Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH/FT (N)/SEM-3/CH (FT)-302/2012-13

2012

CHEMISTRY-II

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 × 1 = 10

i) A normal solution is one that contains one gm-equivalent of a solute in

a) 1000 g of the solvent

b) one litre of the solvent

c) one litre of the solution

d) 22·4 litres of the solution.

ii) Which of the following is a Colligative property ?

a) Surface Tension

b) Elevation of boiling point

c) Vapour pressure

d) Refractive Index.

iii) When 1 mole of sugar is dissolved in water

a) Freezing point of the solution increases

b) Freezing point of the solution decreases

c) Both freezing point and boiling point decrease

d) Boiling point of the solution decreases.

iv) The Hydroxyl ion concentration in a solution having pH value 3 will be

a) 10^{-11} b) 10^{-7}

c) 10^{-3} d) 10^{-14}.

v) pKa value of the strongest acid among the following is

a) 3·0 b) 4·5

c) 1·0 d) 2·0.

vi) A salt *X* is dissolved in water of pH 7. The resting solution becomes alkaline in nature. The salt is made of

a) a strong acid and strong base

b) a strong acid and weak base

c) a weak acid and weak base

d) a weak acid and strong base.

vii) UV Spectra is primarily used to detect

a) reduced mass

b) vibrational frequency

c) extent of multiple bonds

d) path length, 1.

viii) The presence of hydrogen atom attached to an aromatic ring may be identified by which of the following methods ?

a) UV-*vis* b) IR

c) NMR d) EPR.

ix) The most stable carbonium ion will be

a) $(CH_3)_2^+CH$ b) Ph_3^+C

c) $CH_3^+CH_2$ d) $CH_2 = CH^+ - CH_2$.

x) A molecule becomes IR active

a) at 200 – 400 nm

b) due to change in dipole moment

c) due to presence of multiple bonds

d) due to presence of magnetic field.

xi) UV range of the electromagnetic radiation is

a) 200 – 400 nm b) 600 – 800 nm

c) 400 – 800 nm d) 800 – 1000 nm.

xii) EDTA is an example of

a) Monodentate ligand b) Hexadendate ligand

c) Bidentate ligand d) Tetradentate ligand.

GROUP – B

(Short Answer Type Questions)

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

2. a) What is Colligative property ?

   b) Define Raoult's law.

   c) Prove that Lowering of vapour pressure is a Colligative property. 1 + 1 + 3

3. a) Explain with a suitable example the 'linkage isomerism'.

   b) The anion $[CoF_6]^{3-}$ is paramagnetic but the anion $[CoCl_6]^{3-}$ is diamagnetic. Explain.

   (Atomic number of Co = 27) 2 + 3

4. a) What do you mean by a Colloid system ?

   b) Classify the Colloid system and define their characteristics. 1 + 4

5. a) Explain the term 'hyperchromatic' and 'hypochromic' shifts with examples.

   b) Deduce an expression relating optical density (O.D.) with molar extinction coefficient. 2 + 3

6. Write brief notes on any *two* of the following : $2 \times 2\frac{1}{2}$

   a) Tyndall effect

   b) Emulsion

   c) Gold No.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What do you mean by Osmosis and Osmotic pressure ?

   b) State two laws of Osmotic pressure and Vant Hoff's law of Osmotic pressure.

   c) Prove that 'Elevation of Boiling Point' of a solution is directly proportional to the molaity of the solution.

   d) A sample of Camphor (K_f = 40) melts at 176°C. A solution of 0·0205 g of a Hydrocarbon in 0·261 g Camphor melts at 156°C. The Hydrocarbon contains 92·3% Carbon. Determine the molecular formula of the hydrocarbon. 2 + 4 + 5 + 4

8. a) Define Ionic Product of water.

   b) Prove that pH + pOH = pKw = (constant).

   c) What is the effect of common ion on solubility ?

   d) What do you mean by 'Schulze-Hardy Rule' ?

   e) Calculate the pH of 0·01 (M) sodium acetate solution. Given that $K_{CH_3COOH} = 1{\cdot}8 \times 10^{-5}$, and also find the degree of hydrolysis of sodium acetate.

1 + 2 + 4 + 4 + 4

9. a) Explain with an example how IR Spectra of alcohols are affected by dilution.

   b) Relate the atomic weights and atomic numbers of different nuclei with their spin numbers and indicate which of them will be NMR active.

   c) How does a polar and a non-polar solvent affect the UV spectra of an unsaturated compound ?

   d) Find the amount of energy associated with a radiation of wavelength 5000 Å. 4 + 4 + 4 + 3

10. Write short notes on any *three* of the following : 3 × 5

   a) Buffer solution and its capacity

   b) Membrane filtration

   c) Nitration of Benzene

   d) Auxochromes and Chromophores

   e) Fluorescence and Phosphorescence.

11. a) Identify the product with mechanism when a chiral alcohol is reacted with $SOCl_2$ in presence of ether.

b) Explain with reason what is the choice of solvent in Friedel-Crafts reaction.

c) What happens when *meta*-dinitrobenzene is refluxed with a KCN solution ?

d) What happens when benzene is reacted with $(CH_3)_3COCl$ in presence of anhydrous $AlCl_3$?

4 + 4 + 3 + 4