



# 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 اول لازمی ہے اس کے جوابات اسی صفحہ پر دے کر نام مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ اسے پختل استعمال نہ کریں۔

Version No.			
3	0	9	1

ROLL NUMBER					

0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

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	A	B	C	D	A	B	C	D	A	B	C	D
1. The volume occupied by $3.01 \times 10^{23}$ molecules of $NH_3$ gas at STP is:	$11.2 dm^3$	$22.4 dm^3$	$33.6 dm^3$	$44.8 dm^3$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Lyman series of spectral lines lies in which of the following region of electromagnetic spectrum?	UV- region	Near IR region	Mid IR region	Visible region	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Which of the following molecules does not possess trigonal planar geometry?	$PCl_3$	$AlF_3$	$NF_3$	$NH_3$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Which of the following aromatic compounds has zero dipole moment?	Chloro Benzene	1,2-Dichloro Benzene	1,3-Dichloro Benzene	Benzene	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. The value of general gas constant $R$ is 62.4 Its units are:	$dm^3 \cdot atm \cdot K^{-1} \cdot mol^{-1}$	$cm^3 \cdot torr \cdot K^{-1} \cdot mol^{-1}$	$dm^3 \cdot mmHg \cdot K^{-1} \cdot mol^{-1}$	$N \cdot m \cdot K^{-1} \cdot mol^{-1}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Rate of diffusion of $H_2$ gas ( $r_{H_2}$ ) as compared to that of $He$ gas ( $r_{He}$ ) is:	$r_{H_2} = r_{He}$	$r_{H_2} = 1.41 r_{He}$	$r_{H_2} = 4 r_{He}$	$r_{H_2} = 2 r_{He}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. At $145^\circ C$ , Cholesteryl Benzoate exists as:	Crystalline solid	Non-Crystalline solid	Liquid crystal	Clear liquid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. The increase in boiling point of hydrides of group IV-A ( $CH_4$ to $SnH_4$ ) is due to increase in the strength of:	Hydrogen bonding	Dipole-dipole forces	London dispersion forces	Electrostatic forces	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Which of the following is NOT an anisotropic property?	Cleavage plane	Electrical conductivity	Co-efficient of thermal expansion	Polymorphism	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Identify the pair of substances which are not isomorphs?	$NaCl$ and $KBr$	$ZnSO_4$ and $NiSO_4$	$CaCO_3$ and $NaNO_3$	$Ag_2SO_4$ and $CdSO_4$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. The value of $K_p$ will become equal to $K_c$ , $K_x$ and $K_n$ , when	$\Delta n = 1$	$\Delta n = -1$	$\Delta n = \frac{1}{2}$	$\Delta n = 0$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. pOH of $10^{-2} M$ solution of $H_2SO_4$ is	2.0	14.0	1.7	12.3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. For which of the following reaction, the rate constant is equal to the rate of reaction?	Zero order reaction	1 <sup>st</sup> order reaction	2 <sup>nd</sup> order reaction	3 <sup>rd</sup> order reaction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. Boiling point of a solution prepared by dissolving 18g glucose in 1kg water is ( $K_b = 0.52$ )	$100.52^\circ C$	$100.052^\circ C$	$101.52^\circ C$	$101.052^\circ C$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. A colloid in which a liquid is dispersed into another liquid is called:	Sol	Gel	Aerosol	Emulsion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. Heat capacity of a substance is measured in the units of:	$JK^{-1}$	$JK^{-1}g^{-1}$	$JK^{-1}mol^{-1}$	$Jmol^{-1}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. The number of electrons required to balance the equation are: $Cr_2O_7^{2-} + 14H^+ \rightarrow 2Cr^{3+} + 7H_2O$	2	3	5	6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SUPPLEMENTARY TABLE

—1HA-I 2309-3091—

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

24

Time allowed: 2:35 Hours

Total Marks Sections B and C: 68

NOTE: Answer any FOURTEEN parts from Section 'B' and attempt any TWO questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly.

