Version No.				
3	0	0	5	2

ROLL NUMBER					

CHEMISTRY HSSC-I

SECTION – A (Marks 17)

Time allowed: 25 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed.

Do not use lead pencil.

حصہ اوّل لازمی ہے۔اس کے جوابات اسی صفحہ پر دیے کرنا ظم مرکز کے حوالے کریں۔کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔لیڈ پنسل کا استعمال ممنوع ہے۔

Answer Sheet No. _____

ہر سوال کے سامنے دیے گئے، کریکولم کے مطابق درست دائرہ کو پر کریں۔ **Invigilator Sign.** _____

Fill the relevant bubble against each question according to curriculum: **Candidate Sign.** _____

	Question	A	B	C	D	A	B	C	D
1.	A liquid is thought to be pure ethanol. Which of the following is best way to test its purity?	Dehydrating it with H_2SO_4	Measuring its boiling point	Reacting with ethanol	Burning it completely	○	○	○	○
2.	Volume occupied by 2g of SO_2 gas at S.T.P will be:	$17dm^3$	$0.7dm^3$	$0.7cm^3$	$700dm^3$	○	○	○	○
3.	The largest/maximum number of molecules are present in:	180g of $C_6H_{12}O_6$	44g of CO_2	98g of H_2SO_4	36g of H_2O	○	○	○	○
4.	If $^{29}_{63}Cu$ and $^{79}_{197}Au$ are used as anodes for production of x-rays, then "Cu" will produce the x-rays of:	High energy	Shorter wavelength	Longer wavelength	High frequency	○	○	○	○
5.	The third line of Balmer series appears due to the transition of electron from:	$n_3 \rightarrow n_1$	$n_4 \rightarrow n_2$	$n_5 \rightarrow n_2$	$n_5 \rightarrow n_1$	○	○	○	○
6.	Which of the following covalent bond has **lowest** bond energy?	$H-I$	$H-F$	$H-Cl$	$H-Br$	○	○	○	○
7.	Shape of PH_3 molecule is:	T-shape	Octahedral	Pyramidal	Triangular planar	○	○	○	○
8.	Which pair of gases diffuses with the same rate at same temperature and pressure?	CO and PH_3	CO and NO	NO and C_2H_6	NH_3 and PH_3	○	○	○	○
9.	Which of the following is **NOT** present in plasma?	Neutral atoms	Electrons	Cations	Anions	○	○	○	○
10.	Which of the following processes is **NOT** endothermic?	Vaporization	Condensation	Fusion	Sublimation	○	○	○	○
11.	If crystallization of "$NaCl$" is carried out in the presence of urea then its shape will be:	Octahedral	Cubic	Tetrahedral	Pyramidal	○	○	○	○
12.	The strong conjugate base in the given is:	CO_3^{-2}	NO_3^{-1}	Cl^{-1}	SO_4^{-2}	○	○	○	○
13.	A reaction will proceed in forward direction to maximum extent if value of K_c is:	10^{-2}	10^{-30}	1	10^{+30}	○	○	○	○
14.	For a reaction "$A \longrightarrow Product$", doubling the concentration of "A" quadruples the rate. The reaction is:	Zero order	1st order	2nd order	3rd order	○	○	○	○
15.	Swelling of dead bones in water is due to:	Osmosis	Evaporation	Decomposition	Boiling	○	○	○	○
16.	Which of the following is **NOT** a state function?	Work	Temperature	Pressure	Volume	○	○	○	○
17.	"Zn" acts as anode in Daniel cell but acts as cathode when coupled with Aluminum electrode. This is because:	$E°$ of Zn =0	$E°$ of Zn > $E°$ of Al	$E°$ of Zn < $E°$ of Al	$E°$ of Zn = $E°$ of Al	○	○	○	○

SUPPLEMENTARY TABLE

Atomic No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Symbol	H	He	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca
Mass No	1	4	7	9	11	12	14	16	19	20	23	24	27	28	31	32	35.5	40	39	40

CHEMISTRY HSSC–I

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

SECTION – B (Marks 42)

