Version No.			

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	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._____

Sign. of Candidate _____

Sign. of Invigilator _____

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.**

Q.1 Fill the relevant bubble for each part. Each part carries one mark.

1. Plasma is the mixture of:
   - A. Electrons and protons only.
   - B. Electrons and positive ions.
   - C. Electrons and beta two particles.
   - D. Neutrons and protons.

2. The electrode potential of metals are:

   $Mg^{2+} + 2e^- \longrightarrow Mg \quad E° = -2.71$ v

   $Ag \longrightarrow Ag^+ + 1e^- \quad E° = -0.8$ v

   Cell potential (emf) of the cell formed by these two will be:
   - A. + 3.51 v
   - B. -3.51 v
   - C. + 1.91 v
   - D. – 1.91 v

3. At constant Pressure what will be the change in temperature when the volume of a gas will become twice of what it is at 0^oC?
   - A. 546^oC
   - B. 200^oC
   - C. 546 K
   - D. 273 K

4. Rate equation for a reaction $2A \longrightarrow$ product is Rate = K $[A]^2$. Unit of specific rate constant for this reaction is:
   - A. $mol^2dm^{-6}\ S^{-1}$
   - B. $mol^{-1}dm^3\ S^{-1}$
   - C. $moldm^{-3}$
   - D. S^{-1}

5. A substance which itself is not a catalyst but increases the activity of a catalyst is called:
   - A. Enzyme
   - B. inhibitor
   - C. Promoter
   - D. Poisoner

6. Diamond is a bad conductor of electricity because:
   A. It has a tight structure B. It has a high density
   C. It has no free electrons D. It is transparent to light

7. Mixture containing 0.01 mole/300cm^3 of NH_4Cl and 0.1 mole/400cm^3 of NH_4OH having pKb = 5 has pH of:
   A. 4.00 B. 4.12
   C. 9.88 D. 10.00

8. 5g of urea (M.wt = 60) is dissolved in 250 cm^3 of its solution. Concentration of solution will be:
   A. 5 % w/w B. 5 % v/w
   C. 0.34 M D. 0.34m

9. The gaseous element X exists in diatomic form. One volume of the element X combines with two volume of hydrogen to form two volume of gaseous hydride. What is the formula of hydride of X.?
   A. HX_2 B. HX_3
   C. H_2X D. HX

10. The number of bonds in one molecule of Nitrogen is:
   A. one σ and one π B. one σ and two π
   C. three σ only D. two σ and one π

11. Splitting of spectral lines by placing the excited atom in electric field is called:
   A. Zeeman effect B. Stark effect
   C. Photoelectric effect D. Compton effect

12. In the ground state of an atom, the electron is present:
   A. in the valence shell B. in the second shell
   C. nearest to the nucleus D. farthest from the nucleus

13. Which one of the following exists in the solid state as a giant covalent lattice?
   A. ice B. iodine
   C. silicon (IV) oxide D. dry ice

14. pH of 1×10^{-4} M solution of Phosphoric acid is:
   A. 1.10 B. 2.02
   C. 3.52 D. 4.13

15. In which substance does nitrogen exhibit the highest oxidation state?
   A. NO B. N_2O
   C. N_2O_4 D. $NaNO_2$

16. The heat of neutralization of the given reaction is -57.3 kJ
   $NaOH + HCl \longrightarrow NaCl + H_2O$
   What is the heat of neutralization of the following reaction?
   $Fe(OH)_2 + 2HCl \longrightarrow FeCl_2 + 2H_2O$
   A. -57.3kJ B. -114.6kJ
   C. -228kJ D. -28.6kJ

17. Which of these samples of gas contains the same number of atoms as 1g of hydrogen molecule? (At. Mass C = 12, O = 16, H = 1, Ne = 20)
   A. 22 g of CO_2 B. 8 g of CH_4
   C. 20 g of Ne D. 8 g of O_3

Federal Board HSSC-I Examination
Chemistry Model Question Paper
(Curriculum 2006)

Time allowed: 2.35 hours Total Marks: 68

Note: Answer all parts from Section 'B' and all questions from Section 'C' on the **E-sheet**. Write your answers on the allotted/given spaces.

