



Version No.				
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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 اول لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر ناظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیسڈ پینسل کا استعمال ممنوع ہے۔

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8	8	8	8	8	8	8	8	8	8	8	8
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Answer Sheet No. _____

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 third ionization potential value of an element is significantly high as compared to its 1 st and 2 nd ionization potentials. The element belongs to:	Group-1 (I-A)	Group-2 (II-A)	Group-17 (VII-A)	Group-18 (VIII-A)	☐	☐	☐	☐
2. Which pair of elements will most likely form an ionic bond?	C & H	B & Cl	Na & O	H & Cl	☐	☐	☐	☐
3. Which statement is FALSE about comparative bond energy values of Hydrogen halide molecules?	H-Cl > H-F	H-F > H-Cl	H-Cl > H-Br	H-Br > H-I	☐	☐	☐	☐
4. The number of molecules present in 67.2 dm ³ of He gas at STP is:	6.02 × 10 ²⁴	1.204 × 10 ²⁴	1.806 × 10 ²⁴	2.4 × 10 ²⁴	☐	☐	☐	☐
5. What will be the enthalpy of solution of NaCl if ΔH (reverse lattice) is +786 kJ/mol and ΔH (hyd) is -783 kJ/mol?	+3 kJ/mol	-3 kJ/mol	+1569 kJ/mol	-1569 kJ/mol	☐	☐	☐	☐
6. The following equilibrium will NOT be shifted in the forward direction by: (N ₂ + 3H ₂ ⇌ 2NH ₃ + Δ)	Increasing temperature	Increasing pressure	Adding H ₂ gas	Removing NH ₃	☐	☐	☐	☐
7. Aqueous solution of which of the following salts will have pH less than 7?	Na ₂ SO ₄	KNO ₃	CuSO ₄	Na ₂ CO ₃	☐	☐	☐	☐
8. Position of an element in periodic table with electronic configuration 1s ² , 2s ² p ⁶ , 3s ² p ² is:	In Group-1 (I-A)	In Group-2 (II-A)	In Group-13 (III-A)	In Group-14 (IV-A)	☐	☐	☐	☐
9. Peroxyacetyl nitrate (PAN) is formed by the reaction of oxides of nitrogen with:	Oxides of sulphur	Hydrogen sulphide	Oxides of phosphorus	Unburned hydrocarbons	☐	☐	☐	☐
10. Which of the following halides can reduce H ₂ SO ₄ to H ₂ S?	NaF	NaCl	NaBr	NaI	☐	☐	☐	☐
11. Identify the step in the mechanism of free radical chlorination of ethane: CH ₃ - CH ₃ + Cl [•] → CH ₃ - CH ₂ [•] + HCl	Initiation	Propagation	Substitution	Termination	☐	☐	☐	☐
12. Identify the product formed when Ethyl Bromide is warmed with NaOH in ethanol:	CH ₂ =CH ₂	CH ₃ -CH ₂ -ONa	CH ₃ -CHO	CH ₂ =CH-Br	☐	☐	☐	☐
13. Which reagent is used for the reduction of Carboxylic acids to Alcohols?	KMnO ₄	K ₂ Cr ₂ O ₇	LiAlH ₄	H ₂ /Pt	☐	☐	☐	☐
14. The compound which gives Silver mirror test as well as Iodoform test is:	Ethanol	Ethanal	Propanal	Propanone	☐	☐	☐	☐
15. Which pair of organic compounds can be distinguished by using 2, 4-DNPH?	Ethanol and Acetone	1-Propanol and 2-Propanol	Ethanal and Ethanol	Ethyl chloride and Ethyl bromide	☐	☐	☐	☐
16. Identify correct relationship for determination of half-life of a first order reaction:	t _{1/2} = 0.693 / k	t _{1/2} = [A°] / 2k	t _{1/2} = 1 / k[A°]	t _{1/2} = 0.023 [A°] / k	☐	☐	☐	☐
17. Which of the following organic compound can be identified by Fehling solution test?	CH ₃ -CH ₂ -OH	CH ₃ -COOH	CH ₃ CH ₂ CHO	CH ₃ -CH ₂ -Cl	☐	☐	☐	☐