## SECTION - B (Marks 42)

- Q. 2 Answer any FOURTEEN parts from the following. All parts carry equal marks. (14 x 3 = 42)
- Calculate the mass of  $NH_3$  gas produced when  $8 dm^3$  of  $H_2$  gas is reacted with excess of  $N_2$  gas.  
$$N_2 + 3H_2 \rightarrow 2NH_3$$
  - How much energy is required to remove an electron from 1<sup>st</sup> orbit of  $Li^{+2}$  ion in the units of J/atom and kJ/mol?
  - Write down the disadvantages of valence bond theory.
  - Describe any two factors which affect bond length. Give one example for each.
  - Describe the geometries of following molecules on the basis of VSEPR theory.  
(a)  $SO_3$  (b)  $PCl_3$
  - What is an Isobar? Draw an isobar for a given mass of an ideal gas at 1 atm? How does the position of isobar change with increase in pressure?
  - How are London dispersion forces developed in a sample of Helium gas?
  - Which substance in each of the following pairs has stronger London dispersion forces? Give reasons:  
(a)  $Ar$  or  $Kr$  (b)  $Br_2$  or  $I_2$  (c)  $C_2H_6$  or  $C_4H_{10}$
  - What is the role of hydrogen bonding in:  
(a) Cleansing action of soap (b) Structure of DNA and protein molecules
  - Describe transition temperature by giving two examples.
  - Differentiate between Hexagonal close packing and cubic close packing in the structure of metals.
  - What is a precipitation reaction? How can one predict the formation of precipitates of  $CaF_2$  in the following reaction?  
$$Ca^{+2} + 2F^- \rightleftharpoons CaF_2$$
  - How an Acetic acid/sodium acetate buffer resists its change in pH on addition of  $NaOH$ ?
  - Why vapour pressure of a solvent decreases when a non-volatile, non-electrolyte solute is dissolved in it?
  - What is reverse osmosis? Give its one application.
  - If conc. of  $O_3$  in the atmosphere reaches  $0.5 ppb$ , what mass of  $O_3$  would be present per kg of the air?
  - Calculate  $\Delta H^\circ$  for the following reaction  $2C_8H_{18} + 25O_2 \rightarrow 16CO_2 + 18H_2O$  the values of  $\Delta H_f^\circ$  for  $C_8H_{18}$ ,  $O_2$ ,  $CO_2$  and  $H_2O$  are  $-269 kJ$ ,  $0 kJ$ ,  $-393.5 kJ$  and  $-285 kJ$  respectively.
  - When 1.8g glucose is burnt in bomb calorimeter, the temperature of water increases for  $25^\circ C$  to  $31.52^\circ C$ . If heat capacity of calorimeter is  $4.321 kJ / K$ , calculate the heat of combustion of glucose.
  - Predict  $E^\circ$  cell for  $Zn - Ni$  cell and write its cell reactions. The values of reduction potential of  $Zn$  and  $Ni$  are given as:  $E^\circ Zn = -0.76 V$   $E^\circ Ni = -0.25 V$
  - Balance the equation by ion-electron method.  $BrO_3^- + SO_2 \rightarrow HSO_4^- + Br^-$

## SECTION - C (Marks 26)

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

- Q. 3 a. 100 g  $Zn$  is reacted with 100g solution of  $HCl$   $Zn + 2HCl \rightarrow ZnCl_2 + H_2$
- How much volume of  $H_2$  gas is released at STP?
  - Also determine the mass of non-limiting reactant in excess.
- b. Derive a relationship for energy released ( $\Delta E$ ) when an electron drops from  $n_2$  orbit to  $n_1$  orbit in  $He^+$  ion. Also calculate  $\Delta E$  if  $n_1 = 1$  and  $n_2 = 3$  in  $He^+$  ion.
- Q. 4 a. What is salt hydrolysis? Which type of cations and anions undergo hydrolysis? Describe the hydrolysis of four types of salts giving one example for each.
- b. What is collision theory? Describe with reference to the energy of activation, formation of activated complex and heat of reaction.
- Q. 5 a. State and explain Dalton's law of partial pressure. Derive a relationship between:  
(i) Partial pressure and number of moles (ii) Partial pressure and mole fraction
- b. Describe the effect of stated change on the following reactions at equilibrium position.
- Decreasing the volume  $2NO + O_2 \rightleftharpoons 2NO_2$
  - Increasing temperature  $CH_4 + H_2O \rightleftharpoons CO + 3H_2$   $\Delta H = +256 kJ$
  - Adding  $I_2$   $2HI \rightleftharpoons H_2 + I_2$