Q. 2 Answers the following questions briefly. **(14 x 3 = 42)**

(i)	Calculate the volume of oxygen produced by decomposition of 3.04×10^{24} formula units of $KClO_3$ according to given equation. $2KClO_3 \longrightarrow 2KCl + 3O_2$	03	OR	Calculate the wave number ($\bar{\nu}$) of H_α in Balmer series and second line in Paschen series of hydrogen spectrum.	03
(ii)	In an industrial process 40g of "H_2" produces 100g of "NH_3". Calculate the percentage yield of this reaction. $N_2 + 3H_2 \longrightarrow 2NH_3$	03	OR	Justify the following statements with reference to azimuthal quantum number: (i) s-orbital has maximum two $\bar{e}$ (ii) p-orbital can accommodate maximum six electrons	03
(iii)	Calculate the number of molecules of SO_2 gas if its volume is $500cm^3$ at S.T.P.	03	OR	Why CO_2 is linear while H_2O is bent or V-shape, although atomicity of both molecules is same?	03
(iv)	Calculate the number of molecules of CO_2 when 4.8×10^{24} molecules of CH_4 reacts with excess of water according to following reaction. $CH_4 + 2H_2O \longrightarrow CO_2 + 4H_2$	03	OR	Draw the shapes of following molecules according to VSEPR theory: (i) SO_2 (ii) H_2S (iii) CBr_4	03
(v)	Briefly describe the following: (i) Line spectrum (ii) Stark effect (iii) Continuous spectrum	03	OR	Distinguish between 'Sigma' and 'Pi bond' in three ways.	03
(vi)	Calculate the average molar mass of air at sea level at $0°C$, if density of air is $1.29kg/m^3$.	03	OR	Justify the following statements: (i) Petrol evaporates earlier than water (ii) Water has low vapour pressure than ethyl alcohol	03
(vii)	What is the effect on the volume of gas if you simultaneously: (i) Its pressure is halved and its kelvin temperature is doubled (ii) Its pressure is doubled and its kelvin temperature is doubled	03	OR	Why heat of vaporization (ΔH_v) is always greater than heat of fusion (ΔH_f) for a substance?	03
(viii)	Calculate the numerical value of general gas constant "R" for one mole of gas at S.T.P: (i) In SI units (ii) Pressure in atm, volume in dm^3	03	OR	Write any three characteristics of Plasma.	03
(ix)	Predict the shape of ZnS by using formula of radius ratio, if radius of Zn^{+2} is 74pm and radius of S^{-2} is 184pm.	03	OR	If initial concentration of N_2O_4 in moles is "a" and "x" moles of it converted to NO_2, then derive the general relation of equilibrium constant $\left(K_c = \frac{4x^2}{v(a-x)}\right)$ for following reaction: $N_2O_4 \rightleftharpoons 2NO_2$	03
(x)	Calculate the value of K_P at $1050°C$ if K_C is 2.3×10^{22} for following reaction. $2CO_{(g)} + O_{2(g)} \rightleftharpoons 2CO_{2(g)}$	03	OR	Write K_{SP} expressions for following compounds: (i) $Ca_3(PO_4)_2$ (ii) Na_2SO_4	03
(xi)	What is levelling effect of water? How this effect is compensated?	03	OR	Draw potential energy diagram for both exothermic and endothermic reactions according to collision theory.	03
(xii)	Rate equation for given reaction is $R = K[NO]^2[H_2]$. Reaction occurs in two steps and oxygen atom is intermediate then write reaction mechanism. $2NO + 2H_2 \longrightarrow N_2 + 2H_2O$	03	OR	How relative lowring of vapour pressure $\left(\frac{\Delta P}{P°} = X_2\right)$ can be used to calculate molar mass of solute?	03
(xiii)	Describe phenol water system and explain upper consulate temperature.	03	OR	Write thermochemical equations from the given temperature: (i) Standard enthalpy of formation of $CaCO_3$ is $-1207kJ/mol$ (ii) Standard enthalpy of combustion of CH_3COOH is $-875kJ/mol$	03
(xiv)	Calculate $E°_{cell}$ for $Li-Zn$ cell and write cell reactions. $E°_{Li}$ is $-3.05V$ and $E°_{Zn}$ is $-0.76V$.	03	OR	Write chemical reactions that occur at cathode and anode in alkaline dry cell.	03

SECTION – C (Marks 26)

Attempt the following questions.

