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Answer Sheet No. _____

Sig. of Candidate. _____

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CHEMISTRY HSSC-I

SECTION – A (Marks 17)

Time allowed: 25 Minutes

(Revised Syllabus)

Version Number

1	7	0	2
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NOTE:- Section-A is compulsory. 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 Circle the correct option i.e. A / B / C / D. Each part carries one mark.

- (i) Which one of the following metal cannot displace H_2 from H_2O ?
 A. Cu B. Na C. K D. Ca
- (ii) The number of covalent bonds present in 8 g CH_4 are:
 A. 1.204×10^{24} B. 3.01×10^{23} C. 6.02×10^{23} D. 6.02×10^{24}
- (iii) Paschen series of spectral lines is produced due to transition of electrons from higher orbit to the:
 A. 4th orbit B. 1st orbit C. 2nd orbit D. 3rd orbit
- (iv) Which set of quantum numbers is NOT valid for an electron?
 A. $n = 3, l = 2, m = -2$ B. $n = 1, l = 1, m = 0$
 C. $n = 2, l = 0, m = 0$ D. $n = 3, l = 1, m = -1$
- (v) The central atom is sp^2 hybridized in:
 A. CH_4 B. $BeCl_2$ C. BF_3 D. H_2O
- (vi) Which one of the following has greater bond energy?
 A. $N \equiv N$ B. $C \equiv O$ C. $C \equiv N$ D. $C \equiv C$
- (vii) Which one of the following gases possesses lowest density?
 A. CH_4 B. CO_2 C. N_2 D. NH_3
- (viii) If both the pressure and temperature of a gas are doubled, the volume will:
 A. Remain same B. Become double
 C. Increase four times D. Become half
- (ix) The boiling points of NH_3 , H_2O and HF decrease in the order:
 A. $HF > NH_3 > H_2O$ B. $H_2O > NH_3 > HF$
 C. $H_2O > HF > NH_3$ D. $HF > H_2O > NH_3$
- (x) The existence of two compounds in the same crystalline form is known as:
 A. Allotropy B. Anisotropy C. Isomorphism D. Polymorphism
- (xi) In the reaction $N_2O_4 \rightleftharpoons 2NO_2$ $\Delta H = +57.2 \text{ kJ}$ the equilibrium will be shifted in forward direction by:
 A. Increasing the concentration of NO_2 B. Increasing the temperature
 C. Increasing the pressure D. Decreasing the volume
- (xii) Which salt will form acidic solution in water?
 A. K_2CO_3 B. KCl C. $NaBr$ D. NH_4Cl
- (xiii) The order of enzyme catalysed reaction is:
 A. 3 B. 0 C. 1 D. 2
- (xiv) The boiling point of 0.1 molal solution of glucose in water is:
 A. $105.2^\circ C$ B. $100.52^\circ C$ C. $100.052^\circ C$ D. $101.86^\circ C$
- (xv) 18 g glucose is dissolved in 180 g water. The relative lowering in vapour pressure is:
 A. 0.001 B. 10 C. 1.8 D. 0.01
- (xvi) The standard enthalpy of formation is zero for:
 A. $C_6H_{12}O_6$ B. O_2 C. H_2O D. $NaCl$
- (xvii) One coulomb is the charge carried by:
 A. 9.11×10^{31} electrons B. 6.25×10^{18} electrons
 C. 1.602×10^{19} electrons D. 6.02×10^{23} electrons

For Examiner's use only:

Total Marks:

17

Marks Obtained:



CHEMISTRY HSSC-I

(Revised Syllabus)

Time allowed: 2:35 Hours

Total Marks Sections B, C and D: 68

NOTE: The Questions of sections B, C and D are to be answered on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)

(Chapters 1 to 6)

Q. 2 Answer any SEVEN parts. All parts carry equal marks. (7 x3 = 21)

- (i) One mole of H_2SO_4 should completely react with two moles of $NaOH$. How does Avogadro's number help to explain it?
- (ii) Calculate the radius of first orbit of Hydrogen atom and Helium ion. Which one has smaller radius? Give reason.
- (iii) Describe the reason for the production of X-rays.
- (iv) Draw the molecular orbital diagram for F_2 and calculate its bond order.
- (v) State and explain Joule – Thomson effect.
- (vi) a. State Graham's law.
b. Determine the molar mass of a gas which diffuses four times faster as compared to SO_2 gas.
- (vii) Calculate the bond energy of HBr . Bond energy of H_2 is 436 kJ/mol and that of Br_2 is 193 kJ/mol.
- (viii) Explain why?
a. Evaporation is a cooling process.
b. C_6H_{14} is a liquid whereas C_2H_6 is a gas.
- (ix) Write any three differences between molecular and metallic solids.
- (x) What is absolute zero? How will you derive it from Charles' law?

