Roll No. ☐☐☐☐☐☐

Answer Sheet No._____

Sig. of Candidate._____

Sig. of Invigilator._____

CHEMISTRY HSSC–I

SECTION – A (Marks 17)

Time allowed: 25 Minutes

NOTE:- Section–A is compulsory and comprises pages 1–2. All parts of this section are to be answered on the question paper itself. It should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Insert the correct option i.e. A / B / C / D in the empty box provided opposite each part. Each part carries one mark.

(i) If a compound has empirical formula C_3H_3O and its molecular mass is $110\,g\,mol^{-1}$ then what is the molecular formula of the compound?
A. C_3H_3O
B. C_6H_6O
C. $C_6H_6O_2$
D. $C_3H_3O_2$

(ii) A ring is made of diamond having mass $6g$. How many atoms are present in it?
A. 6.02×10^{23}
B. 3.01×10^{23}
C. 1.505×10^{23}
D. 0.75×10^{23}

(iii) The technique in which a solute is separated from a solution by shaking the solution with a solvent in which the solute is more soluble and the added solvent does not mix with solution, is called
A. Crystallization
B. Sublimation
C. Chromatography
D. Solvent Extraction

(iv) What are the SI units of excluded volume 'b' in van der Waals equation?
A. $dm^3\,mol^{-1}$
B. $m^3.mol^{-1}$
C. $mol.dm^{-3}$
D. $mol\,m^{-3}$

(v) London dispersion forces are the only forces present among the:
A. Molecules of water in liquid state
B. Atoms of Helium in gaseous state at high temperature
C. Molecules of solid iodine
D. Molecules of Hydrogen Chloride gas

(vi) The temperature at which two crystalline forms of the same substance can co-exist in equilibrium with each other is called Transition Temperature. The Transition Temperature of Grey tin (cubic) ⇌ White tin (Tetragonal) is:
A. $13.2^{o}C$
B. $14.2^{o}C$
C. $15.2^{o}C$
D. $16.2^{o}C$

(vii) How many electrons can be accommodated in sub-shell for which $n=3$ and $l=2$?
A. 2
B. 6
C. 10
D. 14

(viii) A molecule has two lone pairs and two bond pairs of electrons around the central atom. The shape of molecule is:
A. Linear
B. Angular
C. Pyramidal
D. Tetrahedral

(ix) Which equation define Lattice energy of the compound XY ?

    A. $X_{(s)} + Y_{(s)} \longrightarrow XY_{(s)}$

    B. $X^+_{(s)} + Y^-_{(s)} \longrightarrow XY_{(s)}$

    C. $X_{(g)} + Y_{(g)} \longrightarrow XY_{(s)}$

    D. $X^+_{(g)} + Y^-_{(g)} \longrightarrow XY_{(s)}$

(x) The unit of Kc for the reaction:

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ will be:

    A. $moles\ dm^{-3}$ B. $moles^{-1}\ dm^{+3}$

    C. $moles^2\ dm^{-3}$ D. $moles^{-2}\ dm^{+6}$

(xi) The pH of milk at $25°C$ is:

    A.   6.0   B.   6.5

    C.   7.0   D.   7.8

(xii) Butter is an example of solution:

    A.   Liquid in liquid   B.   Solid in liquid

    C.   Liquid in solid   D.   Solid in solid

(xiii) $18g$ glucose is dissolved in $90g$ of water. The relative lowering of vapour pressure is equal to:

    A. $\dfrac{1}{5}$ B. $\dfrac{1}{51}$

    C.   5.1   D.   6

(xiv) Caustic soda is obtained on industrial scale by the electrolysis of aqueous solution of sodium chloride is carried out in a cell called:

    A.   Daniell's cell   B.   Down's cell

    C.   Nelson's cell   D.   Voltaic cell

(xv) Which of the following statements is not correct about Galvanic cell?

    A.   Anode is negatively charged

    B.   Reduction occurs at anode

    C.   Cathode is positively charged

    D.   Reduction occurs at cathode

(xvi) If the rate equation of a reaction $2A + B \longrightarrow$ products is rate $= K[A]^2[B]$, and A is present in large excess, then order of reaction is:

    A.   3   B.   1

    C.   2   D.   None of these

(xvii) The manufacture of sulphuric acid in the contact process needs platinum as a catalyst. The platinum catalyst is poisoned by:

    A.   Silver   B.   Zinc

    C.   Arsenic   D.   Argon

CHEMISTRY HSSC–I

Time allowed: 2:35 Hours   Total Marks Sections B and C: 68

NOTE:-   Sections 'B' and 'C' comprise pages 1–2 and questions therein are to be answered on the separately provided answer book. Answer any fourteen parts from Section 'B' and attempt any two questions from Section 'C'. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.