Q.3	What is hybridization? Explain the hybridization of CH_4 and $BeCl_2$ with orbital diagrams.	**1+3 +3**	**OR**	Why real gases deviate from gas laws at low temperature and high pressure? Also explains the deviation by general graphical representation of compressibility factor versus pressure.	**2+2 +3**
Q.4	State first law of thermodynamics. Write its mathematical expression with reference to heat and work. Explain it for a gas confined to a cylinder having a moveable piston, and derive the formula of $W = P\Delta V$ for this system.	**2+4**	**OR**	Balance the given redox equations by oxidation number method: **(i)** $HNO_3 + H_2S \longrightarrow NO + S + H_2O$ **(ii)** $P + H_2O + HNO_3 \longrightarrow H_3PO_4 + NO$	**3+3**
Q.5	What is buffer solution? Write its types with composition. Explain buffer action when small amount of base is added in it.	**1+2 +3**	**OR**	What are colligative properties of solutions? Explain quantitative aspects of freezing point depression with general graphical representation to derive the molar mass of solute.	**1+3 +2**
Q.6	What are London dispersion forces? Explain any three factors which affect these forces with suitable example in each factor.	**3+4**	**OR**	Differentiate between cubic close packing and hexagonal close packing in metals. Also compare metallic solids with molecular solids in three ways.	**2+2 +3**

SUPPLEMENTARY TABLE

Atomic No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Symbol	H	He	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca
Mass No	1	4	7	9	11	12	14	16	19	20	23	24	27	28	31	32	35.5	40	39	40

Version No.				
3	2	0	5	3

ROLL NUMBER					

CHEMISTRY HSSC-I

SECTION – A (Marks 17)

Time allowed: 25 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed.

Do not use lead pencil.

حصہ اوّل لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر ناظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیڈ پنسل کا استعمال ممنوع ہے۔

Answer Sheet No. _____

ہر سوال کے سامنے دیے گئے، کریکولم کے مطابق درست دائرہ کو پُر کریں۔ **Invigilator Sign.** _____

Fill the relevant bubble against each question according to curriculum: **Candidate Sign.** _____

	Question	A	B	C	D	A	B	C	D
1.	A device that converts the energy of combustion of Fields like hydrogen directly into electrical energy is known as:	Lead Storage cell	Fuel cell	NICAD cell	Dry cell	○	○	○	○
2.	Which of the following gases resembles ideal gas?	HCl	C_4H_{10}	H_2	NH_3	○	○	○	○
3.	A beaker contains 9g of water. The number of hydrogen atoms in it will be:	6.02×10^{24}	3.01×10^{24}	6.02×10^{23}	3.01×10^{23}	○	○	○	○
4.	Which one of the following pairs of gases contains the same number of molecules at S.T.P?	28g of N_2 and 22g of CO_2	32g of O_2 and 32g of N_2	16g of O_2 and 14g of N_2	8g of O_2 and 22g of CO_2	○	○	○	○
5.	According to Aufbau Principle a new electrons enters the orbital when:	$m+s$ is maximum	$m+s$ is minimum	$n+l$ is maximum	$n+l$ is minimum	○	○	○	○
6.	The frequency of green light is $6\times10^{14}\,Hz$. Its wavelength is:	5000 nm	50000 nm	5 nm	500 nm	○	○	○	○
7.	In which of the following molecules central atom has sp^2 hybridization?	BF_3	NH_3	H_2O	NF_3	○	○	○	○
8.	Which one of the following molecules has zero dipole moment?	H_2S (Bent)	BF_3 (Triangular Planar)	NH_3 (Pyramidal)	H_2O (Bent)	○	○	○	○
9.	Which pair of the gases diffuses with the same rate at S.T.P?	CO and PH_3	NH_3 and PH_3	CO and NO	NO and C_2H_6	○	○	○	○
10.	To which of the following gaseous mixture, Dalton's law is **NOT** applicable?	N_2 and CO_2	NH_3 and HCl	H_2 and N_2	Ne and He	○	○	○	○
11.	Which of the following is **NOT** the unit of viscosity?	poise	$Nm^{-2}s$	$poise^{-1}$	$kgm^{-1}s^{-1}$	○	○	○	○
12.	Which of the following pairs are isomorphs of each other?	MgO and $MgCl_2$	$NaCl$ and MgO	MgO and $CaCO_3$	KNO_3 and $NaCl$	○	○	○	○
13.	Which of the following pairs constitute a buffer solution?	$NaCl+HCl$	$Na_2CO_3+H_2CO_3$	$NaOH+HCl$	$HNO_3+NH_4NO_3$	○	○	○	○
14.	The pH of a solution of HCl is 4. Molarity of solution will be:	0.04	4.0	0.4	0.0001	○	○	○	○
15.	The rate of reaction_____ as the reaction proceeds.	Remains the same	Becomes infinite	Increases	Decreases	○	○	○	○
16.	Which of the following is **NOT** the colligative property of solution?	Optical activity	Osmosis	Elevation of Boiling point	Depression of Freezing point	○	○	○	○
17.	Born Haber cycle is the application of:	Henry's law	Moseley's law	Faraday's law	Hess's law	○	○	○	○