—1HA-I 25005(B)—

SUPPLEMENTARY TABLE

Page 1 of 1

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



26

Total Marks Sections B and C: 68

SECTION – B (Marks 42)

(14 x 3 = 42)

(i)	Write down electronic configuration of : $_{29}\text{Cu}^{+2}$, $_{33}\text{As}$, $_{35}\text{Br}^{-1}$	03	OR	What is meant by Catenation? What is its importance in organic chemistry?	1+2
(ii)	Briefly explain the structure of PCl_3 & NH_4^+ ion on the basis of VSEPR theory.	1.5 + 1.5	OR	Write down the chemical tests with equations to identify chlorides, bromides and iodides present in aqueous solution.	03
(iii)	Keeping in view the factors affecting bond energy, Justify the order of bond energies in the following: a) $\text{Cl}_2 > \text{F}_2$ b) $\text{H}_2 > \text{HBr}$ c) $\text{N}_2 > \text{O}_2$	03	OR	Describe any three properties of water which are due to hydrogen bonding.	03
(iv)	Write down three differences between limiting and non-limiting reactants.	03	OR	Write down the reaction of Ethyl Bromide with $\text{KOH}_{(\text{aq})}$, NH_3 and AgNO_3 .	03
(v)	State any three differences between crystalline and non-crystalline solids.	03	OR	Briefly describe the terms 'shell', 'sub-shell' and 'orbital'.	03
(vi)	Why Enthalpy of solution for NH_4NO_3 is +25.7 kJ/mol (endothermic process) whereas that of CaCl_2 is -83.0 kJ/mol (exothermic process)? Explain briefly.	1.5 + 1.5	OR	What is acid rain? Describe its formation with the help of chemical reactions involved.	1+2
(vii)	Write down any three measures that ensure the preservation of water resources.	03	OR	How can iodoform test be applied to the alcohols? Describe by giving chemical equations.	1.5 + 1.5
(viii)	Why aqueous solution of Na_2CO_3 is basic whereas that of NH_4Cl is acidic? Justify by giving chemical equations.	1.5 + 1.5	OR	How can Ethyl amine be prepared from: a) An Alkyl halide b) A Nitrate c) An Amide	03
(ix)	Determine the principal energy level and number of valence electrons in the different sub-shells and orbitals of an element present in 3 rd period and group-VI A of the periodic table.	03	OR	Write down the mechanism of base catalysed nucleophilic addition reaction of formaldehyde (HCHO) with HCN .	03
(x)	Describe the use of compounds of sulphur in any three chemical industries.	03	OR	State Markonikoff's rule by giving an example and its mechanism.	1x3
(xi)	Calculate the volume occupied by 3.011×10^{24} molecules of NH_3 gas enclosed in a container at STP.	03	OR	How is Ethanol prepared from an/a: a) Alkene b) Alkyl halide c) Carboxylic acid	03
(xii)	Briefly describe β - elimination reaction by giving a suitable example.	03	OR	Write down the reactions of 1- Propanol with: a) SOCl_2 b) PCl_5 c) Conc. $\text{H}_2\text{SO}_4/180^\circ$	03
(xiii)	Calculate K_c for the following reaction at equilibrium at 100°C . $2\text{SO}_{2(\text{g})} + \text{O}_{2(\text{g})} \rightleftharpoons 2\text{SO}_{3(\text{g})}$ [SO_2]=0.59 M [O_2]=0.05 M [SO_3]=0.259 M	03	OR	Calculate total entropy change when NaCl dissolves in water under standard conditions: $\text{NaCl}_{(\text{s})} \longrightarrow \text{Na}^+_{(\text{aq})} + \text{Cl}^-_{(\text{aq})}$ $S^\circ(\text{NaCl})=72.1 \text{ J/mol/K}$, $S^\circ(\text{Na}^+)=321 \text{ J/mol/K}$ $S^\circ(\text{Cl}^-)=56.5 \text{ J/mol/K}$	03
(xiv)	Draw Born-Haber cycle for the formation of KCl . (Calculation is NOT required)	03	OR	For the reaction $\text{N}_2\text{O}_4 \longrightarrow 2\text{NO}_2$, the concentration of N_2O_4 is reduced from 0.1M to 0.05M in 60 sec. If reaction is 1 st order, calculate rate constant for this reaction.	03

SECTION – C (Marks 26)

Attempt the following questions.