SECTION – C (Marks 21)

(Chapters 7 to 12)

Q. 3 Answer any SEVEN parts. All parts carry equal marks. (7 x3 = 21)

- (i) Describe the effect of increase in pressure and temperature on the following reaction at equilibrium: $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)} \quad \Delta H = -198 \text{ kJ}$
- (ii) a. What is a precipitation reaction?
b. How will you predict the formation of precipitates when two solutions are mixed together?
- (iii) What is levelling effect? Describe giving an example.
- (iv) Write down any three applications of buffer solutions.
- (v) a. For the reaction $NO_2 + CO \longrightarrow NO + CO_2$ Rate = $K [NO_2]^2$ write down the mechanism.
b. What will happen if the concentration of CO is increased three times in the above reaction? Justify your answer.
- (vi) What is Arrhenius equation? How this equation describes the effect of increase in temperature on the rate constant and rate of a reaction?
- (vii) Concentration of H_2SO_4 is 98% w/w. Its density is 1.84 g/cm^3 . Calculate the molarity and molality of this solution.
- (viii) Define Osmotic pressure, Colloids, and Molal Freezing point Depression constant.
- (ix) What is Calorimetry? Briefly describe its types.
- (x) Describe the rusting of iron, giving the reactions taking place during the process.

SECTION – D (Marks 26)

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

(13 x 2 = 26)

(Question 4 from Chapters 1 to 6)

- Q. 4**
- a. Define hybridization. Name its types? Explain the structure of ethyne on the basis of hybridization. (1+1+5)
 - b. Derive a relationship for total energy of electron present in n th orbit of hydrogen atom. (6)

(Question 5 from Chapters 7 to 12)

- Q. 5**
- a. Describe the quantitative aspect of elevation in boiling point. (6)
 - b. What is Born Haber cycle? Draw a labelled Born-Haber cycle for the formation of $NaCl$. (2+5)

(Question 6 Part (a) from Chapters 1 to 6 and Part (b) Chapters 7 to 12)

- Q. 6**
- a. Differentiate between limiting and non-limiting reactants. Calculate the mass of NH_3 produced when 100 g $Ca(OH)_2$ is reacted with 100 g NH_4Cl .
 $Ca(OH)_2 + 2NH_4Cl \longrightarrow CaCl_2 + 2NH_3 + 2H_2O$ (2+4)
 - b. Describe the construction and working of an ordinary dry cell and alkaline dry cell, giving the reactions taking place at anode and cathode. (7)

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CHEMISTRY HSSC-I

SECTION – A (Marks 17)

Time allowed: 25 Minutes

(Revised Syllabus)

Version Number

1	7	0	5
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NOTE:- Section-A is compulsory. 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 Circle the correct option i.e. A / B / C / D. Each part carries one mark.

