Total No. of printed pages = 6

Sc-103/Chem-I/1st Sem/2015/M

CHEMISTRY – I

Full Marks – 70

Pass Marks – 21

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No.1 and any *six* from the rest.

1. (a) Fill in the blanks : 1×5=5

(i) 64 grams of SO_2 contain ——— number of molecules.

(ii) Phenolphthalein is ——— in acidic medium.

(iii) The oxidation number of Mn in $KMnO_4$ is ———.

(iv) Isobars are atoms having different ———.

(v) One Faraday = ——— Coulombs.

[Turn over

(b) Choose the correct answer : $1 \times 5 = 5$

(i) The principal quantum number determines

(a) Size (b) Shape

(c) Spin (d) Orientation

(ii) 18 grams of water contains :

(a) 1 gm atom of hydrogen

(b) 2 gm atoms of hydrogen

(c) 3 gm atoms of hydrogen

(d) None of the above

(iii) For a reaction $H_2(g) + I_2(g) \rightleftharpoons 2\,HI\,(g)$, the equilibrium constant Kp changes with

(a) total pressure

(b) catalyst

(c) temperature

(d) the amount of H_2 and I_2 present.

(iv) $FeCl_3$ solution is

(a) acidic

(b) basic

(c) neutral

(d) None of the above

(v) Charle's law is represented mathematically as

(a) $V_t = KV_o t$

(b) $V_t = \frac{k V_o}{t}$

(c) $V_t = V_o \left(1 + 273/t\right)$

(d) $V_t = V_o \left(1 + t/273\right)$

2. (a) State Dalton's law of partial pressure. 2

(b) Prove that equal volume of all gases under similar condition of temperature and pressure contain equal number of molecules. 4

(c) 250 ml of nitrogen maintained at 720 mm pressure and 380 ml of oxygen maintained at 650 mm pressure are put together in one litre flask. If the temperature is constant, what will be the final pressure of the mixture ? 4

3. (a) What are the limitations of a balanced chemical equation ? 3

(b) Balance the following equation by ion-electron method : 4

$$Fe^{2+} + MnO_4^- + H^+ \rightarrow Fe^{3+} + Mn^{2+} + H_2O$$

(c) Explain Bronsted-Lowry concept of acids bases. 3

4. (a) Write the electronic configuration of Cl^- and Cu. 2

(b) State and explan Pauli's exclusion principle. 4

(c) The kinetic energy of a moving electron is given as $3{\cdot}9\times10^{-23}$ J. Calculate the wavelength of the electron. (Given, mass of electron = $9{\cdot}1\times10^{-31}$ kg ; h = $6{\cdot}626\times10^{-34}$ Js.) 4

5. (a) Name two elements of group VA and write their electronic configuration. 3

(b) What do you mean by electron affinity ? How does it vary in a period and in a group ? 1+1+1=3

(c) Explain why HF is weaker acid than HCl. 2

(d) Write the electronic configuration of Cr and Mg^{++}. 2

6. (a) Write two important characteristics of a covalent compound. 2

(b) Explain the formation of CO_2 and $BeCl_2$ with the help of electron dot-structure. 4

(c) Discuss the kinds of bonds formed when the following atoms combine to form molecules.

(i) Magnesium and chlorine

(ii) Nitrogen and nitrogen 4

7. (a) What do you mean by a molar solution ? 2

(b) 25 ml of Na_2CO_3 of concentration 0·1N requires 23·6 ml of H_2SO_4 for complete neutralization. Express the strength of H_2SO_4 in terms of normality and grams per litre. 4

(c) Calculate the pH of

(i) 0·01 M HCl

(ii) 0·001 M NaOH 2+2=4

8. (a) Differentiate between a strong and a weak electrolyte. 3

(b) Calculate the electrochemical equivalent of Zn. (Atomic mass of Zn = 65) 4

(c) Write short notes on electro-refining and electroplating of metals. 3

9. (a) Explain with examples the difference between homogeneous and heterogeneous catalysis. 3

(b) State Le-Chatelier's principle and describe its industrial importance. 4

(c) Write down the ion-exchange resin method for softening of hard water. 3