Q.3	What is mass spectrometry? Explain the construction and working of a mass spectrometer. How can average atomic mass of an element be calculated from data obtained?	1+4 +2	OR	Explain formation of covalent bonds in O_2 molecule on the basis of molecular orbital theory and valance bond theory. Justify that molecular orbital theory is superior to valence bond theory.	3+3 +1									
Q.4	Describe by giving balanced chemical equations and necessary conditions that how a Carboxylic acid can be prepared from: a) CH_3-CH_2-Cl b) $CH_3-CH-CH_2-OH$ CH_3 c) C_6H_5-CHO	2x3	OR	Discuss the effect of following changes on the given reactions at equilibrium: <table><tr><td>i</td><td>Increasing pressure</td><td>$C_3H_8 + 5O_2 \rightleftharpoons 3CO_2 + 4H_2O$</td></tr><tr><td>ii</td><td>Removing SO_3</td><td>$2SO_2 + O_2 \rightleftharpoons 2SO_3$</td></tr><tr><td>iii</td><td>Decreasing temperature</td><td>$CO_2 + \Delta \rightleftharpoons CO + \frac{1}{2} O_2$</td></tr></table>	i	Increasing pressure	$C_3H_8 + 5O_2 \rightleftharpoons 3CO_2 + 4H_2O$	ii	Removing SO_3	$2SO_2 + O_2 \rightleftharpoons 2SO_3$	iii	Decreasing temperature	$CO_2 + \Delta \rightleftharpoons CO + \frac{1}{2} O_2$	2x3
i	Increasing pressure	$C_3H_8 + 5O_2 \rightleftharpoons 3CO_2 + 4H_2O$												
ii	Removing SO_3	$2SO_2 + O_2 \rightleftharpoons 2SO_3$												
iii	Decreasing temperature	$CO_2 + \Delta \rightleftharpoons CO + \frac{1}{2} O_2$												
Q.5	How can one identify the functional groups in the following compounds by chemical tests? Elaborate. a) CH_3CHO b) CH_3-CH_2-OH c) $CH_3-CH=CH_2$	2x3	OR	Why is Ethene more reactive than Ethane? Write down the reactions of Ethene with: a) H_2SO_4/H_2O b) Cl_2/H_2O	2+2 +2									
Q.6	What is solubility product? Derive an expression for the solubility product of CaF_2 . How can the concept of solubility product be applied to predict the precipitation of CaF_2 on mixing aqueous solutions of Ca^{+2} and F^{-1} ions?	1+2 +4	OR	Explain the occurrence of a chemical reaction with reference to molecular collisions, activation energy, formation of activated complex and enthalpy changes in the reaction.	07									

— 1HA-1 25005 (B) —

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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

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Time allowed: 25 Minutes

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ROLL NUMBER						

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6	6	6	6	6	6	6
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9	9	9	9	9	9	9

