Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech. (OLD)/SEM-2/CH-201/2011

2011
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 exothermic process ΔH is

a) zero b) negative

c) positive d) none of these.

ii) Efficiency of a Carnot engine depends on

a) Nature of gas only

b) Temperature of the source only

c) Temperature of the sink only

d) Both on the temp. of source & sink.

iii) In a reversible cyclic process the entropy change is

a) Positive b) Negative

c) Zero d) None of these.

iv) Stronger the Oxidising agent, greater is the

a) Oxidation potential b) Reduction potential

c) Ionic character d) None of these

v) The shape of $\left[Cu(NH_3)^4\right]^{2+}$ is square planar, Cu^{2+} in the complex is

a) sp^3 hybridized b) dsp^2 hybridized

c) sp^3d hybridized d) None of these.

vi) An example of hexadentate ligand is

a) EDTA b) Ethylene diamine

c) NH_3 d) All of these.

vii) In which of the following case does entropy decrease ?

a) Melting of solid ice

b) Expansion of a gas

c) Dissolution of sugar in water

d) Polymerization process.

viii) The unit of specific conductance is

a) $ohm - cm$ b) ohm/cm

c) mho d) $mho - cm^{-1}$.

ix) Bakelite is an example of

a) metal b) thermoplastic

c) rubber d) thermoset.

x) IUPAC name of $K_4\left[Fe(CN)_6\right]$ is

a) Prussian blue

b) Potassium ferrocyanide

c) Potassium hexancyano ferrate (II)

d) Potassium hexacyano iron (II).

xi) The intra-and inter-molecular hydrogen bonding can be distinguished by

a) UV spectroscopy

b) IR spectroscopy

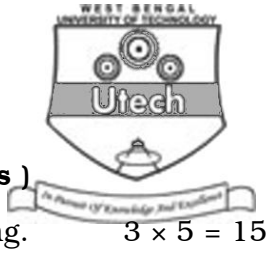
c) ^1H – NMR spectroscopy

d) Both IR and ^1H – NMR spectroscopy.

xii) Example of an electrophile is

a) $AlCl_3$ b) NH_3

c) CH_3OH d) CN^-.



GROUP – B
(Short Answer Type Questions)

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

2. Give a combined statement of first and second law of Thermodynamics in a single sentence. Prove that the work done in an isothermal and reversible process is maximum.

3. State and explain the terms Polymer and Polymerization. Write down the structure and uses of Nylon 66 and Teflon.

4. What is Synthetic Petrol ? Why is water gas called a blue gas ? Write a technical note on Cetane number of a liquid fuel.

5. Explain the following :

   a) NCl_3 and PCl_3 give different products on hydrolysis.

   b) Bond angle in H_2O is greater than in H_2S.

6. Explain how ionic mobility changes with

   a) size

   b) temperature.

GROUP – C

(Long Answer Type Questions)

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

7. a) What is the importance of cracking ? Mention the advantages of catalytic cracking over thermal cracking.

   b) What is the significance of ultimate analysis ? What is the difference between HTC and LTC ?

   c) Calculate the mass of air needed for complete combustion of 5 kg of coal containing 80% carbon, 15% hydrogen and rest oxygen. (1 + 2) + (3 + 5) + 4

8. a) What are the differences between Rubber, Plastics and Fibres ?

   b) Give an example of addition polymerization with reaction. What types of compounds are generally used as initiator for polymerization ?

   c) The degree of polymerization of polystyrene is 1000. Find the molecular weight of polystyrene. 3 + (6 + 2) + 4

9. a) Distinguish between intensive and extensive properties.

   b) Show that Joule – Thomson expansion is an isoenthalpic process.

   c) State the significance of Gibb's free energy.

   d) State the differences between molecularity and order of a chemical reaction.

   e) The half-life period of decomposition of a compound is 5 min. If the initial concentration is halved, the half-life period is reduced to 25 min. Find the order of reaction. 2 + 4 + 2 + 3 + 4

10. a) Explain why *p*-nitrophenol has much higher boiling point than *o*-nitrophenol although both have same molecular weight.

    b) Give reasons why ionic compounds are non-conductors in solid state but good conductors in molten state or in solution state.

    c) State the postulates of Werner's theory. State the limitations of this theory.

d) Write the IUPAC name of the following :

i) $\left[Cr\left(NH_3\right)\left(F\right)\left(CN\right)_2\ \left(H_2O\right)_2\right]$

ii) $K\left[Fe(Cl)\left(en\right)\left(NO_2\right)_2\ \left(H_2O\right)\right]$.

e) Explain why the complex anion $\left[COF_6\right]^{3-}$ is paramagnetic while $\left(CO(CN)_6\right)^{3-}$ is diamagnetic.

3 + 2 + (2 + 2) + (1 + 1) + 4

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

a) Joul-Thomson expansion and inversion temperature

b) Conducting polymers

c) Cetane number

d) Hydrogen electrode

e) Kirchhoff 's equation.