- (i) The number of H^+ ions produced by complete ionization of 9.8 g H_3PO_4 is:
 A. 6.022×10^{22} B. 1.204×10^{23} C. 1.806×10^{23} D. 2.40×10^{23}
- (ii) When ${}^{65}_{29}Cu$ is bombarded with slow neutrons, the radiations emitted are:
 A. α - rays B. β - rays C. γ - rays D. X - rays
- (iii) The radius of 1st orbit of Li^{+2} ion is:
 A. $0.176 A^\circ$ B. $0.2645 A^\circ$ C. $0.529 A^\circ$ D. $2.116 A^\circ$
- (iv) The molecular geometry is determined by the repulsion between only the bond pairs in:
 A. $SnCl_2$ B. $PbCl_2$ C. PCl_3 D. BCl_3
- (v) The energy of σ_{2px} orbital is higher than π_{2py} & π_{2pz} orbitals in the molecular orbital diagram of:
 A. N_2 B. O_2 C. O_2^{+2} D. F_2
- (vi) The volume occupied by 14 g N_2 gas at STP is:
 A. $1.12 dm^3$ B. $2.24 dm^3$ C. $11.2 dm^3$ D. $22.4 dm^3$
- (vii) The relative rate diffusion of CH_4 and SO_2 gases is:
 A. 2:1 B. 1:2 C. 1:4 D. 4:1
- (viii) Hydrogen bonding is **NOT** involved in:
 A. High b.p. of H_2O B. Solubility of CH_3OH in water
 C. Cleansing action of soap D. Existence of C_6H_{14} in liquid state
- (ix) Which one of the following ionic compound possesses greater lattice energy:
 A. $NaCl$ B. KCl C. $MgCl_2$ D. $CaCl_2$
- (x) The value of K_c and K_p will be the same for the reaction:
 A. $N_2 + 3H_2 \rightleftharpoons 2NH_3$ B. $2SO_2 + O_2 \rightleftharpoons 2SO_3$
 C. $N_2 + O_2 \rightleftharpoons 2NO$ D. $N_2O_4 \rightleftharpoons 2NO_2$
- (xi) pH of 0.001 M $Ca(OH)_2$ is:
 A. 3 B. 2.7 C. 11 D. 11.3
- (xii) The rate constant is equal to the rate of reaction if the order of reaction is:
 A. 0 B. 1 C. 2 D. 3
- (xiii) The molarity of $100 cm^3$ solution containing 4 g $NaOH$ is:
 A. 0.1 M B. 0.5 M C. 1.0 M D. 1.5 M
- (xiv) A colloid containing a liquid dispersed into another liquid is called:
 A. Sol B. Gel C. Aerosol D. Emulsion
- (xv) Which one of the following enthalpy is always negative?
 A. Enthalpy of formation B. Enthalpy of solution
 C. Enthalpy of atomization D. Enthalpy of combustion
- (xvi) The number of moles of Cr deposited by passing 1.5 F electricity in the following reaction $Cr^{+3} + 3e^- \rightarrow Cr$ is:
 A. 0.5 moles B. 1.0 mole C. 1.5 moles D. 3 moles
- (xvii) The number of electrons required to balance the following half equation $SO_2 + 2H_2O \rightarrow SO_4^{2-} + 4H^+$ is:
 A. $1e$ B. $2e$ C. $3e$ D. $4e$

For Examiner's use only:

Total Marks:

17

Marks Obtained:



CHEMISTRY HSSC-I

(Revised Syllabus)

Time allowed: 2:35 Hours

Total Marks Sections B, C and D: 68

NOTE: The Questions of sections B, C and D are to be answered on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)

(Chapters 1 to 6)

Q. 2 Answer any SEVEN parts. All parts carry equal marks. (7 x3 = 21)

- (i) Why the actual yield in a chemical reaction is less as compared to the theoretical yield?
- (ii) Calculate the wave number of radiation emitted when an electron shifts from 4th and 2nd orbit in hydrogen atom. Also name the series of spectral lines formed by these radiations.
- (iii) Justify that the e/m ratio of cathode rays is independent of nature of gas whereas that of positive rays depends upon it.
- (iv) Explain briefly the structure of $SnCl_2$ and PCl_5 on the basis of VSEPR theory.
- (v) The observed dipole moment of HCl is 1.03D and bond length is 127 pm. Calculate percentage ionic character in HCl .
- (vi) 150 cm^3 of H_2 gas effuses through a porous partition in 10 seconds. In how much time the same volume of O_2 gas will effuse?
- (vii) a. State Dalton's law of partial pressure.
b. How this law describes the process of breathing at high altitude?
- (viii) Describe vacuum distillation, giving its one application.
- (ix) Define Anisotropy, Transition Temperature, and Cleavage plane.
- (x) What are the liquid crystals? Write down their two uses in medical science.

SECTION – C (Marks 21)

(Chapters 7 to 12)