SECTION – B (Marks 42)

Q.2 Attempt all parts from the following. All parts carry equal marks. (14 × 3 = 42)

i. The bond angles of H_2O and NH_3 are not 109.5° as that of CH_4. Although O and N atoms are Sp^3 hybridized. Give reason. (1+2)

OR

Explain the origin of spectral lines of Lyman, Balmer and Paschen series in H-atom. (1+1+1)

ii. What is corrosion? Give two methods for protection of iron from corrosion. (1.5+1.5)

OR

How can sodium chloride and glucose be dissolved in water? What important forces exist between solute and solvent particles in these solutions?

iii. Calculate molality of aqueous solution of sulfuric acid from the following data. (1+2)

Molar mass	Molarity	Density in g/Cm^3
98	18	1.84

OR

Calculate the molecular mass of the solute by using $\Delta P/P^0 = X_2$? (1+2)

iv. Interpret why water and ethanol can mix easily in all proportions. (1+2)

OR

How sigma (σ) bond is different from a pi(π) bond?

v. What are quantum numbers? Which Quantum number cannot be explained on the basis of Bohr's Atomic Model? (1+2)

OR

The melting and boiling points of hydrazine (N_2H_4) are much higher than those of ethane (C_2H_4). Give reason. (3)

vi. Describe hybridization in acetylene (C_2H_2) molecule. Explain with the help of a diagram. (1.5+1.5)

OR

Explain Hexagonal close packing and Cubic close packing in metals. (1.5+1.5)

vii. Derive the units for general gas constant 'R' in general gas equation. (1.5+1.5)

a. When the pressure is in Nm^{-2} and volume in m^3.

b. When pressure is in atm and volume in dm^3.

OR

Consider the Standard electrode potentials (1+1+1)

$Ag^+/Ag = 0.7994V$, $Fe^{3+}/Fe = 0.771V$

Write the half-cell reactions at each electrode. Also write feasibility of this reaction.

viii. As both NF_3 and BF_3 are tetra atomic molecules but have different geometry. Explain each according to VSEPR theory. (1.5+1.5)

OR

Write Equilibrium constant expression and find its unit for the following reaction.

$$PCl_5 \rightleftharpoons PCl_3 + Cl_2$$ (1.5+1.5)

ix. Benzene (C_6H_6) is an aromatic hydrocarbon which exists as a liquid at room temperature. Using the following standard enthalpy changes. Calculate the enthalpy change of formation of C_6H_6. (1.5+1.5)

Heat of formation of CO_2 = -393 KJ / mol
Heat of formation of H_2O = -286 KJ / mol
Heat of combustion of C_6H_6 = -3268 KJ / mol

OR

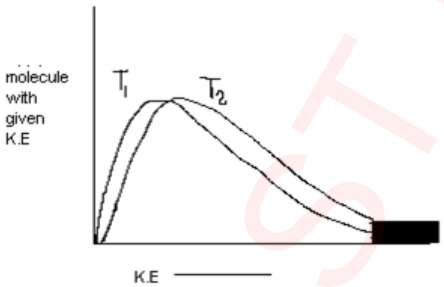
Write an equation to show energy difference between two energy levels, also calculate ionization Energy of H-atom. (1+2)

x. What is reverse osmosis? Give any one daily life application. (1+2)

OR

What are buffer solutions? Name their types with examples. (1+2)

xi. Consider this graph and explain on the basis of Maxwell Boltzmann curve of kinetic energy the effect of temperature on rate of reaction. (1+2)



OR

State Dalton's law. Also write its two applications. (1+2)

xii. An aqueous solution of ammonium chloride is acidic and that of sodium acetate is basic in nature. Give reason with the help of equation. (1+2)

OR

Distinguish between heat capacity and specific heat capacity. (1.5+1.5)

xiii. Ionic Crystals are brittle in nature but metals are malleable in nature. Elaborate. (1.5+1.5)

OR

Heats of solution got an important applications in treatment of injuries and wounds. Justify the statement with the help of exothermic and endothermic heats of solutions. (1.5+1.5)

xiv. Lattice energies of LiCl and KCl are 833 kJ/mol and 690 kJ/mol, respectively. Explain the difference in these energies? (1.5+1.5)

OR

Chemical kinetics is concerned with rates of chemical reactions and factors that affects the rates of chemical reactions. Consider the following steps of reactions:

$FeCl_3$ (aq) + 2Kl (aq) $\longrightarrow$ FeI_2 (aq) + 2KCl (aq) + Cl -(aq) (slow)

2KI(aq) + 2Cl - (aq) $\longrightarrow$ 2KCl(aq) + I_2(S) (fast)

Write the rate law and calculate the order for the above reactions. (2+1)

SECTION – C (Marks 26)

Note: Attempt all questions. Marks of each question are given within brackets.

