Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (NEW)/SEM-1/CH-101/2012-13

2012
CHEMISTRY - I

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 sum of internal energy and pressure volume product is called

   a) entropy b) enthalpy

   c) heat supplied d) none of these.

   ii) Example of thermosetting plastic is

   a) PVC b) Nylon

   c) Polythene d) Bakelite.

   iii) A conductive polymer is

   a) Polyethylene b) Polypropene

   c) Polyaniline d) Bakelite.

iv) Germanium is an example of

a) intrinsic semiconductor

b) n-type semiconductor

c) p-type semiconductor

d) insulator.

v) Galvanic cell does not have

a) an anode b) a cathode

c) a porous barriers d) ions.

vi) Entropy of the universe is

a) decreasing

b) increasing

c) remaining constant

d) dependent on conditions.

vii) The compound with antiknock value of zero is

a) n-pentane b) n-butane

c) n-hexane d) n-heptane.

viii) Which of the following is a macromolecule ?

a) Nylon-66 b) Bakelite

c) Polyester d) Chlorophyll.

ix) Schottky defect is due to

a) missing of anion from a lattice

b) missing of cation from a lattice

c) missing of cation and anion both from a lattice

d) none of these.

x) Which of the following metal containing compounds can show metal deficiency defects ?

a) Sodium b) Silver

c) Calcium d) Copper.

xi) Caprolatum is monomer of

a) Bakelite b) PVC

c) Nylon-6,6 d) Nylon-6.

xii) Electrolytic cell is used for conversion of

a) electrical energy to chemical energy

b) chemical to electrical energy

c) chemical to light energy

d) electrical to heat energy.

GROUP – B

(Short Answer Type Questions)

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

2. Define enthalpy. Relate the change in molar enthalpy with the change in molar internal energy for a given process of an ideal gas system. Justify that the amount of heat transferred at constant pressure is a measure of the enthalpy change of a system. 1 + 2 + 2

3. Draw the conductometric titration curve for HCl *vs* NaOH and explain the features of the curve. How does the nature of curve change, if pure water is used intead of NaOH ? 3 + 2

4. Write down the electrode reactions and over all reaction of the following cells :

   i) zn (s) | Zn^{2+} (aq) || Cu^{2+} (aq) | Cu (s)

   ii) Pt(s) | H_2 (g) | H^+ (aq) || Ag^+ (aq) | Ag (s)

5. a) What is CNG and write its advantage over other fuels ?

   b) What is octane number of a fuel ? How can the octane number be improved ? 3 + 2

6. Explain the number average and weight molecular mass of polymer. Which one is greater and why ? 3 + 2

GROUP – C

(Long Answer Type Questions)

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

7. a) What is meant by transport number of an ion ? How is it related with ionic conductance ?

   b) "H^+ and OH^- ions show very high ionic mobility in aqueous medium."– explain with mechanism.

   c) What is calomel electrode ? How can we measure the pH of a solution using calomel electrode ?

   d) Discuss the difference among isotactic, syndiotactic and atactic polymers. 3 + 3 + 6 + 3

8. a) Compare the C–Cl bond lengths in $CH_2 = CH–Cl$ and $CH_3–CH_2–Cl$.

   b) Arrange the molecules in their increasing acidity order :

      Phenol, 2,6-dimethyl-4-nitrophenol, 3,5-dimethyl-4-nitrophenol

   c) Predict all possible products of neopentyl bromide that undergo solvolysis in aqueous alkali medium.

   d) Distinguish with example :

      i) Carbonium ion and carbenium ion

      ii) Addition reaction and substitution reaction.

3 + 3 + 4 + 5

9. a) Show that the magnitude of the reversible work done is greater that the magnitude of the irreversible work done during isothermal expansion of an ideal gas.

   b) Calculate the work done when one mole of a real gas at 0 °C expands adiabatically and reversibly from 1 Lit to 10 Lit. (Given $\gamma = 5/3$)

   c) State and explain Hess's law.

d) Calculate the heat of formation of ammonia.

Given :

$$NH_3 + \frac{3}{4}O_2 \text{ ------} \rightarrow \frac{1}{2}N_2 + 3/2\ O_2 \qquad \Delta H_c = -90.6 \text{ kcal mole}^{-1}$$

$$H_2 + \frac{1}{2}O_2 \text{ ------} \rightarrow H_2O \qquad \Delta H_c = -68.3 \text{ kcal mole}^{-1}$$

4 + 3 + 3 + 5

10. a) What do you mean by the activation energy of a reaction ? How does the rate constant of a chemical reaction depend on the temperature ?

b) Calculate the activation energy of a reaction whose rate constant is doubled when temperature is increased from 200 K to 300 K.

c) Show the influence of a positive catalyst on the activation energy of a reaction in the energy profile diagram.

d) Distinguish between *p*-type and *n*-type semiconductors. Give two important kinds of example of semiconductors.

3 + 4 + 3 + 5

11. Write notes on any *three* of the following :

a) Conducting polymer.

b) Joule-Thomson expansion and inversion Temperature.

c) Gibbs free energy and its use in denoting the spontaneity of a chemical reaction

d) Anti-Markownikov's rule

e) Schottky defect and Frenkel defect

f) Order and Molecularity of the reaction.