Mech.

(i) Printed Pages : 4 P

(ii) Questions : 7

Roll No. .....

Sub. Code : 6 6 5 0

Exam. Code : 9 0 5

B.Engg. 1st Semester

1125

APPLIED CHEMISTRY

Paper : CH–101

Time Allowed : Three Hours] **[Maximum Marks : 50**

Note:– Attempt **five** questions in all, select **two** questions from each Section and Question No. **I** is compulsory.

I. (a) Differentiate a reversible process from irreversible.

(b) Give the expression for entropy change accompanying conversion of liquid phase to vapour.

(c) Out of 1,3 Hexadiene and 1,4 Hexadiene which one will absorb at higher wavelength and why ?

(d) Define Fermi Resonance.

(e) What is rate of corrosion of Ag in an atmosphere of Cl_2 ?

(f) Give the chemical reactions for methanol oxygen fuel cell.

(g) Give the catalyst for :

(i) Hydrogenation

(ii) Hydroformylation reaction.

V. a) Discuss the mechanism of addition polymerizatio

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7. (a) (h) Give the monomers for the :

(i) Alkyd resins

(ii) Nylon–11

(i) Why singlet to triplet is a forbidden transition ?

(j) Compare the magnetic moment of $[Co F_6]^{3-}$ & $[Co(H_2O)_6]^{3+}$ on the basis of CFT. 10×1=10

SECTION–A

II. (a) Calculate the work done when 2 moles of an ideal monoatomic gas at 27°C expands against a constant external pressure of 1 atm. from a volume of 10 lt to 30 lt in an isothermal manner. What will be the value if process is done in reversible adiabatic manner ?

(b) Derive an expression for efficiency of Carnot cycle.

(c) Discuss the determination of enthalpy of formation of a compound from bond energy data.

(d) Derive an expression showing effect of temperature on enthalpy change of a reaction. 3,3,2,2

III. (a) Discuss 3rd law of thermodynamics and also give its application.

(b) Explain the kinetics of acid catalyzed reaction.

(c) Discuss the mechanism of The Wacker process.

(d) What are reference electrodes ? Describe the set up of any one of it. 3,2.5,2.5,2

IV. (a) Explain the mechanism of :

(i) Intergranular Corrosion

(ii) Waterline Corrosion.

(b) Discuss the corrosion control using inhibitors.

(c) Discuss the effect of nature of corrosion products on rate of corrosion. 5,3,2

SECTION–B

V. (a) Differentiate between step growth polymerization and chain growth giving example.

(b) Write short notes on the following :

(i) Molecular weight of polymers

(ii) Syndiotactic polymers

(iii) Mechanism of anionic polymerization.

(c) Explain the inverse spinel structure of $NiFe_2O_4$ on the basis of crystal field splitting. 2,6,2

Exam.Code:905
Sub. Code: 7838

Max. Marks: 50

each Unit. All

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(b) Discuss the I.R. spectrum of CO_2.

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(d) Explain how does the energy of d-orbitals change when an octahedral complex is distorted tetragonally. What will be the effect if this distortion is increased further ? 2,2,3,3

VII. (a) Compare electronic spectra of acetone and methyl vinyl ketone using M.O. energy diagram.

(b) Discuss the charge transfer transitions.

(c) What is the effect of solvent polarity on transitions from Π orbitals ?

(d) Discuss with examples the various electronic factors affecting position of I.R absorption. 3,2,2,3

ME
1SH SEM

Exam.Code:0905
Sub. Code: 6650

1127

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) Why it is not possible to assign an exact molecular weight to a polymer?

ii) Which isomer will absorb at longest wavelength of UV absorption and why?

(a) CH_2=CH-CH=CH-CH_3
(b) CH_2=CH-CH_2-CH=CH_2

iii) Write the cell reaction for Propane-Oxygen fuel cell.

iv) What is Bedworth Rule?

v) What is Wilkinson's catalyst?

vi) Which complex has larger crystal field splitting : $[Pt(NH_3)_2Cl_2]$ or $[Cr(NH_3)_3Cl_3]$

vii) In the following processes, state whether the entropy of the system increases, decreases or remains unchanged.

(a) Vaporization of a mole of water into steam at its normal boiling point

(b) Formation of a compound from its elements in the standard state

viii) What occurs when a molecule absorbs infrared radiation?

ix) Classify energy, heat capacity, specific heat, and boiling point into extensive and intensive properties.

x) Why elastomers undergo reversible elongations? (10 x 1 = 10)

Section A

II (a) Compare isothermal and adiabatic expansion of an ideal gas. (2)
(b) When 1 mole of ice melts at 0°C and a constant pressure of 1 atm, 1440 cal of heat is absorbed by the system. The molar volume of ice and water are 0.0196 L and 0.0180 L. Calculate ΔH and ΔU. (3)
(c) State and explain Gibbs Duhem equation. (5)

III (a) How does a catalyst work? (2)
(b) Write the steps to discuss the mechanism of heterogeneous catalysis. (3)
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P.T.O.

which the organization ...
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VII Write short notes on:-

IV (a) Write a note on galvanic series. (2)
(b) Discuss cathodic protection. (3)
(c) Discuss various types of reference electrodes. (5)

Section B

V (a) Equal number of molecules with M_1=10,000 and M_2=100,000 are mixed. Calculate M_N and M_W. (2)
(b) Give a brief description of ionic polymerization. (3)
(c) Give the synthesis, properties and uses of epoxy resins. (5)

