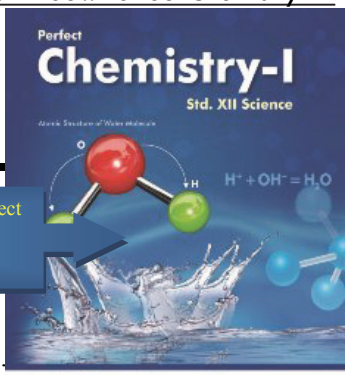
# BOARD QUESTION PAPER: MARCH 2014
# CHEMISTRY – I (12th Sci., HSC, Maharashtra)






**Note:**

i. All questions are compulsory.
ii. Answer to both sections should be written in the same answer book.
iii. Figure to the right hand side indicate full marks.
iv. Draw neat, labelled diagrams and write balanced equations wherever necessary.
v. Use of logarithmic table is allowed.
vi. Answer to every new question must be started on a new page.

## SECTION – I

**Q.1. Answer any ONE of the following:** **[7]**

i. What is 'boiling point'?
Derive a relation between $\Delta H$ and $\Delta U$ for a chemical reaction.
Draw neat labelled diagram of calomel electrode.
Resistance and conductivity of a cell containing 0.001 M KCl solution at 298 K are 1500 Ω and $1.46 \times 10^{-4}$ S. $cm^{-1}$ respectively. What is the cell constant?

ii. Write molecularity of the following reaction:
$2NO_{(g)} + O_{2\,(g)} \longrightarrow 2NO_{2\,(g)}$
What is 'calcination'? How does it differ from 'roasting'?
Write resonating structures of ozone.
The decomposition of $N_2O_{5(g)}$ at 320 K according to the following equation follows first order reaction:

$$N_2O_{5(g)} \rightarrow 2NO_{2(g)} + \frac{1}{2}O_{2(g)}$$

The initial concentration of $N_2O_{5(g)}$ is $1.24 \times 10^{-2}$ mol. $L^{-1}$ and after 60 minutes, $0.20 \times 10^{-2}$ mol. $L^{-1}$. Calculate the rate constant of the reaction at 320 K.

**Q.2. Answer any THREE of the following:** **[9]**

i. One mole of a gas expands by 3 L against a constant pressure of 3 atmosphere. Calculate the work done in:
a. L. atmosphere
b. Joules
c. Calories

ii. Calculate the amount of $CaCl_2$ (van't Hoff factor i = 2.47) dissolved in 2.5 L solution so that its osmotic pressure at 300 K is 0.75 atmosphere.
Given: Molar mass of $CaCl_2$ is 111 g. $mol^{-1}$.
R = 0.082 L. atm. $K^{-1}$ $mol^{-1}$

iii. Describe anomalous behavious of fluorine with the other elements of group 17 with reference to:
a. Hydrogen bonding
b. Oxidation state
c. Polyhalide ions

iv. Face centred cubic crystal lattice of copper has density of 8.966 g. $cm^{-3}$. Calculate the volume of the unit cell.
Given: Molar mass of copper is 63.5 g. $mol^{-1}$ and Avogadro number $N_A$ is $6.022 \times 10^{23}$ $mol^{-1}$.

**Q.3. A. Answer any SIX of the following:** **[12]**

i. What is the action of the following reagents on ammonia:
   a. Nessler's reagent
   b. Sodium metal

ii. State the first and second law of electrolysis.

iii. Draw neat and labelled diagram of Bessemer converter used in the extraction of copper.

iv. Derive the relation between half-life period and rate constant for first order reaction.

v. Derive the relation between $\Delta G^\circ$ and equilibrium constant (K) for the reaction, $aA + bB \rightleftharpoons cC + dD$.

vi. Explain brown ring test with the help of chemical equation.

vii. Explain, why do aquatic animals prefer to stay at lower level of water during summer?

viii. Distinguish between:
Crystalline solids and Amorphous solids.

**Q.4. Select and write the most appropriate answer from the alternatives given below each sub-question:** **[7]**

i. To prepare n-type semiconductor, the impurity to be added to silicon should have the following number of valence electrons:
(A) 2 (B) 3
(C) 4 (D) 5

ii. Number of faradays of electricity required to liberate 12 g of hydrogen is _____.
(A) 1 (B) 8
(C) 12 (D) 16

iii. What is molecular formula of oleum?
(A) $H_2SO_3$ (B) $H_2SO_4$
(C) $H_2S_2O_7$ (D) $H_2S_2O_8$

iv. Purification of aluminium by electrolytic refining is carried out by _____.
(A) Hoope process (B) Hall Process
(C) Baeyer process (D) Serperck process

v. The rate of reaction for certain reaction is expressed as:
$$\frac{1}{3}\frac{d[A]}{dt} = -\frac{1}{2}\frac{d[B]}{dt} = -\frac{d[C]}{dt}$$
The reaction is _____.
(A) $3A \rightarrow 2B + C$ (B) $2B \rightarrow 3A + C$
(C) $2B + C \rightarrow 3A$ (D) $3A + 2B \rightarrow C$

vi. A system absorbs 640 J heat and does work of 260 J, the change in internal energy of the system will be _____.
(A) + 380 J (B) – 380 J
(C) + 900 J (D) – 900 J

vii. Which of the following is 'not' a colligative property?
(A) Vapour pressure (B) Depression in freezing point
(C) Elevation in boiling point (D) Osmotic pressure