HSC Maharashtra Board question paper: March 2013

Note:

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

CHEMISTRY: SECTION – I

Q. 1. Select and write the most appropriate answer from the given alternatives for each sub-question: [7]

i. In body centred cubic structure the space occupied is about
(A) 68 % (B) 53 %
(C) 38 % (D) 32 %

ii. For a gaseous reaction the unit of rate of reaction is
(A) L atm s^{-1} (B) atm mol^{-1} s^{-1}
(C) atm s^{-1} (D) mol s

iii. Which of the following compounds contains S = O as well as S = S bonds?
(A) Sulphuric acid (B) Thiosulphuric acid
(C) Sulphurous acid (D) Thiosulphurous acid

iv. Which of the following solutions shows maximum depression in freezing point?
(A) 0.5 M Li_2SO_4 (B) 1 M NaCl
(C) 0.5 M $Al_2(SO_4)_3$ (D) 0.5 M $BaCl_2$

v. For a chemical reaction $\Delta S = -0.035$ kJ/K and $\Delta H = -20$kJ.
(A) 5.14 K (B) 57.14 K
(C) 571.4 K (D) 5714.0 K

vi. The standard e.m.f of the following cell is 0.463 V
$Cu\,|\,Cu^{++}_{(1M)}\,||\,Ag^{+}_{(1M)}\,|\,Ag$. If $E^{O}_{Ag} = 0.800$ V,
What is the standard potential of Cu electrode?
(A) 1.137 V (B) 0.337 V
(C) 0.463 V (D) –0.463 V

vii. Fe_2O_3 is reduced to spongy iron near the top of blast furance by
(A) H_2 (B) CaO
(C) SiO_2 (D) CO

Q. 2. (A) Answer any SIX of the following: **[12]**

i. Distinguish between crystalline solid and amorphous solid.

ii. State Kohlrausch Law and write mathematical expression of molar conductivity of the given solution at infinite dilution.

iii. Write cell reactions in lead storage battery during discharge.

iv. Draw structures and write geometry of PCl_3 and PCl_3.

v. Prove that $\Delta H = \Delta U + \Delta n\, RT$. What is the condition under which $\Delta U = \Delta H$?

vi. Mention names and formulae of two ores of aluminium.

vii. Derive the relationship between relative lowering of vapour pressure and molar mass of nonvolatile solute.

viii. What is pseudo first order reaction? Give one example of it.

Q. 3. Answer any THREE of the following: **[9]**

i. Calculate the mole fraction and molality of HNO_3 in a solution containing 12.2 % HNO_3.
(Given – atomic masses : H = 1, N = 14, O = 16)

ii. Consider the reaction –

$$3\bar{I}_{(aq)} + S_2O_8^{2-} \rightarrow I_{3(aq)}^- + 2SO_{4(aq)}^{2-}$$

At particular time t, $\frac{d\left[SO_4^{2-}\right]}{dt} = 2.2 \times 10^{-2}$ m/s.

What are the values of the following at the same time?

a. $-\frac{d\left[I^-\right]}{dt}$

b. $-\frac{d\left[S_2O_8^{2-}\right]}{dt}$

c. $-\frac{d\left[I_3^-\right]}{dt}$

iii. 300 M mol of perfect gas occupies 13 L at 320 K. Calculate the work done in joules when the gas expands –

a. isothermally against a constant external pressure of 0.20 atm.

b. isothermal and reversible process.

c. into vaccum until the volume of gas is increased by 3L. ($R = 8.314$ J mol^{-1} k^{-1})

iv. What is the action of the following reagents on ammonia?

a. Excess of air

b. Excess of chlorine

c. Na metal

Q. 4. Answer any ONE of the following: **[7]**

i. a. Explain with reason sign conventions of ΔS in the following reactions :

1. $N_{2(g)} + 3H_{2(g)} \longrightarrow 2NH_{3(g)}$
2. $CO_{2(g)} \longrightarrow CO_{2(s)}$

b. Explain the following terms:

1. Smelting
2. Flux

c. Gold occurs as face centred cube and has a density of 19.30 kg dm^{-3}. Calculate atomic radius of gold. (Molar mass of Au = 197)

ii. a. Explain the trends in the following properties with reference to group 16:

1. Atomic radii and ionic radii
2. Density
3. ionisation enthalpy
4. Electronegativity

b. In the electolysis of $AgNO_3$ solution 0.7g of Ag is deposited after a certain period of time. Calculate the quantity of electricity required in coulomb.
(Molar mass of Ag is 107.9 g mol^{-1}).

c. Define Osmosis.