SECTION – B (Marks 42)

Q. 2   Attempt any FOURTEEN parts. The answer to each part should not exceed 5 to 6 lines.

(14 x 3 = 42)

(i)	Define the following with examples:		
	a.	Gram Formula	01
	b.	Gram Atom	01
	c.	Gram Ion	01
(ii)	Write down the methods for drying of the Crystallized Substance.		03
(iii)	Justify that $180g$ of glucose and $342g$ of sucrose have same number of molecules but different number of atoms present in them.		03
(iv)	What is the general principle of liquefaction of gases? Also, define the Critical Temperature with one example.		2+1
(v)	Calculate the density of ammonia in $grams/dm^3$ at $752\,mmHg$ and $55^{o}C$.		03
(vi)	Vacuum distillation can be used to avoid decomposition of a sensitive liquid. Explain with example.		03
(vii)	Ionic crystals are brittle in nature while metals are ductile and malleable. Explain the difference.		03
(viii)	Calculate the value of principal quantum number if an electron in hydrogen atom revolves in an orbit of energy $-0.242\times10^{-18}J$.		03
(ix)	Derive de-Broglie equation about Dual Nature of Matter. What does this equation show?		2+1
(x)	Define Ionization Energy. Name the factors on which ionization energy of an atom depends.		03
(xi)	Explain atomic orbital hybridization with reference to sp-Hybridization for Ethyne (C_2H_2).		03
(xii)	Define Enthalpy of Atomization and Enthalpy of Neutralization with examples.		03
(xiii)	How Kc can be used to predict the direction of a chemical reaction?		03
(xiv)	What is common ion effect? Explain with two examples?		03
(xiv)	One molal solution of urea, in water is dilute as compared to one molar solution of urea, but the number of particles of solute is same. Justify it.		03
(xvi)	What are Ebullioscopic and Cryoscopic constants?		03

(xvii) Calculate the Oxidation Number of elements underlined in the following compounds: 03

     a. $Na_2\underline{C}O_3$ b. $H\underline{N}O_3$

     c. $K\underline{Mn}O_4$ d. $K_2\underline{Cr_2}O_7$

     e. $Na\underline{Cl}O_3$ f. $H_2\underline{S}O_4$

(xviii) Silver Oxide Battery is a tiny and expensive battery:

     a.   Write down the chemical reactions taking place at Anode and Cathode.   02

     b.   Give any two uses of this battery.   01

(xix) What is Heterogeneous Catalysis? Explain with two examples.   03

SECTION – C (Marks 26)

Note:-   **Attempt any TWO questions. All questions carry equal marks.**

        (2 x 13 = 26)

Q. 3   a.   State Graham's Law of Diffusion. Also verify it experimentally.   2+3

     b.   Explain the following with reasons:

        (i)   Heat of sublimation of a substance is greater than that of vapourization.   02

        (ii)   Earthenware vessels keep water cool.   02

     c.   A mixture of two liquids, N_2H_4 and N_2O_4 are used in rockets. They produced N_2 and water vapours according to the following reaction.

$$2N_2H_4 + N_2O_4 \longrightarrow 3N_2 + 4H_2O$$

      If $100g$ of N_2H_4 and $200g$ of N_2O_4 are allowed to react then:

        (i)   How many grams of N_2 gas will be formed?   02

        (ii)   Calculate the excess amount of reagent left unreacted.   02

Q. 4   a.   State Chadwick's experiment for discovery of Neutron. Also, write down any four properties of Neutron.   3+2

     b.   Differentiate between sigma and Pi bonds by giving one example of each.   2+2

     c.   Octane (C_8H_{18}) is a motor fuel. $1.80g$ of a sample of octane is burned in a bomb calorimeter having heat capacity $11.66\,kJ\,K^{-1}$. The temperature of the calorimeter increases from $21.36\,C^o$ to $28.78\,C^o$. Calculate the heat of combustion for 1g of octane. Also, calculate the heat for one mole of octane.   2+2

Q. 5   a.   What are Buffer Solutions? Derive Henderson's equation to calculate the pH of a buffer.   1+3

     b.   Balance the following ionic equations by ion-electron method:

        (i) $Cl^- + MnO_4^- \longrightarrow Cl_2 + Mn^{+2}$ (Acidic medium)   02

        (ii) $S_2O_3^{-2} + OCl^{-1} \longrightarrow Cl^{-1} + S_4O_6^{-2}$ (Acidic medium)   02

     c.   Write down the important characteristics of Enzyme Catalysis.   05

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