SUPPLEMENTARY TABLE

Atomic No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Symbol	H	He	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca
Mass No	1	4	7	9	11	12	14	16	19	20	23	24	27	28	31	32	35.5	40	39	40

CHEMISTRY HSSC–I

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

SECTION – B (Marks 42)

Q. 2 Answers the following questions briefly. **(14 x 3 = 42)**

(i)	Calculate the mass of Hydrogen ions (H^+) produced by the ionization of 20g of H_2SO_4 $H_2SO_4 \rightleftharpoons 2H^+ + SO_4^{-2}$	03	OR	Calculate the radius of 3rd orbit for $_2He^{+1}$ $r = \frac{\epsilon_o h^2 n^2}{z\pi me^2}$	03
(ii)	Calculate the number of formula units of MgS when 10g of "Mg" reacts with 10g of "S". $Mg + S \longrightarrow MgS$	03	OR	How much "$AgCl$" will be formed by reacting 100g of "$AgNO_3$" $(At.Wt, Ag = 107)$ with a solution of 50g of" $NaCl$"? $AgNO_3 + NaCl \longrightarrow AgCl + NaNO_3$	03
(iii)	Calculate the volume of N_2 gas for 3.01×10^{23} molecules at S.T.P.	03	OR	Justify the given order of energy of sub-shells according to $n+l$ rule. (i) $3d > 4s$ (ii) $2p < 3s$	03
(iv)	A photon of light has energy of $10^{-10}J$ Convert this energy into frequency (ν), wave length (λ) and wave numbers $(\bar{\nu})$ in Hz, meter and m^{-1} respectively.	03	OR	Justify the following statements: (i) Bond energy of $H-H$ is greater than $Cl-Cl$ (ii) Bond energy of $H-Br$ is less than $H-Cl$	03
(v)	The dipole moment of HCl is $1.03D$ and distance between atoms is 127pm. Calculate the percentage ionic character of HCl bond. $(q = 1.6022\times10^{-19}C)$ $(1pm = 10^{-12}m)$	03	OR	Prove that kelvin temperature of a gas is the measurement of average kinetic energy of its molecules. $(K.E \propto T)$	03
(vi)	What is the Charles law? Derive its critical form. $(V_t = \frac{V_o}{273}T)$	1+2	OR	Why a small droplet of water assumes nearly a spherical shape on the surface of a waxy bonnet of a car?	03
(vii)	Describe any two applications of Dalton's law of partial pressure.	03	OR	Compare molecular and metallic solids in three ways.	03
(viii)	Write down the faulty postulates of Kinetic molecular theory.	03	OR	Differentiate between Homogeneous and Heterogeneous equilibrium.	03
(ix)	Why boiling point of SiH_4 is greater than CH_4? Although both molecules are non-polar and have same atomicity.	03	OR	Write K_{SP} expressions for following compounds: (i) $Al(OH)_3$ (ii) $Mg_3(PO_4)_2$	03
(x)	Differentiate liquid crystals from pure liquids and crystalline solids. (Any three differences)	03	OR	'Q' is called ion product. How is it helpful to determine the precipitation in a reaction by comparing it with K_{SP}?	03
(xi)	Write K_c expressions for following reactions and derive its unit: (i) $C_{(s)} + H_2O_{(g)} \rightleftharpoons CO_{(g)} + H_{2_{(g)}}$ (ii) $3Fe_{(s)} + 4H_2O_{(g)} \rightleftharpoons Fe_3O_{4_{(s)}} + 4H_{2_{(g)}}$	03	OR	Derive the given relationship $K_a \times K_b = K_w$ for a conjugate acid base pair.	03
(xii)	What is meant by the following terms: (i) Order of reaction (ii) Initial rate of reaction (iii) Average rate of reaction	03	OR	What is meant by the solvation? Briefly explain this term for ionic compounds.	1+2
(xiii)	Calculate the mass (w/w) percent of a solution containing 80g sugar $(C_{12}H_{22}O_{11})$ in 250g of water.	03	OR	Write thermochemical equations from the given information: (i) standard enthalpy of formation of Fe_2O_3 is $-824kJ/mol$ (ii) standard enthalpy of combustion of CH_3COOH is $-875kJ/mol$	03
(xiv)	Balance the following half reactions that take place in acidic medium: (i) $NO_3^{-1} \longrightarrow NO_2$ (ii) $ClO_4^{-1} \longrightarrow ClO_3^{-1}$	03	OR	Explain dry cell with the help of chemical reactions that occur at cathode and anode.	03

