CHEMISTRY – I

Course Code: DCH-101
Time: 3 Hours
Full Marks: 100

Instructions:

1. ***All questions of PART-A is compulsory***
2. ***Answer any five questions from PART-B***

PART-A

1. Choose the correct answers: (1X10=10)

(i) Particles within a solid
[A] Do not move. [C] Vibrate about fixed positions.
[C] Move about freely. [D] Exchange positions easily

(ii) To which of the following gaseous mixture is Dalton's law not applicable?
[A] He + Ne + SO_2 [B] NH_3 + HCl + HBr
[C] O_2 + N_2 + CO_2 [D] N_2 + H_2 +O_2

(iii) What is the mass (weight) of 6.022 x 10^{22} oxygen molcules?
[A] 32 gms [B] 3.2 gms [C] 16 gms [D] 1.6 gms

(iv) Ozone layer protects the earth from
[A] Lightning strikes [B] Volcanic eruptions
[C] UV-radiation [D] All of the above

(v) Valency of carbon
[A] 3 [B] 4 [C] 5 [D] 6

(vi) Identify the functional group of aldehyde
[A] –CHO [B] –CO- [C] –OH [D] -COOH

(vii) Example of chain compound
[A] n-Propane [B] Benzene [C] Cyclobutane [D] Cyclohexane

(viii) The quantity of electricity needed to liberate one gram equivalent of an element:
[A] 1 ampere [B] 96500 amperes [C] 96500 coulombs [D] 96500 faradays

(IX) The mass deposited at an electrode is directly proportional to
[A] molecular weight [B] atomic weight
[C] equivalent weight [D] none

(X) The nucleus of an atom consists of
[A] Proton only [B] Proton and neutron [C] neutron only [C] Electron and Proton

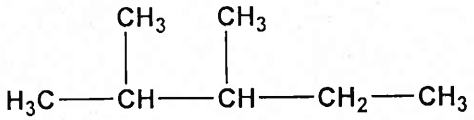
2. Write True or False: (1X6 = 6)

(i) Electron affinity of halogen group 17 elements decreases from fluorine to Iodine.
(ii) Highest electropositive character is found in periodic table in Group I.
(iii) One mole of electron carries the charge 96,500 faraday.
(iv) Rutherford discovers neutron.
(v) Electrochemical equivalent (Z) x Faraday (F) = Chemical equivalent (E).
(vi) Charge of an electron is same as neutron.

3. Fill in the blanks: (1X8=8)

(i) The rms velocity of H_2 is _____ than N_2 at room temperature,
(ii) One example of derived protein is _____.
(iii) Sugar molecule present in milk is known as_____.
(iv) Real gas approaches ideal gas behaviour at _____ temperature and _____ pressure.
(v) The deficiency of vitamin C causes the deficiency disease_____.
(vi) The unit of Vander-Waals constants are _____ and _____.

4. Answer the following questions: (1X6=6)
(i) Give one example of strong electrolyte and weak electrolyte
(ii) What is the equivalent weight of Al in $AlCl_3$?
(iii) Write full form of IUPAC.
(iv) Give the IUPAC name of the following compound
$CH_3CH_2CH_2CH_2CH(CH_3)CH_3$
(v) What is the unit of ionization energy
(vi) Give the IUPAC names of the following compound.



PART-B

5. (a) What are the conclusions made by Rutherford from his famous α-particle scattering experiment? 4
(b) Write down the drawbacks of Rutherford's atomic model. 3
(c) What are the Bohr's postulates on atomic model? 4
(d) What are the drawbacks of Bohr's atomic model? 3

6. (a) Define Faraday's first law of electrochemistry with mathematical expression and define electrochemical equivalent. 3+1
(b) What amount of silver will be deposited when electric current of 3 ampere is passed through a $AgNO_3$ solution for 15 minutes (Atomic mass of Ag = 108 a.m.u). 4
(c) Discuss purification of Aluminium by Hoop's method. 3
(d) Differentiate between electrolytes and non-electrolytes. 2
(e) How many coulombs of electricity required for reduction of 1 mole Al^{3+} to 1 mole Al. 1

7. (a) How you differentiate between organic and inorganic compounds. 2
(b) Draw the structure of the following compounds: 1x4=4
(i) Neo-pentane (ii) Lactic acid (iii) 2-Butene (iv) 2-Bromobutane
(c) Write the different structure of C_5H_{12} molecules and give IUPAC names. 1+1+1=3
(d) How can you define classification of organic compounds? Explain open and cyclic organic compounds with examples. 2+3

8. (a) How will you prepare alkane in laboratory, give example with reaction? 4
(b) Give conversion: 2x2=4
(i) alcohol to alkene (ii) Propene-1 to 2-Bromopropane
(c) Give difference between ionization energy and electron affinity in terms of reaction. 3
(d) How will you differentiate between metal and non-metal. 3

9. (a) Give the postulates of kinetic theory of gases. 4
(b) Prove that $C_{rms} > C_{average} > C_{mp}$ of gases molecules according to kinetic theory of gases. Where C_{rms} is root mean square velocity, $C_{average}$ is average velocity, and C_{mp} is most probable velocity. 4
(c) Calculate the rms velocity of CO_2 molecule at 0°C and 25°C. 3
(d) Out of H_2, N_2, O_2 which has the largest rms velocity (consider room temperature)? 2
(e) Define isoelectric point. 1

10. (a) What are nucleic acids? Distinguish between RNA and DNA. 1+3=4

(b) What is an amino acid? What are essential and nonessential amino acids? Give two examples of both acidic and basic amino acids. 1+2+1=4

(c) Give Vander-Waals equation for 1 mole of real gas. 3

(d) Calculate the rms and most probable velocities of N_2 and H_2 molecules at room temperature. 3

11. (a) Deduce the ideal gas equation. 4

(b) Deduce a relationship between the molecular weight of a gas and its vapour density. 4

(d) Calculate the number of water molecules present in 1.8 gram of it. 4

(e) State Dalton's law of partial pressure 2

12. (a)Define the terms pollutants and pollution with examples. 3

(b) What are TDS? 1

(c) Calculate the volume occupied by 2 gram of oxygen at 27 °C and 740 mm pressure. 4

(c) Write short notes on any two of the followings 3+3=6

(i) Greenhouse effects (ii) Ozone layer depletion (iii) Acid rain