Answer Sheet No. _____

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 electronic configuration of an ion with mass number 63 and charge +2 is $[Ne] 3s^2, 3p^6, 3d^9$. The number of electrons, protons and neutrons present in the atom are:	e=27 p=27 n=36	e=29 p=27 n=36	e=29 p=29 n=34	e=34 p=29 n=63	☐	☐	☐	☐
2.	A molecule with formula H_2CO has three sigma bond pairs and one pi bond pair in valence shell of central atom (carbon). Its structure is:	Triangular pyramid	Trigonal planar	Bent	Tetrahedral	☐	☐	☐	☐
3.	$0.5 dm^3$ of CO_2 gas is enclosed in a container at STP. The mass of gas is:	0.49g	0.98g	22.4g	48.6g	☐	☐	☐	☐
4.	Which molecule possesses stronger London dispersion forces?	n-Butane	n-Pentane	Iso butane	Iso pentane	☐	☐	☐	☐
5.	Which of the following is the correct relationship for Gibb's free energy?	$G = H + TS$	$G = H \times TS$	$G = H - TS$	$G = \frac{H}{TS}$	☐	☐	☐	☐
6.	Correct rate equation for given reaction is: $H_2 + Cl_2 \xrightarrow{\text{sunlight}} 2HCl$	Rate = $k[H_2][Cl_2]$	Rate = $k[H_2]$	Rate = $k[Cl_2]$	Rate = k	☐	☐	☐	☐
7.	Which of the following reaction at equilibrium will NOT be affected by change in pressure?	$N_2O_4 \rightleftharpoons 2NO_2$	$CO + 2H_2 \rightleftharpoons CH_3OH$	$N_2 + O_2 \rightleftharpoons 2NO$	$N_2 + 3H_2 \rightleftharpoons 2NH_3$	☐	☐	☐	☐
8.	If solubility of a salt MX is $2 \times 10^{-2} \text{ mol/dm}^3$, what will be the value of K_{sp} if salt dissociates into one cation (M^+) and one anion (X^-)?	1×10^{-4}	2×10^{-4}	4×10^{-4}	8×10^{-4}	☐	☐	☐	☐
9.	Which of the following decreases across the period?	Atomic radius	Ionization potential	Electron affinity	Electronegativity	☐	☐	☐	☐
10.	An element M reacts with O_2 , H_2O and Cl_2 to form the products M_2O , MOH and MCl respectively. The element is most likely:	Li	Al	Mg	Ca	☐	☐	☐	☐
11.	Which compound of sulfur is used as fertilizer?	$(NH_4)_2SO_4$	$CuSO_4$	Na_2SO_4	$BaSO_4$	☐	☐	☐	☐
12.	Identify x and y, in the reaction: $CH_2 = CH_2 \xrightarrow{x} C_2H_5OH \xrightarrow{y} CH_3 - CH_2 - OH$	x = H_2O , y = HCl	x = H_2SO_4 , y = $LiAlH_4$	x = H_2SO_4/H_2O , y = Al_2O_3	x = $NaBH_4$, y = H_2SO_4	☐	☐	☐	☐
13.	An alkyl halide is reacted with $AgNO_3$ in ethanol, light yellow ppt insoluble in NH_4OH are formed. Identify the alkyl halide:	$CH_3 - CH_2 - F$	$CH_3 - CH_2 - Cl$	$CH_3 - CH_2 - Br$	$CH_3 - CH_2 - I$	☐	☐	☐	☐
14.	What is produced when ethene is reacted with cold, dilute solution of $KMnO_4$?	$CH_3 - CH_2 - OH$	$CH_3 - CHO$	$CH_3 - COOH$	$HO - CH_2 - CH_2 - OH$	☐	☐	☐	☐
15.	Identify the product Q in given reaction: $CH_3 - CH_2 - CN + 2H_2O \xrightarrow{HCl} Q + NH_3$	$CH_3 - CH_2 - OH$	$CH_3 - CH_2 - COOH$	$CH_3 - CH_2 - NH_2$	$CH_3 - COOH$	☐	☐	☐	☐
16.	Butanone can be prepared by oxidation of:	1-Butanol	2-Butanol	Butanal	Butanoic acid	☐	☐	☐	☐
17.	The reduction of $C_6H_5 - NO_2$ by Sn/HCl results in the formation of:	C_6H_6	$C_6H_5 - NH_2$	$C_6H_5 - OH$	$C_6H_5 - Cl$	☐	☐	☐	☐

—1HA-I 25005 (D)—

SUPPLEMENTARY TABLE

Page 1 of 1

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

SECTION – B (Marks 42)

