Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech/SEM-2/CH-201/2010

2010

ENGINEERING 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) In the process of melting ice at –15°C

a) $\Delta G < 0$ b) $\Delta G = 0$

c) $\Delta G \neq 0$ d) $\Delta G > 0$.

ii) One mole of an ideal gas expands isothermaly, until its volume is doubled. What is the change in Gibbs energy ΔG, for the process ?

a) $R \ln 1/2$ b) $R \ln 2$

c) $RT \ln 1/2$ d) $RT \ln 2$.

iii) If the enthalpy of reactant is less than that of product then

a) the reaction is exothermic

b) heat is evolved

c) the reaction is endothermic

d) none of these.

iv) The boiling point of *p*-nitrophenol is greater than *o*-nitrophenol because of

a) ionic bonding

b) intermolecular H-bonding

c) van der Waals attractive forces

d) intramolecular H-bonding.

v) The ligand that can act as a flexidentate ligand is

a) OH^-

b) Ethylene diamine

c) NO_2^-

d) SO_4^{2-}.

vi) The electrons trapped in anion vacancies in metal excess defects are known as

a) valence electrons

b) F-centres

c) mobile electrons

d) trapped electrons.

vii) Which of the following has the least bond angle ?

a) NH_3 b) H_2O

c) CH_4 d) BeF_2 .

viii) The half-life period of a reaction is found to be directly proportional to the intial concentration. The order of reaction is

a) zero b) one

c) two d) three.

ix) A conducting polymer is

a) Polyethylene b) Polypropylene

c) Polyaniline d) Bakelite.

x) The highest ranking coal is

a) Anthracite b) Bituminous

c) Lignite d) Peat.

xi) The material used in the solar cell contains

a) Cs b) Si

c) Sn d) Ti.

xii) An essential condition for a molecule to be IR active is

a) molecule be polar

b) molecule has an oscillating dipole moment

c) molecule has a permanent dipole

d) none of these.

GROUP – B

(Short Answer Type Questions)

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

2. a) Prove that for an adiabatic reversible process, PV^{γ} = constant.

b) Show that for an ideal gs $C_p - C_v = R$, where the notations have their usual significance.

3. Explain octane number and cetane number with their significanes.

4. Write down the mathematical form of Lambert-Beer Law. State its significanes.

5. Write down the structure and use of Nylon-66 and PVC.

6. Show that Joule-Thompson effect is an enthalpic process. Explain the condition of heating and cooling.

GROUP – C
(Long Answer Type Questions)

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

7. a) What do you understand by HTC & LTC of a coal ? Write down the usefulness of each process.

   b) What are the important products formed from the atmospheric distillation of crude oil ?

   c) What is the importance of "functional group region" in IR Spectroscopy ? What are the different absorption peaks possible for methanol & ethanol ?

   d) What are the differences between *p*-type and *n*-type semiconductors ? 5 + 4 + 4 + 2

8. a) Define condensation polymerization with suitable example.

   b) Explain mathematically Weight Average Molecular Weight.

   c) What are raw rubber and vulcanized rubber ?

   d) Explain Mesomeric Effect with example. 5 + 3 + 4 + 3

9. a) What is anti-knocking compound ? Discuss the function of TEL as anti-knocking agent. What is unleaded petrol ? Write its significance.

   b) Why does benzene undergo electrophilic substitution rather than addition reaction ?

   c) What is reference electrode ? Explain the working principle of one reference electrode. 6 + 4 + 5

10. Explain why :

   a) Phenol is more easily nitrated than benzene.

   b) $CdCl_2$ will induce Schottky defect if added to AgCl crystal.

   c) NH_3 , H_2O and CH_4 have sp^3 hybridization but have different bond angles.

   d) Aqueous copper sulphate solution (blue colour) gives

      i) a green precipitate with aqueous KF and

      ii) bright green solution with aqueous KCI.

   3 + 3 + 3 + (2 ∞ 3)

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

a) Hyperconjugation

b) Proximate analysis of coal

c) Gibbs-Duhem equation for a two component system

d) Optical isomerism and linkage isomerism in coordination compound.

e) Bathochromic shift and hypsochromic shift

f) Hydrogen bonding and its effect on properties of compounds.