## 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

## 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 اول لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر نام مرکز کے حوالے کریں۔ گانت کر دوبارہ لکھنے کی اجازت نہیں ہے۔ سیاہ پینسل کا استعمال ممنوع ہے۔

Version No.			
7	0	9	1

ROLL NUMBER					

0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

Answer Sheet No. \_\_\_\_\_

ہر سوال کے سامنے دیے گئے، کرکیم 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. $22.4dm^3$ of which of the following gas contains greater number of atoms?	Helium	Chlorine	Ozone	Ammonia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. The mass of $O_2$ required to burn 0.1 mole of $C_2H_5OH$ as per following equation $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$	3.2g	32g	9.6g	96g	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. How much larger is the radius of 3 <sup>rd</sup> orbit of Hydrogen atom as compared to the 1 <sup>st</sup> one?	2 – times	3 – times	6 – times	9 – times	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. The values of quantum numbers for an electron present in $3d_{xy}$ orbital, are	$n=3, l=2, m=+2$	$n=3, l=2, m=-2$	$n=3, l=2, m=-1$	$n=3, l=1, m=+1$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. The geometry of a molecule containing 2 – $\sigma$ bond and one lone pair of electrons in the valence shell of central atom, is	Trigonal bipyramid	Trigonal pyramid	Trigonal planar	Angular	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Under what conditions, the deviation of a gas from ideal behavior, is maximum	$-10^\circ C, 1atm$	$-10^\circ C, 5atm$	$0^\circ C, 1atm$	$0^\circ C, 5atm$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Which of the following molecule has least polarizability?	$F_2$	$Cl_2$	$Br_2$	$I_2$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Graphite conducts the electricity in a direction parallel to the layers of carbon-atoms. This property is known as:	Isotropy	Anisotropy	Allotropy	Symmetry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Which of the following ionic compounds possesses greater lattice energy?	$LiCl$	$NaCl$	$KCl$	$MgCl_2$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. For the reaction $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ $K_p$ and $K_c$ are related as:	$K_p > K_c$	$K_c > K_p$	$K_c = K_p$	$K_p = \frac{1}{2} K_c$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. The maximum yield of $SO_3$ is obtained in the reaction: $2SO_2 + O_2 \rightleftharpoons 2SO_3 \quad \Delta H = -198kJ$ by	Increasing temperature Increasing pressure	Increasing temperature Decreasing pressure	Decreasing temperature Increasing pressure	Decreasing temperature Decreasing pressure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Which of the following solution has zero pH?	0.5M HCl	0.5M HNO <sub>3</sub>	0.5M H <sub>2</sub> SO <sub>4</sub>	0.5M CH <sub>3</sub> COOH	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. For the reaction $A \rightarrow$ Product, if conc. of A is increased two times, the rate of reaction increases four time. The order of reaction is:	0	1	2	3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. Which of the following is NOT colligative property?	Lowering in vapor pressure	Elevation in Boiling point	Osmotic pressure	Transition temperature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. For the reactions involving solids and liquids, $\Delta H$ & $\Delta E$ are related as:	$\Delta H = \Delta E$	$\Delta H > \Delta E$	$\Delta H < \Delta E$	$\Delta H = \frac{1}{2} \Delta E$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. Which of following atoms in the given reaction undergoes reduction? $2Ag + H_2S + \frac{1}{2}O_2 \rightarrow Ag_2S + H_2O$	Ag	S	H	O	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. Which of following metals cannot displace hydrogen from dil HCl?	Mg	Zn	Fe	Cu	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SUPPLEMENTARY TABLE

—1HA-I 2309-HA—

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

NOTE: Answer any FOURTEEN parts from Section 'B' and attempt any TWO questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly.