Q.3 Derive the equation for the radius of nth orbit of hydrogen atom using Bohr's model. (2+5)

OR

What are the factors that affects the bonding? (3+2+2)

i. $AsCl_3$
ii. H_2O
iii. BF_3

Q.4 Solvay process is used to manufacture sodium carbonate. During this process ammonia is recovered by the following reaction. (3+3)

$2NH_4Cl + Ca(OH)_2 \longrightarrow CaCl_2 + 2H_2O + 2NH_3$

When 100 g of ammonium chloride and 150 g calcium hydroxide are used then

i. Calculate the mass in kg of ammonia produce during chemical reaction.
ii. Calculate the excess mass in gram of one of the reactants left unreacted.

(At. Mass N=14 H=1 Cl= 35.5 Ca=40)

OR

Phosgene ($COCl_2$) is a toxic gas. This gas is prepared by the reaction of carbon monoxide with chlorine. (4+2)

$CO\ (g) + Cl_2\ (g) \longrightarrow COCl_2\ (g)$

The following data were obtained for kinetic study of this reaction.

Experiment	Initial [CO]	Initial [Cl_2]	Initial rate (moles $dm^{-3}\ s^{-1}$)
1	1.000	0.100	1.29×10^{-29}
2	0.100	0.100	1.30×10^{-30}
3	0.100	1.000	1.30×10^{-30}

i. Use the above data and deduce the order of the reaction with respect to CO and Cl_2.
ii. Write rate law/equation for this reaction.

Q.5 Consider the following reaction:

$N_2 + 3H_2 \rightleftharpoons 2NH_3$

i. Derive expression of Kc for the above reaction
ii. Calculate equilibrium concentration of N_2. The equilibrium concentration of H_2 and NH_3 are 1.0 $moldm^3$ and 0.5 $moldm^{-3}$ respectively. Kc of above reaction at 25℃ is 1.85×10^{-3}. (3+3)

OR

Balance the following chemical equation in an acidic medium by showing all steps.

$Cr^{3+} + BiO_3^{1-} \longrightarrow Cr_2O_7^{2-} + Bi^{3+}$

(1x6=6)

Q.6 Explain Born Haber's cycle to calculate lattice energy and draw its cycle. (4+3)

OR

Explain primary and secondary storage batteries? How can lead storage batteries produce electric current? (4+3)

* * * * *

SUPLEMENTARY TABLE														
Atomic No	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Symbol	**H**	**He**	**Li**	**Be**	**B**	**C**	**N**	**O**	**F**	**Ne**	**Na**	**Mg**	**Al**	**Si**
Mass no	**1**	**4**	**7**	**9**	**11**	**12**	**14**	**16**	**19**	**20**	**23**	**24**	**27**	**28**
Atomic No	**15**	**2**	**16**	**17**	**18**	**19**	**20**	**31**	**32**	**33**	**34**	**35**	**36**	**37**
Symbol	**P**	**He**	**S**	**Cl**	**Ar**	**K**	**Ca**	**Ga**	**Ge**	**As**	**Se**	**Br**	**Kr**	**Rb**
Mass no	**31**	**4**	**32**	**35**	**40**	**39**	**40**	**70**	**73**	**74**	**79**	**80**	**84**	**85**
Atomic No	**38**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**81**	**82**	**83**	**84**	**85**
Symbol	**Sr**	**In**	**Sn**	**Sb**	**Te**	**I**	**Xe**	**Cs**	**Ba**	**Tl**	**Pb**	**Bi**	**Po**	**At**
Mass no	**88**	**115**	**119**	**122**	**128**	**127**	**131**	**133**	**137**	**204**	**207**	**208**	**209**	**210**

Federal Board HSSC-I Examination
Chemistry Model Question Paper
(Curriculum 2006)

Section A

1. Define and explain Plasma.
2. Use the activity series of metals to predict the product of single replacement reaction.
3. Drive ideal gas equation.
4. Explain and use the term rate of reaction, rate equation, order of a reaction and rate determining steps.
5. Explain that a catalyst provides a reaction path way that has a low activation energy.
6. Describe properties of crystalline solid.
7. Make Buffer solution and explain how such a solution maintain such a PH.
8. Express solution concentration in term of molality.
9. Interpret volume of the gasses at STP.
10. Describe the change on bond length.
11. Use Bohr atomic model for calculating energy of electron in a given orbit of Hydrogen atom.
12. Summarize Bohr atomic theory.
13. Describe the simple properties of simple liquids.
14. Make Buffer solution and explain how such a solution maintain such a PH.
15. Use the oxidation number change method to identify items being oxidized or reduced.
16. Relate a change in enthalpy to the heat of reaction.
17. Interpret representative particles.

