1108
B.E. (Mechanical)
First Semester
CH-101: Applied Chemistry
(Common with ECE and EEE)

Time allowed: 3 Hours   Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section.*

x-x-x

I.   Answer the following briefly:

i) What is the order of different types of energies?

ii) Give the cell representation for ion selective electrodes.

iii) Predict the kind of electronic transition in (a) Cl_2 (b) C=O group

iv) Why are alkenes good monomers for polymerization reactions?

v) Give a difference between homogeneous and heterogeneous catalyst.

vi) Identify the state functions and path functions out of the following:
   Enthalpy, entropy, heat, work, free energy

vii) Why a gas shows cooling effect in adiabatic expansion.

viii)   List out the number of translational, rotational and vibrational degrees of freedom for (a) Ne (b) O_2

ix) Why does impure metal corrode faster than pure metal?

x) Represent the electronic configuration of following complexes using Crystal Field Theory

(i)$[Ni(NH_3)_6]^{2+}$ (ii) $[Cr(CN)_6]^{3-}$ (10 x 1 = 10)

Section A

II a) To what pressure must a certain ideal gas (C_p/C_v=1.4) at 373K and 1 atmosphere pressure can be compressed adiabatically in order to raise its temperature to 773K?   (2)

b) Discuss the significance of A and G functions.   (3)

c) Discuss the dependence of enthalpies of reaction on temperature.   (5)

III a) Give brief outline of Wacker's process.   (2)

b) Explain and illustrate the following:
   (i) Negative catalyst (ii) Catalytic inhibitors (iii) Enzyme catalysis   (3)

c) Discuss homogeneous hydrogenation of alkenes.   (5)

IV a) Illustrate the advantages of fuel cells.   (2)

b) Describe the construction of calomel electrode.   (3)

c) Discuss the mechanism of electrochemical corrosion.   (5)

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Section B

V. a) A solution contains 1:2 ratio of masses of particles of two substances with molar mass 10,000 g/mol and 20,000 g/mol, respectively. Determine the number average (M_n) and weight average (M_w) molar mass. (3)

b) Write a note on condensation polymerization (3)

c) Discuss synthesis, properties and uses of polyesters. (4)

VI a) Explain the following: (i) fundamental transition (ii) overtones (iii) finger print region (3)

b) Explain Beer-Lambert's law. Give their limitations. (3)

c) Which of the following three modes of vibration of a linear triatomic molecule AB_3 are IR active.

(i)   B→ A← B   (ii) B→ ← A ←B
              ↑

(ii)   B   A   B
        ↓   ↓

Give reasons in support of your answer. (4)

VII a) Arrange the following octahedral complexes in decreasing order of their crystal field splitting. Give reasons also. $[CrF_6]^{3-}$, $[Cr(H_2O)_6]^{3+}$, $[Cr(NH_3)_6]^{3+}$, $[Cr(CN)_6]^{3-}$ (2)

(b) Predict the magnetic behavior of following complexes (4)
$[Co(NH_3)_6]^{3+}$, $[Co(en)_3]^{3+}$, $[CoF_6]^{3-}$, $[Co(H_2O)_6]^{3+}$

(c) Discuss crystal Field Splitting in tetrahedral complexes. (4)

x-x-x