## SECTION – B (Marks 42)

Q. 2 Answer any FOURTEEN parts from the following. All parts carry equal marks. (14 x 3 = 42)

- What are the limiting and non-limiting reactants? Why expensive reactants are used in small amount whereas in-expensive reactants in large amount in an industrial process?
- How much  $Fe$  is required to produce 200 g of  $FeCl_3$  when  $Cl_2$  is present in excess?  
 $2Fe + 3Cl_2 \rightarrow 2FeCl_3$  ( $Fe = 56 \text{ g/mol}$ ,  $Cl = 35.5 \text{ g/mol}$ )
- Why are x-rays produced when cathode rays collide with a target-anode? What are the types of spectral lines so produced?
- Calculate the wave number of limiting line in the Balmer series of Hydrogen spectrum.
- Why the structure of  $BeCl_2$  is different from that of  $SnCl_2$ ? Explain by applying VSEPR theory
- Describe any two factors which affect bond energy. Give one example for each.
- What is absolute zero? Derive it from critical statement of Charle's law.
- $O_2$  gas effuses 1.173 times as compared to an un-known gas. Calculate the molar mass of gas and identify it. The gas is produced during the combustion of hydrocarbons.
- Why boiling points of noble gases increase from Helium to Radon?
- Justify the following order of boiling points of following hydrides.  
(a)  $H_2O > HF$  (b)  $HF > HCl$  (c)  $SiH_4 > CH_4$
- What is cleavage plane? Justify that cleavage plane is an anisotropic property.
- Write down any three differences between metallic and molecular solids.
- How can a reaction at equilibrium be recognized by spectroscopic method?
- Describe the effect of increase in temperature on equilibrium position and equilibrium constant in the following reaction at equilibrium.  $2SO_2 + O_2 \rightleftharpoons 2SO_3$   $\Delta H = -198 \text{ kJ}$
- What is levelling effect? Why  $H_2O$  exhibits this phenomenon whereas  $CH_3COOH$  does not?
- pH of a buffer containing 1M  $CH_3COOH$  and 1M  $CH_3COONa$  is 4.76. Determine the change in pH on addition of 0.1M solution of  $NaOH$  to this buffer.  $pK_a = 4.76$
- Rate equation for the reaction  $2NO + 2H_2 \rightarrow N_2 + 2H_2O$  is  $\text{Rate} = k[NO]^2[H_2]$ . Suggest the mechanism for this reaction
- Describe the effect of temperature on solubility of solids and gases in liquids.
- Determine the enthalpy of sublimation of  $I_2$  from following data:  
 $H_{2(g)} + I_{2(s)} \rightarrow 2HI_{(g)}$   $\Delta H = +51.8 \text{ kJ}$   
 $H_{2(g)} + I_{2(g)} \rightarrow 2HI_{(g)}$   $\Delta H = -10.5 \text{ kJ}$
- What is Galvanizing? Why is it also called sacrificial corrosion?

## SECTION – C (Marks 26)

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

- Q. 3 a. Differentiate between  $sp^3$  and  $sp^2$  modes of hybridization. Explain the formation of Ethene molecule on the basis of hybridization in C-atoms.
- b. Give the reasons for the following facts:  
(i) Vapour pressure of Ether is higher than that of water.  
(ii) Food is cooked in less time in pressure cooker  
(iii) Vacuum distillation is carried out to purify sensitive liquids.
- Q. 4 a. Why freezing point is decreased when a non-volatile, non-electrolyte solute is added to a solvent? Explain. Also predict the freezing point of a coolant prepared by dissolving 2kg Ethylene glycol in 5kg water ( $K_f = 1.86$ )
- b. State and explain Faraday's 1<sup>st</sup> and 2<sup>nd</sup> laws of electrolysis
- Q. 5 a. Why real gas deviate from ideal behaviour? Explain these deviations at high pressure and low temperature with the help of diagram.
- b. Explain Hess's law, with an example. Write down its two indirect applications. How enthalpy of a reaction can be determined from heats of formation?

### 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





27

Version No.			
3	0	9	9

ROLL NUMBER					

0	●	0	0
1	1	1	1
2	2	2	2
●	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	●	●

