PUNJAB PUBLIC SERVICE COMMISSION

COMBINED COMPETITIVE EXAMINATION FOR RECRUITMENT TO THE POSTS OF PROVINCIAL MANAGEMENT SERVICE -2020

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.

Attempt FIVE Questions in all. Attempt in Urdu or English.

Q.No.1 a) Define the Concentration, activity and activity coefficient

b) Discuss the importance of Gibbs free energy in chemistry

c) What is radioactivity and how it is measured? (3+7+10=20)

Q. No.2 a) Define the 1st law of thermodynamics and derive its mathematical expression

b) What is a nuclear reaction? Differentiate between fission and fusion reaction (10+10=20)

Q. No.3 a) Define the equalent and molar conductance. How they are measured?

b) Differentiate between:

i. Potential and potential difference

ii. Normal hydrogen and glass electrode

c) What is pH and how it is measured? (10+4+6=20)

Q. No.4 a) Explain the relationship between free energy and equilibrium constant

b) How diammonium phosphate fertilizer is prepared?

c) How caustic soda is prepared and obtained in solid form? (5+5+10=20)

Q. No.5 a) What are chelates? Draw structure of three chelate

b) What is the difference between VBT and CFT?

c) Define the transition elements, where they are found the periodic table and discuss their ionic configuration. (5+5+10=20)

Q. No.6 a) Define hybrid orbital, bond order and metallic bond

b) What is molecular orbital theory?

c) Differentiate between ionic and covalent bonds

d) Draw the molecular orbital diagram of O_2 molecule and discuss its paramagnetic nature. Also discuss the non-existence of helium molecule on the basis of Molecular Orbital Theory. (3+3+4+10=20)

Q. No.7 a) Define eigen function and eigen value

b) Derive schrodinger wave function and discuss its physical significance.

c) Explain the Tunnel Effect (2+10+8=20)

Q. No.8 a) Explain briefly the advantages and disadvantages of supplying sewerage and sludge to the agriculture soil

b) State and explain the Deby-Huckel theory. How it can be applied to the strong electrolyte (10+10=20)

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COMBINED COMPETITIVE EXAMINATION FOR RECRUITMENT TO THE POSTS OF PROVINCIAL MANAGEMENT SERVICE -2020

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.

Attempt FIVE Questions in all. Attempt in Urdu or English.

Q.No.1 **(a) Illustrate the difference between the following with example:** **(4+5=9)**
i. Tautomerism and Steric Effect
ii. Centre of Symmetry and Axis of Symmetry
(b) Why $ClCH_2COOH$ and HCOOH are stronger acid than CH_3COOH? **(5)**
(c) Explain how the Resonance effect makes the ortho and para positions of **(3+3=6)**
i) Phenol as nucleophilic center and
ii) Nitrobenzene as electrophilic center

Q No.2: **(a) How will you synthesize Aldehyde starting from:** **(3x3=9)**
i) Acid Chloride ii) Phenol iii) Toluene
(b) Discuss the mechanism of following reactions: **(4+3=7)**
i) Aldol Condensation ii) Reimer-Tiemann Reaction.
(c) What is the role of Tollen's reagent and Fehling's solution for the oxidation of aldehydes, but not for ketones? **(4)**

Q No.3: **(a) Describe the main components and their role in a simple double beam IR Spectrophotometer.** **(9)**
(b) Elaborate the principle of Raman Spectroscopy and how this spectroscopy is more advantageous over IR Spectroscopy? **(4+2=6)**
(c) Write a brief note on applications of UV/VIS Spectroscopy. **(5)**

Q No.4: **(a) Starting from Benzene, how will you prepare the following:** **(3+4+4+4=15)**
i) Benzoic acid ii) 2,5-Cyclohexadiene-1-carboxylic acid
iii) t-Butyl benzene iv) Benzo trichloride
(b) Discuss orientation in substituted Naphthalene **(5)**

Q No.5: **(a) Explain any four methods for the resolution of a racemic mixture.** **(8)**
(b) Define the following terms: **(6x2=12)**
i) Steroids ii) PCR iii) Epimerization
iv) Oligosaccharides v) Composites vi) Vulcanization

Q No.6: **(a) What are Vitamins? How are they classified? Discuss the role of various vitamins in human body.** **(2+2+5=9)**
(b) State applications of Column chromatography **(3)**
(c) What are the differences between Dyes and Pigments? **(3)**
(d) Discuss why Dyes are colored compounds? **(5)**

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Q No.7: **(a) How would you classify pigments and what are the characteristics of a good pigment?** **(3+3=6)**

(b) Write names and structures of the monomers from which each of the following polymers can be prepared **(5)**

i) Teflon ii) Orlon iii) Nylon 6
iv) Dacron v) Neoprene

(c) Elaborate the following: **(3+3+3=9)**

i) Development of Chromatogram
ii) Types of Addition Polymerization
iii) Effect of Doping in Semiconductors.