Section B

Q2:

i. Determine the shape of some molecules using orbital hybridization.

OR

Relate energy equation for electron of radiation emitted or absorbed.

ii. Define cell potential and describe how it is determined.

OR

Use concept of hydrolysis to show why aqueous solution of salt is not necessarily neutral.

iii. Express solution concentration in term of molality.

OR

Describe on a particle bases why a solution has lower vapour pressure than the pure solvent.

iv. Use the concept of Hydrogen bonding to explain the properties of water.

OR

Describe features of sigma and pi bond.

v. Relate the discreate line spectrum of Hydrogen to energy levels of electrons in the Hydrogen atom.

OR

Explain applications of dipole dipole force, Hydrogen bonding and London force.

vi. Determine the shape of some molecules from the number of bonded pairs and lone pair of electrons around the central atoms

OR

Explain three types of packing arrangements and draw or construct models of them.

vii. Explain the significance and different units of ideal gas constants.

OR

Define cathode, anode, electrode potential and standard hydrogen electrode.

viii. Use VSEPR and VBT theories to describe the shapes of the molecules.

OR

Write equilibrium expression for a given chemical reaction.

ix. Use standard heat of formation to calculate the heat of reaction and Calculate lattice energy and enthalpy of formation.

OR

Use Bohr's Atomic Model to calculate energy of electron in given orbit of H-atom.

x. Explain on a particle bases how the addition of the solute to the pure solvent.

OR

Make a buffered solution and show how it maintains its pH by adding an acid or base.

xi. Explain the effect of concentration, temperature and surface area on reaction rate.

OR

State and use Dalton law of partial fraction.

xii. Distinguish between solvation of ionic species.

OR

Distinguish between heat capacity and Specific heat.

xiii. Differentiate between ionic and covalent crystal.

OR

Define heat of solution and apply this concept to hydration of ammonium nitrate crystals.

xiv. Calculate lattice energy and enthalpy of formation.

OR

Given the order with respect to each reactant write the rate law for the reaction.

Section C

Q3: Use Bohr atomic model for calculating radii of orbits.

OR

Determine the shape of some molecules from the number of bonded pairs and lone pair of electrons around the central atoms. Describe the shapes of simple molecules using orbital hybridization.

Q4: Perform Stoichiometric calculation with balanced equation using moles.

OR

Given the order with respect to each reactant write the rate law for the reaction.

Q5: write the equilibrium expression for the given chemical reaction.

OR

When given and unbalanced redox equation use the half reaction method to balance the equation.

Q6: Explain reaction pathway diagram in terms of enthalpy changes of the reaction. (BornHaber's Cycle)

OR

Explain how a lead storage battery produces electricity.

Subject: Chemistry			**Paper: Model set-1**			**Class\Level HSSC-I Set 1**			**Year 2023-24**			**Code**		
Topics/Subtopics	**Stoichiometry**	**Atomic structure**	**Theories of covalent bonding**	**States of matter-Gases**	**States of matter-Liquids**	**States of matter-Solids**	**Chemical Equilibrium**	**Acids Bases and salts**	**Chemical kinetics**	**Solutions and colloid**	**Thermochemistry**	**Electrochemistry**	**Total marks for each Assessment Objective**	**%age**
Analysis of Questions of syllabus(contents) and assessment objectives														
(Knowledge based)		1xi(01) 1xii(01)	2viii(03) 2xiOR(03)	1iii(01) 2vii(03)	1i(01) 1xiii(01)	1vi(01) 2xiii(03)	2viii OR(03)	2xii(03) OR2x(3)	1v(01)	2x(03) 2xiiiOR(03)	2xiiOR(03) 2xi(03)	2viiOR(03)	43	28.1%
(Understanding based)	1xvii(01) 1ix(01)	2v(03) 2iOR(03) 3(07)	1x(01) 2i(03) 3OR(06) 2iv OR (03)		2iv(03) 2vOR(03)		5(06)	2ii OR(03)	1iv(01) 1xiv(01) 2xivOR(03)		1xvi(01) 2xiv(03) 6(07)	1ii(01) 1xv(01) 2ii(03) 5OR(06) 6OR (07)	77	50.3%
(Application based)	4(06)	2ix (3)	2vi(03)			2viOR(3)		1vii(01)	4OR(07)	1viii(01) 2iii(03) 2iiiOR(03)	2ix(03)		33	21.6%
Total marks for each Topic/Subtopic	08	18	22	04	08	07	09	10	13	13	20	21	153	100%