SECTION – C (Marks 26)

Attempt the following questions.

Q.3	What is hybridization? Explain the hybridization of NH_3 and BF_3 with orbital diagrams.	**1+3 +3**	**OR**	State Dalton's law of partial pressure. Derive the relationship for partial pressure and number of moles for two supposed gases A and B.	**1+3 +3**
Q.4	Explain construction and working of lead storage battery with reactions that occur at anode and cathode during charging and discharging.	**06**	**OR**	Predict the nature of the given salts (Acidic, Basic or Neural) and write chemical equation when they are Hydrolysed in water: **(i)** NH_4NO_3 **(ii)** $MgSO_4$ **(iii)** Na_2CO_3	**2+2 +2**
Q.5	Why boiling point elevate when non-volatile solute is added in a solvent? Explain its quantitative aspects and derive the relationship for molar mass of solute using elevation of boiling point.	**1+3 +2**	**OR**	What is Hess's law? Give its mathematical expression and draw energy cycle for the given reaction: $C + O_2 \longrightarrow CO_2 \quad \Delta H° = -393.5kJ$ Reaction can be carried out in two steps **(i)** $C + \frac{1}{2}O_2 \longrightarrow CO \quad \Delta H_1° = -110.52kJ$ **(ii)** $CO + \frac{1}{2}O_2 \longrightarrow CO_2 \quad \Delta H_2° = -282.98kJ$	**3+3**
Q.6	What is meant by hydrogen bonding? How it explains the following: **(i)** Boiling point of water is higher than HF. **(ii)** Cleansing action of soap **(iii)** Solubility of covalent compounds	**1+2 + 2+2**	**OR**	What is unit cell? Calculate the number of Na^+ and Cl^- in one unit cell of Sodium Chloride.	**1+3 +3**

SUPPLEMENTARY TABLE

Atomic No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	47
Symbol	H	He	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca	Ag
Mass No	1	4	7	9	11	12	14	16	19	20	23	24	27	28	31	32	35.5	40	39	40	107

$h = 6.625 \times 10^{-34} Js \qquad c = 3 \times 10^8 ms^{-1}$