Q. 3 Answer any SEVEN parts. All parts carry equal marks. (7 x3 = 21)

- (i) a. Define solubility product.
b. Calculate the solubility of $PbSO_4$ when $K_{sp} = 1.96 \times 10^{-8}$ at $25^\circ C$.
- (ii) What is the effect of increase in temperature on equilibrium position and the value of K_c on the given reaction? $N_2O_4 \rightleftharpoons 2NO_2$ $\Delta H = +57.2\text{ kJ/mol}$
- (iii) a. State Bronsted – Lowry concept of acids and bases.
b. Prove that CH_3COOH acts as a Bronsted acid as well as a base.
- (iv) What is a zero order reaction? Give two examples.
- (v) Differentiate between homogeneous and heterogeneous catalysis, giving one example of each.
- (vi) Write down the three statements of Raoult's law.
- (vii) Write down three differences between molarity and molality.
- (viii) Balance the equation by oxidation number method. $MnO_2 + HCl \rightarrow MnCl_2 + H_2O + Cl_2$
- (ix) Find out the cell potential for Ni/Mg cell. The values of reduction potential for half reactions are:
 $Ni^{+2} + 2e \rightleftharpoons Ni$ $E^\circ = -0.25\text{ V}$
 $Mg^{+2} + 2e \rightleftharpoons Mg$ $E^\circ = -2.38\text{ V}$
- (x) Calculate ΔH for the following reaction $S + O_2 \rightarrow SO_2$ from the following data:
 $S + \frac{3}{2}O_2 \rightarrow SO_3$ $\Delta H = -395.2\text{ kJ}$
 $2SO_2 + O_2 \rightarrow 2SO_3$ $\Delta H = -198.2\text{ kJ}$

SECTION – D (Marks 26)

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

(13 x 2 = 26)

(Question 4 from Chapters 1 to 6)

- Q. 4**
- a. Derive Vander Waal equation for a non-ideal gas. (07)
 - b. Differentiate between Sp^3 , Sp^2 and Sp hybridizations. Write any two differences. (06)

(Question 5 from Chapters 7 to 12)

- Q. 5**
- a. Describe the quantitative aspects of depression in Freezing point with the help of a graph. (06)
 - b. Explain the construction and working of lead storage battery. Write down the reactions taking place at the electrodes during the discharging process. (07)

(Question 6 Part (a) from Chapters 1 to 6 and Part (b) Chapters 7 to 12)

- Q. 6**
- a. Explain the origin of spectrum of hydrogen atom on the basis of Bohr's atomic model. What are the different series of spectral lines present in the infrared region of this spectrum and how they are formed? (06)
 - b. Explain how the mixture of CH_3COOH and CH_3COONa acts as a buffer. Also calculate the pH of a buffer containing 0.1 M CH_3COOH and 1.0 M CH_3COONa . The value of PK_a for CH_3COOH is 4.76. (07)

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Answer Sheet No. _____

Sig. of Candidate. _____

Sig. of Invigilator. _____

CHEMISTRY HSSC-I

SECTION – A (Marks 17)

Time allowed: 25 Minutes

(Old Syllabus)

NOTE: Section-A is compulsory. 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 Circle the correct option i.e. A / B / C / D. Each part carries one mark.

- (i) The spectrum of the different isotopes in the Mass-spectrometer is done on the basis of:
 A. Different amount of positive charge on each ion
 B. Different $\frac{e}{m}$ value
 C. Different $\frac{m}{e}$ value
 D. Velocities of the ions
- (ii) The volume occupied by 1.8 g of O_2 at STP is:
 A. 22.4 dm^3 B. 1.26 dm^3 C. 1.12 dm^3 D. 112 dm^3
- (iii) When hot saturated solution is cooled very rapidly we get?
 A. Medium sized crystals
 B. Large sized crystals
 C. Premature crystallization of the substance
 D. No crystallization
- (iv) A graph obtained from Boyle's law is:
 A. A straight line B. A curve with maximum
 C. A curve with minimum D. A parabolic curve called Isotherm
- (v) The critical temperature of Ar gas is low as compared to NH_3 and SO_2 due to the reason that:
 A. Ar is monoatomic gas B. It has a small size
 C. It has low polarizability D. It has four lone pairs in it
- (vi) Which one of the following liquids has lowest vapour pressure at $32^\circ C$?
 A. Ether B. Chloroform C. Ethanol D. Water
- (vii) $NaCl$ is a face-centered cubic structure. The Na^+ ion at the face of the unit cell is shared by:
 A. Two unit cells B. Four unit cells
 C. Only one unit cell D. Eight unit cells
- (viii) When 6d orbital is complete, the entering electron goes into:
 A. 7f B. 7s C. 7p D. 7d
- (ix) Which of the following molecules has zero-dipole moment?
 A. NH_3 B. $CHCl_3$ C. H_2O D. BF_3
- (x) Calorie is equivalent to:
 A. 0.418 J B. 41.84 J C. 4.184 J D. 418.4 J
- (xi) The unit of equilibrium constant K_c for the reaction $N_2 + 3H_2 \rightleftharpoons 2NH_3$ will be:
 A. $\text{dm}^6 \text{ mole}^{-2}$ B. $\text{mole}^2 \text{ dm}^{-6}$ C. mole dm^{-3} D. Having no units
- (xii) If more solvent is added to solution, the value of heat of solution:
 A. Increases
 B. Decreases
 C. Is not affected
 D. Is affected only when the solution is infinitely diluted
- (xiii) If a strip of Cu metal is placed in a solution of $FeSO_4$ then:
 A. Cu will be deposited B. Fe is precipitated out
 C. Cu and Fe both dissolve D. No reaction takes place
- (xiv) The unit of rate constant is the same as that of the rate of reaction in:
 A. First order reaction B. Second order reaction
 C. Third order reaction D. Zero order reaction
- (xv) After 3-half-lives of a chemical reaction the percentage fraction of the amount left is:
 A. 6.25 B. 75 C. 12.5 D. 50
- (xvi) Number of sigma bond(s) between two carbon atoms in C_2H_2 is/are:
 A. One B. Two C. Three D. Four
- (xvii) The Iodine present in water can be separated by which one of the following techniques?
 A. Sublimation B. Filtration C. Chromatography D. Solvent extraction

