FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION FOR RECRUITMENT TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT, 2014
CHEMISTRY, PAPER-I

Roll Number

TIME ALLOWED:	**(PART-I MCQs)**	**30 MINUTES**	**MAXIMUM MARKS: 20**
THREE HOURS	**(PART-II)**	**2 HOURS & 30 MINUTES**	**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) Candidate must write **Q. No.** in the **Answer Book** in accordance with **Q. No.** in the **Q. Paper.**
(iv) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
(v) Extra attempt of any question or any part of the attempted question will not be considered.

PART-II

Q. No. 2. **(a)** What are zeolites and how can they be synthesized? Give some important applications of zeolites. **(07)**
(b) Explain significance of quantum mechanical wave function. Also enlist properties of a well-behaved wave function. **(07)**
(c) Write some important chemical properties of Cl_2. Also give its general and industrial applications. **(06)**

Q. No. 3. **(a)** How are the human activities in urban areas responsible for air-pollution? What measures should be taken to minimize air-pollution? **(07)**
(b) With suitable examples differentiate between internal energy change and enthalpy change. Under what conditions the two quantities have almost same value? **(07)**
(c) Explain dissociation of weak acids. How can dissociation constant be determined using conductance measurements? **(06)**

Q. No. 4. **(a)** Many transition element complexes (TEC) exhibit their characteristic spectra in the visible-region. Give detailed account of factors which affect/modify spectra of the TEC. **(07)**
(b) Explain synthesis of cement; also draw flow-chart diagram to show the significant steps. **(07)**
(c) Explain significance of Gibbs expression. How can ΔG value be utilized to predict occurrence of a chemical reaction? **(06)**

Q. No. 5. **(a)** How does silver exist in nature? What shape compounds are formed by Ag (I) with different ligands? **(07)**
(b) Elaborate the common and different features of H_2 and H_2^+ molecules according to the pertinent molecular orbital theory. **(07)**
(c) Enlist different oxyacids of N and P. Also explain differences in their behaviour. **(06)**

Q. No. 6. **(a)** Derive Schroedinger's wave equation for a particle of mass '*m*' confined in a one-dimensional box of length '*l*'. Also give a relationship for the zero-point energy. **(07)**
(b) Define 2^{nd} law of thermodynamics. How can the entropy change become an indicator for spontaneity of a process? **(07)**
(c) How can shapes of transition element complexes (TEC) be explained on the basis of some typical hybridization by the central ion? **(06)**

Q. No. 7. **(a)** Describe functioning of a typical Fuel-Cell (FC). What is the role of membrane equilibria in the FC?. **(07)**
(b) What is the origin of magnetic property in the complexes of transition elements? Give some factors on which magnetic property may depend. **(07)**
(c) With suitable examples of multi-electron atoms, elaborate Aiufbau principle in the light of Pauli's principle and Hund's rule. **(06)**

Q. No. 8. **(a)** 'Debye-Hueckel theory (D-HT) Works under limiting conditions'. Elaborate the statement with examples. Also give significance of D-HT. **(07)**
(b) What are transition elements? Give a generalized account of physical and chemical characteristics of transition elements. **(07)**
(c) With the electrochemical reaction that take place at the two electrodes, describe 'electrolysis of aqueous solutions'. **(06)**

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CHEMISTRY, PAPER-II

Roll Number

TIME ALLOWED:	**(PART-I MCQs)**	**30 MINUTES**	**MAXIMUM MARKS: 20**
THREE HOURS	**(PART-II)**	**2 HOURS & 30 MINUTES**	**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) Candidate must write **Q. No.** in the **Answer Book** in accordance with **Q. No.** in the **Q. Paper.**
(iv) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
(v) Extra attempt of any question or any part of the attempted question will not be considered.

PART-II

Q. No. 2. Define the following terms: **(2 each)** **(20)**
(a) Catalytic cracking **(b)** Catalytic reforming **(c)** Fermentation
(d) Alkylation **(e)** Antibiotics **(f)** Plastic
(g) Surfactant **(h)** Unit operation **(i)** Unit Process
(j) Emulsion polymerization

Q. No. 3. **(a)** Explain the following with suitable examples. **(2 each)** **(14)**
(a) Partition Coefficient **(b)** Surface tension **(c)** Viscosity
(d) Colloidal solution **(e)** Emulsions **(f)** Nanoparticles
(g) Baeyer's strain theory

(b) Give one examples (with structure) of each of the following: **(2 each)** **(06)**
(a) *s – sp* hybridization **(b)** *sp2 – sp2* hybridization
(c) *sp – sp2* hybridization

Q. No. 4. **(a)** What do you mean by Chemiluminescence? Explain with examples. **(07)**

(b) Arrange the following functional groups in decreasing order of stability of carbocations? **(05)**

$(CH_3)_3C^+$, CH_3^+, $CH_3CH_2^+$, $(CH_3)_2CH^+$, $CH_2=CH-CH_2^+$, $C_6H_5CH_2^+$,

(c) Explain the following terms:
(a) Standard solution **(b)** Molar solution **(c)** Molal solution **(05)**
(d) Formal Solution **(e)** Normal solution

(d) How many grams of KOH are in 600 mL of 0.450 M KOH solution? **(03)**

Q. No. 5. Give one representative example of each of the following reactions. Give complete equation and label it. **(2 each)** **(20)**
(a) Witting reaction **(b)** Oxiation of 1^o and 2^o alcohols
(c) Friedel-Crafts alkylation **(d)** Hydration of Alkenes
(e) Glycol cleavage **(f)** Ozonolysis
(g) Tollen's test **(h)** Propagation reaction
(i) SNl reaction **(j)** Condensation polymerization

Q. No. 6. **(a)** What are wetting agents and for what purpose they are used? **(10)**

(b) Describe briefly the alternatives used to hydrogenation of vegetable oils for the formation vegetable Ghee. **(05)**

(c) Give a laboratory test to differentiate between unsaturated and saturated molecules. **05)**

Q. No. 7. **(a)** What approaches are followed to rule out keto-enol tautomerism. Draw the tautomerism exhibited by acetone and acetoacetic ester. **(10)**

(b) Explain the industrial preparation of Gels? Explain their use in medicine and cosmetics? **(10)**

Q. No. 8. **(a)** Draw the structures of the following molecules: **(10)**

(a) Cyclohex-en-1-one **(b)** Cyclohexanecarbaldehyde
(c) Hexadecane **(d)** 3-methyl-1-butene
(e) 4-bromo-3-methy1-1-butene **(f)** 4-ethenylcyclohexanol
(g) 2-methy1-3-butene-1-ol **(h)** 6-ethyl-1-methylcyclohexene
(i) 2-amino-3-phenylpropionic acid **(j)** 2-formyl-4-oxocyclohexanecarboxylic acid

(b) Name the following structures according to IUPAC/common system of nomenclature: **(10)**

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