FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION FOR
RECRUITMENT TO POSTS IN BPS-17 UNDER
THE FEDERAL GOVERNMENT, 2010

CHEMISTRY, PAPER-I

TIME ALLOWED:	(PART-I) 30 MINUTES	MAXIMUM MARKS:20
	(PART-II) 2 HOURS & 30 MINUTES	MAXIMUM MARKS:80

NOTE: (i) **First** attempt **PART-I (MCQ)** on separate **Answer Sheet** which shall be taken back after **30 minutes.**
(ii) **Overwriting/cutting of the options/answers will not be given credit.**
(iii) **Scientific calculator is allowed**

PART – I (MCQ)
(COMPULSORY)

Q.1. **Select the best option/answer and fill in the appropriate box on the Answer Sheet.** **(20)**

(i) When an electron is brought from infinite distance close to the nucleus of the atom, the energy of Electron-nucleus system?
   (a) increases to a smaller negative value   (b) decreases to a greater negative value
   (c) decreases to a smaller positive value   (d) increases to a greater positive value

(ii) The probability of finding the electron in the nucleus is:
   (a) 100% due to forces of attraction   (b) finite for all orbitals
   (c) Zero for all orbitals   (d) Zero for some orbitals and finite for others

(iii) When Zn metal is kept in $CuSO_4$ solution, copper is precipitated and $ZnSO_4$ is formed because:
   (a) Atomic number of Zinc is smaller than copper
   (b) Atomic number of Zinc is larger than copper
   (c) Standard reduction potential of Zinc is more than that of copper
   (d) Standard reduction potential of Zinc is less than that of copper

(iv) Electrolytes when dissolved in water, dissociate into their constituent ions, the degree of dissociation of an electrolyte increases with the:
   (a) Presence of a substance yielding common ion
   (b) Decreasing temperature
   (c) Decreasing concentration of electrolyte
   (d) Increasing concentration of electrolyte

(v) There is a large positive entropy change for an exothermic reaction. It means that the reaction will be:
   (a) possible at high temperatures only   (b) impossible at all temperatures
   (c) possible at low temperatures only   (d) possible at all temperatures

(vi) Which of the following statement is false?
   (a) the temperature of the system will fall if an exothermic reaction is isolated from its surroundings
   (b) Energy is absorbed when one compound is converted into another with higher heat content
   (c) the temperature of the system is likely to fall if heat is absorbed during the course of a reaction
   (d) None of these

(vii) The H_____ bond is strongest in:
   (a) S–H ……O   (b) O-H …….S   (c) F–H ……..O   (d) F–H ……..S

(viii) Heavy water contains:
   (a) Large amount of salts   (b) Deuterium   (c) O^{18} (d) O^{16}

(ix) pH + pOH of a solution is:
   (a) 7   (b) Zero   (c) 14   (d) -14

(x) The compound that is not Lewis acid:
   (a) BF_3 (b) $BaCl_2$ (c) $SnCl_4$ (d) $AlCl_3$

(xi) Strongest acid having K_a:
   (a) 10^4 (b) 10^{-4} (c) 1   (d) 10^{-2}

(xii) Ore of Aluminium:
   (a) Calamine   (b) Dolomite   (c) Bauxite   (d) Limestone

(xiii) Oxidation number of S in sulphuric acid:
    (a) Four   (b) Six   (c) Two   (d) Eight

(xiv) d-block elements form coordination compounds because of:
    (a) Small Cationic size   (b) Large ionic Charge
    (c) Unfilled d-orbitals   (d) Filled d-orbitals

(xv) Brass is an alloy of:
    (a) Cu and Zn   (b) Cu, Ni, Zn   (c) Cu and Ni   (d) Cu, Al, Zn

(xvi) Urea is a high quality nitrogenous fertilizer with:
    (a) 76% nitrogen   (b) 46% nitrogen   (c) 66% nitrogen   (d) 26% nitrogen

(xvii) Diamond is:
    (a) Good conductor of electricity   (b) Bad conductor of electricity
    (c) Bad conductor on heating   (d) Good conductor on heating

(xviii) Carbon monoxide is poisonous gas because it:
    (a) replaces oxygen from lungs   (b) forms carboxy haemoglobin
    (c) Forms carbon dioxide with oxygen   (d) has a sweet smell

(xix) Rust is:
    (a) $FeO + Fe(OH)_2$ (b) $Fe_2O_3 + Fe(OH)_2$ (c) Fe_2O_3 (d) $Fe_2O_3 + Fe(OH)_3$

(xx) Calcium Carbide reacts with water to give:
    (a) Methane   (b) Ethylene   (c) Acetylene   (d) Ethane

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) Extra attempt of any question or any part of the attempted question will not be considered.

Q.2. (a) Derive the Principal Quantum number from schrodinger wave equation and justify that if the orbit of hydrogen atom is spherically symmetrical then expression for energy of electron is the same as deduced by Bohr. **(12)**

    (b) An atom of Helium is moving in one Dimensional box of width 10^{-2} m. Calculate the energy difference between second and third energy level. **(8)**

Q.3. (a) How do you measure the pH of a solution by potentiometric method using: **(15)**
    (i) Hydrogen Electrode   (ii) Glass Electrode

    (b) Calculate the pH of a buffer solution containing 0.2M acetic acid and 0.02 M sodium acetate. pK_a of acetic acid is 4.73. **(5)**

Q.4. (a) Define following types of processes: **(8)**
    (i) Isothermal   (ii) Adiabatic   (iii) Isochoric   (iv) Isobaric

    (b) How the pressure, temperature and volume of a gas are related to each other in adiabatic process: **(8)**

    (c) 1 mole of an ideal gas at $25^{o}c$ is allowed to expand reversibly at constant temperature from $15dm^3$ to $30dm^3$ calculate the work done by gas: **(4)**

Q.5. (a) What is acid rain? How is it produced? Give in detail its chemistry. **(8)**
    (b) Discuss the harmful effects of acid rain on environment and human health. **(8)**
    (c) Enlist major sources for air pollution. **(4)**

Q.6. (a) Describe the composition of Portland cement. **(6)**
    (b) Which raw materials are used to manufacture glass on industrial scale? **(6)**
    (c) What is fibre glass? Describe its uses. **(4)**
    (d) Which compounds are added to impart different colours to glass? **(4)**

Q.7. (a) How is urea manufactured in Pakistan, explain with flow sheet diagram? **(10)**
    (b) Name at least four nigtrogenous fertilizers. **(4)**
    (c) 5.35 gm NH_4Cl is heated with excess of quick lime. What is the weight of ammonia obtained? If this ammonia is dissolved in 1 litre of water, Calculate the normality of this solution. **(6)**

Q.8. (a) What are transition metals? Discuss their characteristic features. **(12)**
    (b) Why AgCl is soluble in NH_3? **(4)**
    (c) What are alloy steels, give some examples? **(4)**

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