For Examiner's use only:

Total Marks:

17

Marks Obtained:



CHEMISTRY HSSC-I

(Old Syllabus)

32

Time allowed: 2:35 Hours

Total Marks Sections B and C: 68

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

SECTION – B (Marks 42)

Q. 2 Answer any FOURTEEN parts. The answer to each part should not exceed 5 to 6 lines. (14 x 3 = 42)

- (i) What are the number of covalent bonds in 8g of CH_4 ?
- (ii) What is the distribution co-efficient K ? To which technique is it applicable?
- (iii) Justify that the volume of the given mass of a gas becomes theoretically zero at $-273^\circ C$.
- (iv) Propanone (CH_3COCH_3), Propanol ($CH_3CH_2CH_2OH$) and butane ($CH_3CH_2CH_2CH_3$) have very similar relative molar masses. List them in order of increasing boiling points. Explain your answer.
- (v) What is the $H\alpha$ – line in hydrogen spectrum?
- (vi) How do you justify that the distances between adjacent orbitals of H atoms go on increasing from lower to higher orbits?
- (vii) Define Zeeman effect and stark effect.
- (viii) Calculate the number of electrons in s, p, d, f subshells with the help of formula.
- (ix) Calculate the value of principal quantum number if an electron in hydrogen atom revolves in an orbit of energy $-0.242 \times 10^{-18} J$.
- (x) How can the percentage of ionic character of the polar bond be determined?
- (xi) When do different types of chemical equilibrium constant for a reaction become equal?
- (xii) Define Raoult's law in three different ways.
- (xiii) The solubility product of Ag_2CrO_4 is 2.6×10^{-2} at $25^\circ C$. Calculate the solubility of the compound.
- (xiv) 4.675 g of a compound with empirical formula C_3H_3O were dissolved in 212.5 g of pure benzene. The freezing point of solution was found $1.02^\circ C$ less than that of pure benzene. The molal freezing point constant of benzene is $5.1^\circ C$. Calculate the relative molar mass.
- (xv) Write down the reactions in Alkaline battery. What is its voltage?
- (xvi) How is the Voltaic cell represented?
- (xvii) When does the reaction become Zero-order?
- (xviii) Balance the given equation by acidic medium $IO_3^{1-} + AsO_3^{3-} \longrightarrow AsO_4^{3-} + I^-$
- (xix) Differentiate between the internal energy change and enthalpy change.

SECTION – C (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks. (2 x 13 = 26)

- Q. 3 a. Calculate the number of grams of Al_2S_3 which can be prepared by the reaction of 20 g of Al and 30 g of sulphur. How much non-limiting reactant is in excess? 04
Atomic masses: $Al = 27$ $S = 32$
- b. Why is experimental yield mostly less than the theoretical yield? 03
- c. Write down the postulates of VSEPR theory. Discuss the structures of NH_3 , SO_2 with reference to this theory. 2+2+2
- Q. 4 a. How can the lattice energy of the ionic compound be measured by Born-Haber cycle? 06
b. What is Le-Chatelier's principle? Write down the effect of catalyst on equilibrium constant. 1+3
c. Explain how is the pressure of dry gas equal to the difference of total pressure and aqueous tension of water? 03
- Q. 5 a. Define and explain the Arrhenius equation. How does Arrhenius equation help us to calculate the energy of activation of a reaction? 2+4
b. What are the advantages of vacuum distillation? 04
c. State the biological applications of liquid crystal. 03