12+8=20 Marks)
- Q.No.3** a) How will you synthesize ethyl phenyl ketone from each of the following compounds?
(1) Benzene (2) Benzoyl chloride (3) Benzoic acid
(4) Benzaldehyde (5) Benzoinitril.
- b) What do you know about condensation reaction? Describe two types of condensation reactions shown by aldehydes.
(10+10=20 Marks)
- Q.No.4** a) How will you prepare following compounds starting from benzene in two step mechanism?
(1) p-Chloro nitrobenzene (2) m-Chloro nitro benzene (3) Ethyl cyclohexane
(4) n-Propyl benzene (5) m-Dinitro benzene
- b) Why activating group direct in coming electrophile to ortho and para and deactivating group to meta position.
(10+10=20 Marks)
- Q.No.5** a) What are carbohydrates? Discuss metabolism of carbohydrates.
- b) What are Lipids? How you can classify them. Discuss their importance.
(10+10=20 Marks)
- Q.No.6** a) What is TLC? Explain its mechanism. Discuss its applications.
- b) Compare gas chromatography with liquid chromatography.
(14+6=20 Marks)
- Q.No.7** a) Discuss the application of Dyes.
- b) What are pigments? How they can be manufactured? Give some examples.
(8+12=20 Marks)
- Q.No.8** a) Explain the conformational analysis. On what factors conformational energy depends?
- b) Define optical activity. What are chiral compounds ? How chirality is determined by using polarimeter?
(10+10=20 Marks)



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MAXIMUM MARKS: 100

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- 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:** a) How will you apply the Schrodinger wave equation to a hydrogen atom.
b) Explain Principal quantum numbers (n). **(12+8=20 Marks)**
- Q No. 2:** a) Define Le Chatelier's principle and explain the effect of temperature and change in concentration in Haber's process.
b) Explain types of chemical equilibrium with two examples of each. **(12+8=20 Marks)**
- Q No. 3:** a) Define electrical conductance and describe the Wheatstone bridge system to measure the conductance.
b) What is molar conductance? Give classification of different electrolytes with examples. **(12+8=20 Marks)**
- Q No. 4:** a) Define radioactivity. Describe the natural and artificial radioactivity with two examples of each.
b) Describe the nature and properties of alpha (α) rays. **(12+8=20 Marks)**
- Q No. 5:** a) Predict the shapes of following molecules and ions on the basis of Valence Shell Electron Pair Repulsion (VSEPR) Theory
i) H_2Se ii) H_3O^+ iii) $COCl_2$ iv) I_3^- v) SF_4 vi) IF_5
b) Discuss the defects of VBT, MOT and VSEPR theories.
c) Why the structure of water molecule is not linear? **(12+6+2=20 Marks)**
- Q No. 6:** a) Write IUPAC names of the following complexes:
i) $Na_2[HgCl_4]$ ii) $K_3[Fe(C_2O_4)_3]$ iii) $[Ni(CO)_2(Ph_3P)_2]$
iv) $[Co(ONO)(NH_3)_5]SO_4$ v) $[(NH_3)_5Cr-OH-Cr(NH_3)_5]Cl_5$
b) Sketch the structure of following complexes on the basis of VBT:
i) $[Fe(CN)_6]^{3-}$ ii) $[MnCl_4]^{2-}$ iii) $[Ni(CN)_4]^{2-}$ iv) $[Co(CO)_6]^{3+}$
c) Discuss the defects of VBT when applied to transition metal complexes **(6+10+4=20 Marks)**
- Q No. 7:** a) Explain in detail the Contact process for the manufacture of Sulphuric acid along with flow sheet diagram.
b) Define and give general formula of glass. What is meant by annealing of glass. **(15+5=20 Marks)**
- Q No. 8:** a) Explain Photochemical smog and Acid rain.
b) Discuss heavy metal pollution in water emphasizing on lead, mercury and cadmium. **(12+8=20 Marks)**