Q. 2 Answers the following parts briefly.

(14 x 3 = 42)

(i)	Write down the electronic configuration of an element with atomic number 24 and also of its ion with charge +3. Describe the reason for any discrepancy in electronic configuration of element.	1x3	OR	Briefly explain the terms with examples: a) Enthalpy of atomization, b) Lattice energy, c) Electron affinity.	03
(ii)	Draw molecular orbital diagram for N_2 and calculate its bond order.	03	OR	What is dynamic equilibrium? How does it exist between two physical states of a substance? Describe by giving an example.	1+2
(iii)	What is molar volume? Calculate the volume occupied by 2000g of Cl_2 gas at STP.	1+2	OR	How are the elements arranged in different blocks of periodic table?	03
(iv)	Why does carbon form a large number of organic compounds? Give three reasons.	03	OR	Complete the following reactions: i $CH_2 = CH_2 + H_2O + KMnO_4 \longrightarrow$ ii $CH_3 - CH_2 - COOCH_3 + NaOH \longrightarrow$ iii $C_6H_5CHO + 2[H] \xrightarrow{NaBH_4}$	03
(v)	What is Azimuthal quantum number? Describe its significance.	1+2	OR	Explain why: i is the falling drop of water spherical in shape? ii has water high surface tension than Ether?	1.5 + 1.5
(vi)	Justify the difference in the boiling points of $CH_4(-162^\circ C)$, $HCl(-85^\circ C)$ and $H_2O(100^\circ C)$.	03	OR	What is the Photo chemical smog? Briefly describe its formation.	1+2
(vii)	What is entropy? Describe the increase or decrease in entropy of system with sign in the following reactions: a) $N_2O_{4(g)} \longrightarrow 2NO_{2(g)}$ b) $NH_{3(g)} + HCl_{(g)} \longrightarrow NH_4Cl_{(s)}$	1x3	OR	Ethanol can be converted into propanoic acid in three stage process. $C_2H_5OH \xrightarrow{I} A \xrightarrow{II} B \xrightarrow{III} C_2H_5 - COOH$ Write down the balanced chemical equation to show the conversion in each step.	03
(viii)	Write down three methods by which un-useable water can be converted into clean water.	03	OR	Write down any three harmful effects of acid rain.	03
(ix)	Write down three methods for the preparation of Ethyl chloride from an alcohol.	03	OR	How can primary, secondary and tertiary alcohols be distinguished by applying Lucas test?	03
(x)	Briefly explain the factors which affect the relative stability of primary, secondary and tertiary carbocation.	03	OR	Write down the reactions of Ethyl Amine ($C_2H_5 - NH_2$) with: a) $CH_3CH_2 - Cl$ b) HNO_2 / HCl	1.5 + 1.5
(xi)	Differentiate between metallic and non-metallic behavior of elements.	03	OR	For the reaction $2NO_2 + F_2 \longrightarrow 2NO_2F$ $Rate = [NO_2][F_2]$ propose the mechanism of reaction.	03
(xii)	Describe how $(n+l)$ rule and Hund's rule are applied in writing the electronic and orbital configuration of Mn ($Z=25$).	03	OR	How does a catalyst affect the rate of a chemical reaction? Explain by drawing a reaction pathway diagram.	03
(xiii)	Calculate concentration of H^+ ion in 1.0 M solution of Formic acid ($HCOOH$) which ionizes as: $HCOOH \rightleftharpoons H^+ + HCOO^-$, $K_a = 1.8 \times 10^{-4}$	03	OR	How can Iodoform test be applied for identification of aldehydes and ketones? Describe by giving chemical equations.	1.5 + 1.5
(xiv)	Draw position isomers and functional group isomers of $C_3H_7 - OH$	1.5 + 1.5	OR	Why is the ionization of HF decreased when aqueous solution of its salt is added to it? Briefly explain by applying Le-Chatlier's principle.	03

SECTION – C (Marks 26)

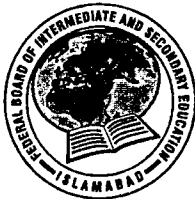
Attempt the following questions.