0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

# 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 اول لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر تمام مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لید پینسل 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. The temperature at which partially immiscible pair of liquid leads to the formation of single phase is called:	Absolute temperature	Consolute temperature	Standard temperature	Transition temperature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. In conversion of $Br_2$ to $BrO_3^-$ the oxidation state of Bromine changes from:	0 to -3	0 to 5	2 to 5	0 to -2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. In the given reaction, select the correct statement for the given reaction: $Mg + Cl_2 \rightarrow MgCl_2$	Mg is reducing agent	$Cl_2$ is reducing agent	$MgCl_2$ is oxidizing agent	Mg is oxidizing agent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. The number of covalent bonds present in 2 moles of $H_2S$ gas are:	$6.02 \times 10^{23}$	$2.4 \times 10^{24}$	$24.1 \times 10^{24}$	$3.01 \times 10^{23}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. The difference in angular momentum of electron which jumps from 3 <sup>rd</sup> orbit to 6 <sup>th</sup> orbit of Hydrogen atom will be:	$3\left(\frac{h}{\pi}\right)$	$6\left(\frac{h}{\pi}\right)$	$6\left(\frac{h}{\pi^2}\right)$	$3\left(\frac{h}{2\pi}\right)$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Which of the following compounds has the highest ionic character?	HCl	HBr	HI	HF	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. A diatomic molecule has dipole moment of 1.2D. If its bond distance is $1.0 \text{ \AA}$ . What fraction of electric charge exists in each atom?	18% of $e^-$	25% of $e^-$	30% of $e^-$	12% of $e^-$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Gases exert pressure on the walls of the container. It is due to the:	Elastic collision between their molecules	Vander Wall's forces between their molecules	Force of repulsion between their molecules	Force of attraction between their molecules	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. A liquid is thought to be pure Diethyl ether. Which of the following is the best way to test its purity?	Burn with oxygen	Dehydrate with $H_2SO_4$	React with pure ether	Measure its boiling point	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Amount of heat absorbed when one mole of a solid melts into liquid form at its melting point is called:	Molar heat of vaporization	Molar heat of condensation	Molar heat of fusion	Molar heat of sublimation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. $NaF$ and $KCl$ have both atomic ratio 1:1 in their crystals, such property is called:	Isomorphism	Allotropy	An isotropy	Polymorphism	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



	Question	A	B	C	D	A	B	C	D
12.	Diamond is a bad conductor of electricity because:	It has high density	It has no free electrons	It is transparent to light	It has tight structure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13.	Identify what is TRUE about the following reaction: $H_2 + Cl_2 \rightleftharpoons 2HCl$	$K_p < K_c$	$K_p = K_n$	$K_n < K_c$	$K_p > K_c$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14.	Which of the following change will favour the formation of more $SO_3$ at equilibrium? $2SO_2 + O_2 \rightleftharpoons 2SO_3 + heat$	By increasing temperature	By decreasing pressure	By increasing pressure	By adding $SO_3$ at equilibrium	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15.	The concentration of $H^+$ ion concentration of an aqueous solution having $pH = 10.6$ is:	$1.02 \times 10^{-11} mol.dm^{-3}$	$1.07 \times 10^{-5} mol.dm^{-3}$	$2.15 \times 10^{-3} mol.dm^{-3}$	$2.51 \times 10^{-11} mol.dm^{-3}$	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16.	Rate law for the reaction $CH_3 - Cl + H_2O \rightarrow CH_3OH + HCl$ Rate = $K[CH_3 - Cl]$ The rate of reaction will be doubled when:	Concentration of $CH_3Cl$ is reduced to half	Concentration of $CH_3Cl$ is doubled	Concentrations of $CH_3Cl$ and $H_2O$ are reduced to half	Concentration of $H_2O$ is doubled	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17.	Molarity of acetic acid ( $CH_3COOH$ ) solution is _____ when 9g of it is dissolved in $0.25dm^3$ of solution.	0.6M	0.3M	0.5M	0.25M	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

—1HA-I 2309 (SP) 3099 —

ROLL NUMBER				

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

28

Time allowed: 2:35 Hours

Total Marks Sections B and C: 68

NOTE: Answer any FOURTEEN parts from Section 'B' and attempt any TWO questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly.

