Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Sc (H) (BT/GE/MICRO/MOL)/SEM-1/CH-101/2011-12

2011
CHEMISTRY

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) The unit in which wave number is measured is

   a) hertz b) $\sec^{-1}$

   c) nanometre d) cm^{-1}.

   ii) The Balmer series in the spectrum of hydrogen atom falls in

   a) ultraviolet region b) visible region

   c) infrared region d) none of these.

   iii) The radius of first orbit in hydrogen atom is $0{\cdot}529\,\mathring{A}$. The radius of second orbit is given by

   a) $1/2 \times 0{\cdot}529\,\mathring{A}$ b) $2 \times 0{\cdot}529\,\mathring{A}$

   c) $4 \times 0{\cdot}529\,\mathring{A}$ d) $8 \times 0{\cdot}529\,\mathring{A}$.

iv) The energy of an electron in Bohr's atom ..... as we move away from the nucleus.

a) remains the same

b) decreases

c) increases

d) sometimes increases, sometimes decreases.

v) According to de Broglie's equation, the momentum of a particle in motion is ..... proportional to wavelength.

a) inversely b) directly

c) not d) none of these.

vi) Number of phases at triple point is

a) 0 b) 1

c) 2 d) 3.

vii) In SN_2 reaction,

a) carbocation is produced

b) recimic mixture is produced

c) inversion of structure takes place

d) none of these.

viii) In electrophilic aromatic substitution reaction, which of the following is deactivating but o-/p- directing ?

a) NH_2 b) OH

c) Cl d) NO_2.

ix) Which molecule has non-zero dipole moment ?

a) Cl_2 b) CO_2

c) CCl_4 d) $CHCl_3$.

x) The principal & azimuthal quantum number for 3rd orbital are

a) N = 3, 1 = 0 b) N = 3, 1 = 1

c) N = 3, 1= 2 d) N = 3, 1 = –1.

xi) The (*) C atom in the compound $CH_3C*H(Cl)(Br)$

a) Prochiral b) Achiral

c) Stereogenic d) Chiral.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Explain how degree of dissociation determined from conductance measurement. Calculate mobility of H^+ ion in water where specific conductance of H^+ is 350. 3 + 2

3. a) What is ionic mobility ? Explain how ionic mobility vary with concentration.

   b) Calculate the shortest wavelength in the absorption spectrum of deuterium $\left(R_H = 109737\,\text{cm}^{-1}\right)$. The velocity of an electron is 2×10^8 cmsec^{-1}. 2 + 3

4. How can the principle of radioisotopes be used in clinical assay ? Write down the hazardness of radioactivity. 3 + 2

5. Explain with example Pauli's exclusion principle. Write down correct set of quantum numbers for the outermost electron of chromium (Cr) atom. 3 + 2

6. Write down the Fischer projection of the following compounds : 2 + 1 + 2

   a) (2R, 3S) -2, 3- di hydroxy pentane

   b) L (-)- Glycine

   c) (Z)-2-bromo pent 2-ene.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Define : Phase, component and degree of freedom.

   b) Write in short on phase diagram of water.

   c) What are Nernst distribution law, aziotropic mixture and critical solution temperature ? 3 + 6 + 6

8. a) What are optical activity and specific rotation?

   b) What are elements of symmetry ? Explain each of them.

   c) Explain the terms 'enantiomers', 'diastereomers' and 'meso-compound'. (2 + 2) + (1 + 4) + (2 × 3)

9. a) Define Hybridization and describe three hybridized states of carbon.

   b) Illustrate the formation of sigma bond and pi bond.

c) Explain why :

i) The C-C bond length in alkanes is more than the C-C bond length in alkenes, which is again more than that in alkynes.

ii) The bond angle in a sp hybridized carbon is 180°.

7 + 3 + (2·5 × 2)

10. a) Deduce the relation for radioactivity. The half-life of radium is 1590 years. How long will it take for 1 gm. of the element to lose 0·1 gm ?

b) Write the nature of α, β positron decay and *k*-capture.

c) Briefly explain Meson theory for nuclear stability. What do you mean by mass defect and nuclear binding energy ? 5 + 5 + 5

11. Draw the orbital representation of acetylene with hybridization state. Define polarity and polarizability. Arrange the order of SN^1 reactivity of following with proper explanation.

$(CH_3)_3CBr$, $(CH_3)_2CHBr$, $CH_2 = CH - CH = CH - CH_2Br$

Define diastereomers. 5 + 4 + 5 + 1