Q.3	What is hybridization? Write down three differences between sp^3 and sp^2 hybridizations. Explain bonding in BF_3 on the basis of hybridization.	1+3 +3	OR	Why are alkanes chemically less reactive? Describe the mechanism of free radical chlorination of Ethane to form Ethyl Chloride.	3+4
Q.4	Explain one physical and one chemical method to recognize a system at equilibrium.	3+3	OR	Write down a chemical reaction between CH_3COOH and CH_3OH with necessary conditions. Also write the mechanism of this reaction, explaining each step.	2+4
Q.5	Explain the relative reactivity of halogens: (i) as oxidizing agents (ii) in their reaction with H_2 , by giving suitable examples.	3+3	OR	Describe the behaviour of 1-propanol and 2-propanol with respect to their: (i) reaction with $I_2/NaOH$ (ii) reaction with $HCl/ZnCl_2$ (iii) reaction with $K_2Cr_2O_7/H_2SO_4$	2x3
Q.6	300 g Zn is reacted with 300 g HCl . $Zn + 2HCl \longrightarrow ZnCl_2 + H_2$ Calculate the mass of H_2 produced. In an experiment, if 6g H_2 is obtained, calculate percentage yield. (Atomic masses $Zn=65.38$ g/mol $H=1$ g/mol $Cl=35.5$ g/mol)	07	OR	State Hess's law with an example. Apply Hess's law to calculate enthalpy of formation of CH_3COOH . The standard enthalpies of combustion of carbon, hydrogen and acetic acid are -393.5 kJ/mol, -285.8 kJ/mol and -875 kJ/mol respectively.	2+5

SUPPLEMENTARY TABLE

— 1HA-I 25005 (D) —

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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
(Old Curriculum 2006)
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.

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حصہ اول لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر نام مرکز کے حوالے کریں۔ گات کر دیا جائے
لکھنے کی اہلیت نہیں ہے۔ لیڈ پینل کا استعمال منع ہے۔

Version No.				
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ROLL NUMBER						

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0	9	9	9	9

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

Answer Sheet No. _____

Invigilator Sign. _____

Fill the relevant bubble against each question according to curriculum:

Candidate Sign. _____

Question	A	B	C	D	A	B	C	D
1. Amount of salt obtained in a reaction between acid and base is 250g. Having theoretical yield 500g, percentage yield is:	45%	50%	25%	35%	☐	☐	☐	☐
2. Which pair has the same electronic configuration as possessed by Neon?	Na^+, Cl^-	K^+, Cl^-	Na^+, Mg^+	Na^+, F^-	☐	☐	☐	☐
3. Select the molecule, which has a dipole moment equal to zero. ($\mu = 0$)	C_6H_6	HBr	SO_2	NH_3	☐	☐	☐	☐
4. A molecule has two lone pairs and two bond pairs around the central metal atom, it is expected to be:	Triangular geometry	Linear geometry	V-shaped geometry	Tetrahedral geometry	☐	☐	☐	☐
5. The volume occupied by Nitrogen gas (N_2) having number of moles 2.75 at STP is:	$56.64 dm^3$	$45.46 dm^3$	$61.64 dm^3$	$3.89 dm^3$	☐	☐	☐	☐
6. Plasma is the ionized gas mixtures which consists of:	Ions and electrons	Electrons, ion and neutral atoms	Electrons and neutral atoms	Ions and neutral atoms	☐	☐	☐	☐
7. Which sequence for variation of heat of vaporization is correct?	$H_2O > NH_3 > CH_4$	$NH_4^+ > NH_3 > H_2O$	$NH_3 > H_2O > CH_4$	$CH_4 > H_2O > NH_3$	☐	☐	☐	☐
8. London Dispersion forces are only forces present among which of the following?	Polar molecules of water	Molecules of HF	Molecules of solid iodine	Molecules of ammonium chloride	☐	☐	☐	☐
9. In crystal lattice of ice, each O-atom of water molecule is attached to:	Four hydrogen atoms	Three hydrogen atoms	Two hydrogen atoms	Five hydrogen atoms	☐	☐	☐	☐
10. Formation of NH_3 is a reversible, exothermic process, what will happen on cooling?	More reactant will be formed	More H_2 will be formed	More N_2 will be formed	More NH_3 will be formed	☐	☐	☐	☐
11. The pK_a of CH_3COOH is +4.76. pK_b of the conjugate base of CH_3COOH is:	9.24	5.32	3.76×10^5	2.34×10^5	☐	☐	☐	☐
12. Which salt dissolved in water forms a solution with a pH greater than 7?	$NaCl$	$CuSO_4$	Na_2CO_3	NH_4Cl	☐	☐	☐	☐
13. When a reaction proceeds in a sequence of steps, the overall rate is determined by:	Fastest step	Slowest step	Order of reaction	Molecularity of all steps	☐	☐	☐	☐
14. The colligative properties of the solution depends upon the:	Nature of solute	Number of solute particles	Nature of solvent	Number of solvent particles	☐	☐	☐	☐
15. Enthalpy change for the reaction $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ is called enthalpy of:	Formation (ΔH_f°)	Neutralization (ΔH_n°)	Combustion (ΔH_c°)	Atomization (ΔH_{at}°)	☐	☐	☐	☐
16. Change in heat energy of a chemical reaction at constant temperature and pressure is:	Enthalpy change	Bond energy	Heat of sublimation	Internal energy change	☐	☐	☐	☐
17. Reduction potential of copper electrode is +0.34 V and that of zinc electrode is -0.76 V. emf of a cell counting these two is:	-0.42 V	+0.42 V	-1.10 V	+1.10 V	☐	☐	☐	☐

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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

(Old Curriculum 2006)

30

Time allowed: 2:35 Hours

Total Marks Sections B and C: 68

SECTION – B (Marks 42)

Q. 2 Answers the following parts briefly.

(14 x 3 = 42)

