# CHEMISTRY 2018

Time: 2 Hours 40 Minutes Marks: 68

## SECTION 'B' (SHORT-ANSWER QUESTIONS)

**NOTE: Answer any Ten part questions. (40)**

2.(i) Define the following:
(i) Stoichiometry (ii) Molar volume
(iii) Activation energy (iv) Enthalpy

(ii) Find the mass of the $CH_3OH$ produced when 356 gm of CO is mixed with 65.0 gm of $H_2$.

$$CO + 2H_2 \rightarrow CH_3OH$$

(iii) 100 gram of $KNO_3$ heated to redness. Find volume of oxygen is liberated at 39°C and 765 torr pressure.

$$2KNO_3 \rightarrow 2KNO_2 + O_2$$

(iv) Give the scientific reasons for any four of the following:
(*) Viscosity of ethyl alcohol is greater than that of diethyl ether.
(*) Milk sours rapidly in summer than in winter.
(*) Evaporation is a cooling process.
(*) $H_2O$ has higher boiling point than HF.
(*) $CO_2$ has zero dipole moment.

(v) Calculate the density of $SO_2$ in $g/dm^3$ at 25°C and 300 torr pressure.

(vi) What is ideal gas? Derive the ideal gas equation.

(vii) State Pauli's exclusion principle and write the electronic configurations of the following:
* $Ca^{+2}$ (Z = 20) * $Br^-$ (Z = 35) * Cr (Z = 24)

(viii) Explain Ionic character of Covalent bond.

(ix) State the First Law of thermodynamics and show that:

$$q_v = \Delta E \qquad q_p = \Delta H$$

(x) Calclate $\Delta H_{25^oC}$ of ethane from the data given below:

* $2C_{(s)} + 3H_{2(g)} \rightarrow C_2H_{6(g)}$ $\Delta H_{25oC} = ?$
* $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$ $\Delta H_{25oC} = -394$ KJ/mole
* $H_{2(g)} + \frac{1}{2} O_{2(g)} \rightarrow H_2O_{(l)}$ $\Delta H_{25oC} = -286$ KJ/mole
* $C_2H_{6(g)} + 7/2\ O_{2(g)} \rightarrow 2CO_{2(g)} + 3\ H_2O_{(l)}$ $\Delta H_{25oC} = -1560$ KJ/mole

(xi) State and explain the law of mass action. Derive the expression for the general reversible reaction given below: $mA + nB \rightleftharpoons xC + yD$

(xii) 4.6 gram of ethyl alcohol and 6.0 gram of acetic acid were kept at constant temperature until equilibrium was established 2.0 gram of acetic acid remained unused.

Calculate $K_c$ for the reaction.

$$CH_3COOH + C_2H_5OH \rightleftharpoons CH_3COOC_2H_5 + H_2O$$

(xiii) What is Electrolysis? Explain electrolysis in $CuCl_2$ solution. Also give the chemical reactions on the electrodes.

(xiv) Determine the order of reaction from the data given below:

$A + B \rightarrow$ Product

| Experiment Number | [A] mole/$dm^3$ | [B] mole/$dm^3$ | Rate of reaction mole/$dm^3 s$ |
|---|---|---|---|
| 1 | 0.1 | 0.1 | $3.0 \times 10^{-3}$ |
| 2 | 0.2 | 0.1 | $6.0 \times 10^{-3}$ |
| 3 | 0.1 | 0.3 | $9.0 \times 10^{-3}$ |

(xv) Make the list of factors which affect the rate of reaction. Discuss the following factors:
* Surface area * Temperature

## SECTION'C' (DETAILED- ANSWER QUESTIONS)(28)

**NOTE: Answer 2 questions from this section.**

3.(a) With the help of the experiment of scattering of α-rays, explain the atomic model and its conclusion.

(b) State the postulates of Bohr's Atomic Theory and derive an expression for the energy of an electron in the nth orbit when $r = n^2h^2 / 4\pi^2 mZe^2$.

(c) Differentiate between Isomorphism and Polymorphism and explain Ionic crystal.

4.(a) What is Chemical bond? Give its types. Uing the example of NaCl, explain the formation and stability of ionic bond.

(b) Give the postulates of electron pair repulsion model and draw the molecular shapes of $BF_3$ and $H_2O$ on the basis of this model.

(c) Should AgCl precipitate from a solution prepared by mixing 400 ml of 0.1 M NaCl and 600 ml of 0.03 M $AgNO_3$? ($K_{sp}$ of AgCl = $1.6 \times 10^{-10}$ $mole^2 / dm^6$)

5.(a) What is Electrode potential? Determine the electrode potential of Zinc with the help of cell diagram.

(b) Balance any one of these equation by ion electron method:
(i) $HNO_3 + H_2S \rightarrow NO + S + H_2O$
(ii) $MnO_4^- + SO_3^{2-} + OH^- \rightarrow Mn^{2+} + SO_4^{2-}$

(c) 4.0 g NaOH is dissolved in 2.5 $dm^3$ solution. Find its molarity and pH.