Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (FT-N)/SEM-3/CH (FT)-302/2011-12

2011

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 : $10 \times 1 = 10$

i) A molal solution is one that contains one mole of a solute in

a) 1000 gm 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 not a colligative property ?

a) Osmotic pressure

b) Elevation of boiling point

c) Vapour pressure

d) Depression of Freezing point.

iii) When common salt is dissolved in water

a) boilling point of the solution increases

b) boilling point of the solution decreases

c) both freezing point and boiling point decrease

d) freezing point of the solution increases.

iv) 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.

v) NMR spectra is normally observed in

a) liquids or solution

b) gases

c) solids

d) suspension.

vi) Which of the following octahedral complexes

(*M* = metal atom, *A*, *B* ligands) exhibits geometrical isomerism ?

a) $[MA_6]$ b) $[MA_5B]$

c) $[MA_4B_2]$ d) $[MA_3B_3]$.

vii) The most stable carbonium ion will be

a) $(CH_3)_2\overset{+}{C}H$ b) $Ph_3\overset{+}{C}$

c) $CH_3\overset{+}{C}H_2$ d) $CH_2 = CH - \overset{+}{C}H_2$.

viii) In octahedral field the most destabilized set of orbitals is

a) d_{z^2} and $d_{x^2-y^2}$ b) d_{xz} and d_{yz}

c) d_{z^2} and d_{xy} d) $d_{x^2-y^2}$ and d_{xz} .

ix) UV range of the electromagnetic radiation is

a) 200 – 400 nm b) 600 – 800 nm

c) 400 – 800 nm d) 800 – 1000 nm.

x) The spin number for the nuclei which do not show NMR spectra is

a) $I = \frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \ldots\ldots$

b) $I = -1, \frac{1}{2}, -2, \ldots\ldots$

c) $I = 0$

d) $I = 1, 2, 3, \ldots\ldots$

xi) Back side attack of the nucleophile at a particular centre with twice inversion of configuration of the centre results from

a) $S_N 1$ b) $S_N 2$

c) NGP d) SNi.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. a) Explain the terms 'hyperchromatic' and 'hypochromic' shifts with examples.

   b) Compare between *u-v* spectra of aniline in acidic and neutral medium. 2 + 3

3. Explain why the hexafluorocobalt (III) anion is paramagnetic but that of hexacyanocobalt (III) is diamagnetic.

4. What are any *two* of the following ? $2 \times 2\frac{1}{2}$

   a) Tyndall effect

   b) Emulsion

   c) Gold No.

5. State and explain Raoult's law. What is osmosis ? 3 + 2

6. a) S_N2 gives inversion of configuration whereas S_N1 occurs with racemisation. Explain.

   b) What is a carbanion ? 4 + 1

GROUP – C

(Long Answer Type Questions)

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

7. a) What is isomerism ? Give examples of each of geometrical, optical and linkage isomerisms.

   b) Show hybridisation and magnetic properties of $Fe(H_2O)_6^{3+}$ and $Fe(CN)_6^{3-}$.

   c) How does the common ion effect influence the solubility of a sparingly soluble salt ?

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

   (2 + 6) + 3 + 2 + 2

8. a) Define Ionic Product of water.

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

   c) Calculate the pH at which $Mg(OH)_2$ begins to precipitate from a solution containing 0·10 M Mg^{+2} ions. Solubility product (K_{sp}) for $Mg(OH)_2 = 1{\cdot}0 \times 10^{-11}$.

d) Show that pH of the solution is equal to $\left(\frac{1}{2} \text{pKw} - \frac{1}{2} \text{pKb} - \frac{1}{2} \log c \right)$ when salts of strong acid and weak base get hydrolysed.

e) Find out the pH of 0·02 M aqueous solution of NH_4Cl. $\left[K_{NH_4OH} = 1{\cdot}85 \times 10^{-5} \right]$ and also find out the degree of hydrolysis of NH_4Cl. 1 + 2 + 4 + 5 + 3

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

a) Buffer solution and its capacity

b) Carbenes

c) Fluorescense and Phosphorescense

d) Dialysis

e) Nitration of Benzene

f) Application of NMR spectroscopy.

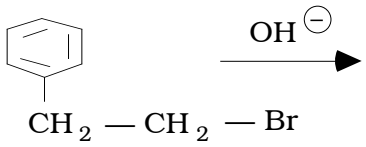
10. a) What are resonance and chemical shift in the context of NMR spectroscopy ?

b) Why do ethene $(CH_2 = CH_2)$ and acetylene not absorb IR energy ?

c) State the laws of photochemistry.

d) A 0·01 (M) solution of a compound transmits 20% of radiation when the absorbing path length is 1·5 cm. What is the □ of the substance ? 4 + 4 + 4 + 3

11. a) Identify the product with mechanism of the following reaction :



Mention what mechanistic pathway is followed.

b) Give an example of the Friedel-Craft reaction on benzene with mechanism.

c) How – SO_3H can be introduced in a benzene ring ? Answer giving mechanism.

d) *O*-nitrochlorobenzene is refluxed with concentrated NaOH. What will happen ? 4 + 4 + 4 + 3