(i)	Calculate mass of positive and negative ions produced when 3.26×10^{22} molecules of CaCl_2 were dissolved in solution.	03	OR	Human body burns glucose for energy. Burning 1.8g of glucose produces 20.36kJ heat. Calculate molar heat of combustion of glucose. ($\text{C}_6\text{H}_{12}\text{O}_6$)	2+1
(ii)	What is the effect of catalyst on the following: a) Rate of reaction b) The energy of activation c) The equilibrium position	03	OR	Using Kinetic gas equation $PV = \frac{1}{3}mNc^2$. Derive an expression which relates the average kinetic energy of the molecule to the temperature.	03
(iii)	Why bond formation is NOT possible between two He-atoms? Prove with the molecular orbital theory.	03	OR	Calculate energy and frequency of radiation emitted d when electron jumps from $n=4$ to $n=2$ of hydrogen atom.	03
(iv)	By using VSEPR theory, predict the geometry, bond angle of the following: a) CH_2O b) SO_3 c) CHCl_3	03	OR	The dipole moment of HF is 2.03 D, and the bond length is 120 pm. Calculate the percentage of ionic character of HF bond.	03
(v)	Describe the relationship between the enthalpy change and the heat of reaction.	03	OR	Differentiate between amorphous and crystalline solids.	03
(vi)	The standard reduction potential for the following half reactions are: $\text{Cu}^{+2} + 2e^- \longrightarrow \text{Cu}_{(s)} \quad E^\circ = +0.34\text{V}$ $\text{Cl}_2 + 2e^- \longrightarrow 2\text{Cl}^- \quad E^\circ = +1.36\text{V}$ Calculate E° cell for CuCl_2 , write cell reaction and identify cathode and anode.	03	OR	By applying HESS'S law calculate enthalpy of formation of methane from given data: $\text{CH}_4 + 2\text{O}_2 \longrightarrow \text{CO}_2 + 2\text{H}_2\text{O} \quad \Delta H^\circ = -890.4\text{kJ/mol}$ $\text{H}_2 + \frac{1}{2}\text{O}_2 \longrightarrow \text{H}_2\text{O} \quad \Delta H^\circ = -285.5\text{kJ/mol}$ $\text{C} + \text{O}_2 \longrightarrow \text{CO}_2 \quad \Delta H^\circ = -393.5\text{kJ/mol}$ $\text{C} + 2\text{H}_2 \longrightarrow \text{CH}_4 \quad \Delta H^\circ = ?$	03
(vii)	Prove the given relationship for the conjugate acid-base pair is: $pK_a + pK_b = pK_w$	03	OR	Describe the effect of change in pressure on the volume of a gas. Show it graphically.	2+1
(viii)	What are Buffer solutions? Write their types.	2+1	OR	State Hund's rule. Write its importance.	03
(ix)	What is the limiting reactant? How does it control the quantity of the product formed?	2+1	OR	Ice has high heat of fusion. Give its two importance in real life.	03
(x)	What is critical solution temperature? Explain by using the example of phenol-water system.	03	OR	Illustrate the conductivity of a metallic crystal by using electron sea theory.	03
(xi)	Consider the reaction: $\text{SO}_2 + \text{Cl}_2 \rightleftharpoons \text{SO}_2\text{Cl}_2 + \text{heat}$ Propose three changes that will produce the maximum SO_2Cl_2	03	OR	Describe the following properties of crystalline solids with example : a) Polymorphism b) Isomorphism	03
(xii)	The rate law for the following reaction $2\text{H}_2 + 2\text{NO} \longrightarrow \text{N}_2 + 2\text{H}_2\text{O}$ $\text{Rate} = K[\text{H}_2][\text{NO}]^2$ Propose mechanism. Identify rate determining step in the mechanism.	03	OR	Give reasons for: a) H_2O is a liquid but H_2S is gas at room temperature. b) Heat of sublimation is greater than heat of vaporization.	03
(xiii)	How the anomalous behaviour of water will be explained when its density becomes maximum at 4°C ?	03	OR	Balance the equation by the oxidation number method: $\text{HNO}_3 + \text{HI} \longrightarrow \text{NO} + \text{I}_2 + \text{H}_2\text{O}$	03
(xiv)	How the nature of reactant and surface area affect the rate of reaction?	03	OR	An aqueous solution containing 100g ethanol per dm^3 of solution has density of 0.984g cm^{-3} . Calculate mole fraction of each component.	03

SECTION – C (Marks 26)

Attempt the following questions.

Q.3	Keeping in mind the Bohr's atomic theory, derive an expression for energy of an electron revolving in n^{th} orbit of hydrogen atom, convert this energy into kJ/mol	5+2	OR	Explain the effect on boiling point of solution. When non-volatile solute is added. Elaborate with graphical representation. How molar mass of this non-volatile solute can be determined? Derive.	2+2 +3
Q.4	Carbon atom shows sp^3, sp^2, sp hybridization. Give one example of each along the structures.	2x3	OR	By using Le-Chatellier's principle, describe best three conditions to get the maximum yield of Ammonia by Haber's process. $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3 + \Delta H$	2x3
Q.5	Describe the causes of deviations of real gases from their ideal behavior. Explain these deviations at: i) Low Temperature ii) High Pressure	2+4	OR	Write construction, working along chemical reaction at cathode, at anode of the following dry cell: a) Simple dry cell b) Alkaline dry cell	3+3
Q.6	The percentage yield of the following reaction is 76% $2\text{Al} + 3\text{Cl}_2 \longrightarrow 2\text{AlCl}_3$ How many grams of AlCl_3 will be obtained from 36.5g of Aluminum metal?	07	OR	Explain the term vapour pressure. Write two factors affecting the vapour pressure of liquid. Compare the vapour pressure of Diethyl ether, water and ethanol.	2+2 +3

— 1HA-I 25005(OLD) —

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