### SECTION – B (Marks 42)

- Q. 2 Answer any FOURTEEN parts from the following. All parts carry equal marks. (14 x 3 = 42)
- What is meant by percentage composition? Determine the mass percentage of each element in magnesium chloride ( $MgCl_2$ ).
  - (a) What is the relationship between wave number and frequency?  
(b) What will be the wave number ( $\bar{\nu}$ ) of the spectral lines of an electron when it jumps from  $n_1 = 2$  to  $n_2 = 4$ ?
  - (iii) Which subshell in each of the following pairs is higher in the energy?  
(a)  $4p$  and  $4s$  (b)  $5s$  and  $6p$  (c)  $6s$  and  $4f$
  - (iv) How Moseley used x-rays spectrum to predict the atomic number of elements. Give one use of x-rays in the field of chemistry.
  - (v) The molecules of  $AlCl_3$  have planar triangular geometries while  $NH_3$  have triangular pyramidal geometries. Briefly explain on the basis of VSEPR theory.
  - (vi) State Joule-Thomson effect. Give its one application in home appliances.
  - (vii) Calculate average molar mass of air at sea level and  $0^\circ C$  if the density of air is  $1.29 kg / m^3$
  - (viii) Give the relationship of partial pressure with:  
(a) Number of moles of gas (b) Mole fraction of gas
  - (ix) Why distillation under reduced pressure is often used in the purification of chemicals? Elaborate with an example of glycerine.
  - (x) Describe the conductivity of metallic crystals using electron sea theory.
  - (xi) Briefly explain the effect of change in pressure on the volume of a gas, when temperature remains constant. Give graphical representation.
  - (xii) Describe the following properties of crystalline solids.  
(a) Transition temperature (b) Anisotropy (c) Polymorphism
  - (xiii) How would the solution of  $CH_3COOH$  and  $CH_3COONa$  resist the change in pH upon addition of  $HCl$ ?
  - (xiv) Prove the given relationship  $pK_a + pK_b = pK_w$  by selecting general reaction of dissociation for acid and base.
  - (xv) The rise in temperature increases the rate of a certain chemical reaction. Briefly explain in the light of Collision Theory by graphical representation.
  - (xvi) Differentiate between the First order reaction and Pseudo first order reaction with suitable example in each case.
  - (xvii) Briefly explain heat of solution. Apply this concept to the hydration of ammonium nitrate crystals.  
 $\Delta H_{sol} = 2.57 KJmol^{-1}$
  - (xviii) Calculate  $\Delta H^\circ$  for the given reaction  $NO + O \rightarrow NO_2$  from the following data.  
 $NO + O_3 \rightarrow NO_2 + O_2 \quad \Delta H^\circ = -198.9 KJ$   
 $O_3 \rightarrow \frac{3}{2} O_2 \quad \Delta H^\circ = -142.3 KJ$   
 $O_2 \rightarrow 2O \quad \Delta H^\circ = 495.0 KJ$
  - (xix) The standard reduction potentials for the following half reactions are;  
 $Ni^{+2} + 2e^- \rightarrow Ni_{(s)} \quad E^\circ = -0.25V$   
 $Mg^{+2} + 2e^- \rightarrow Mg_{(s)} \quad E^\circ = -2.38V$   
Calculate  $E^\circ$  cell. Write cell reaction. Show the direction of electrons.
  - (xx) Describe how a dry cell produces electricity and helps to operate the electric appliances.

### SECTION – C (Marks 26)

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

- Q. 3 a. 30 g of  $K_2SO_4$  on dissolving in water ionizes completely. Calculate.
- Number of  $K_2SO_4$  molecules
  - Number of  $K^+$  and  $SO_4^{2-}$  ions
  - Mass of individual ions
- b. Why is Molecular Orbital Theory superior to Valence Bond Theory. Explain the magnetic behaviour of  $N_2, N_2^{+2}$  and  $N_2^{-2}$  species on the basis of Molecular Orbital Theory.
- Q. 4 a. What is hydrogen bonding? Using the concept of Hydrogen bonding in water, explain the given properties:
- High surface tension
  - High specific heat
  - High heat of vaporization
- b. Design best three conditions to get maximum yield of ammonia by using given chemical reaction.  
 $N_2 + 3H_2 \rightleftharpoons 2NH_3 \quad \Delta H^\circ = -92.46 KJ$
- Q. 5 a. What is cryoscopic constant? Discuss the quantitative aspects of depression in freezing point of a solution. Give graphical representation for depression in freezing point.
- b. Born Haber's cycle is special application of Hess's law for Binary ionic compound. Write reactions and draw step wise Born Haber cycle for measurement of  $\Delta H^\circ$  lattice for sodium chloride ( $NaCl$ ).

### 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