

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 × 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 isothermally, 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) $RT \ln 2$ |

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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 initial 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.

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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. $3 \times 5 = 15$

2. a) Prove that for an adiabatic reversible process, $PV^\gamma = \text{constant}$.
b) Show that for an ideal gas $C_p - C_v = R$, 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. $3 \times 15 = 45$

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 KCl .

$3 + 3 + 3 + (2 \times 3)$

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.
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