VI (a) Which of the following molecules will show vibrational infrared spectrum and why: H_2, HCl, CO, CO_2, CH_3Cl, H_2O, NH_3, C_6H_6 (2)
(b) What is the effect of polar solvents on $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ transitions? (3)
(c) Discuss the inductive and mesomeric effect on vibrational frequencies of molecules with examples. (5)

VII (a) Explain the violet colour in $[Ti(H_2O)_6]^{3+}$. (2)
(b)Arrange CO, CN^-, NH_3, H_2O, F^- in decreasing order of their power to cause crystal field splitting. Give reasons (3)
(c) Discuss Crystal Field Splitting in Octahedral Complexes. (5)

x-x-x

Exam.Code:0905
Sub. Code: 6650

1128

B.E. (Mechanical Engineering)
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 Unit.*

x-x-x

I. Answer the following briefly:

a) Why increase in volume of a gas for a given decrease in pressure is less in an adiabatic expansion than in isothermal expansion.

b) Classify the following polymers on the basis of action of heat on them: Bakelite, nylon, polyethylene, polyester

c) List the electronic transitions possible for CH_3Cl and $H_2C{=}O$.

d) Write the cell reaction for calomel electrode

e) Give the sequence of energy levels of d-orbitals in square planar crystal field. (5x2)

UNIT – I

II. a) Ig of water at 373 K is converted into steam at the same temperature. The volume of water becomes 1671 ml on boiling. Calculate the change in internal energy of the system if the heat of vaporization is 540 cal/g.

b) State the first law of thermodynamics. With the help of this law show that: (i) Heat absorbed by the system at constant volume is equal to increase in internal energy of the system, (ii) Heat absorbed by a system at constant pressure is equal to an increase in the enthalpy. (5,5)

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IV. a) Write a note on glass electrode.

b) What do you mean by corrosion inhibitors? Explain their action with examples. (5,5)

P.T.O.

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UNIT – II

V. a) A polymer consists of 40% by weight of macromolecules of molecular weight 10,000 and 60% by weight of macromolecules of molecular weight 75,000. Calculate number average and weight average molecular weight of the polymer.

b) Define the term functionality of monomers. Explain its significance with suitable. (5,5)

VI. a) Arrange the following compounds in the increasing order of their UV absorption maxima

i) Ethylene
ii) Napthalene
iii) Anthracene
iv) 1,3-butadiene. Provide reasons for your answers.

b) How will you distinguish between following pairs of compounds on the basis of IR spectroscopy

i) Ethyl alcohol and Diethyl ether
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(i) Printed Pages : 4 P

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Sub. Code : 6 6 5 0

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B.Engg. 1st Semester

1125

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Exam.Code:905
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Exam.Code:0905
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1127

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CH-101: Applied Chemistry
(Common with ECE and EEE)

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Exam.Code:0905
Sub. Code: 6650

1128

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First Semester
CH-101: Applied Chemistry
(Common with ECE and EEE)

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Roll No. .....

Sub. Code : 6650

Exam. Code : 905

B.Engg. 1st Semester

1125

APPLIED CHEMISTRY

Paper : CH–101

Time Allowed : Three Hours] [Maximum Marks : 50

Note:– Attempt **five** questions in all, select **two** questions from each Section and Question No. **I** is compulsory.

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(i) Printed Pages : 4 Roll No. .....

Roll No. 1 5 1

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Exam. Code: 905
Sub. Code: 7893

1016

B. Engg. (Mechanical Engineering) 1st Semester

CH-101: Applied Chemistry

(Common with ECE, EEE)

Time allowed: 3 hours

Max. Marks: 50

Note: Attempt Five questions in all including Q. No. I which is compulsory and selecting two questions each from Part A & B.

-O-O-

1. (a)What is the difference between open system and closed system. [10 x 1 = 10]
   (b)Define Flame Temperature
   (c) What is syndiotactic polymer, give one example of this type.
   (d) What is the difference between homogeneous and heterogeneous catalyst ?
   (e) What is waterline corrosion.
   (f) Define Chromophore
   (g) what are the different type of bending vibration observed in a molecule?
   (h) What are the advantages of crystal field theory ?
   (i) What is electrochemical Series ?
   (j) Write the formula of catalysts used in wacker process

PART A

2. (a) (a) The enthalpy of combustion of methane (CH_4) is -890.4 kJ/mole. If enthalpy of formation of CO_2 and H_2O are -394.5 and -286.6 kJ/mole respectively, calculate the enthalpy of formation of methane (CH_4). [3]

   (b) Define entropy. Derive expressions of entropy change for an ideal gas with respect to pressure, volume and temperature. [3]

   (c) Derive the equations for q, w, ΔE and ΔH for reversible isothermal of an ideal gas [4]

3. (a) Give detailed mechanism for wacker process. [5]
   (b) Derive Michaelis-Menton's equation for enzyme catalysis. When the reaction rate is of first order ? [5]

4. (a) In a polymer, there are 100 molecules of molecular weight 100, 200 molecules of molecular weight 1000 and 300 molecules of molecular weight 10,000. calculate M_n and M_w and PDI. [3]

   (b) Explain the mechanism of Zeigler Natta Polymerization. [3]

   (c) Explain detailed synthesis, properties and uses of polyesters [4]

P.T.O.

Q. 6 a) What are the different ways to plot ... different parameters used to give 'light' effects.
b) How a graph can be exported into image file? What are the different image formats in which graphs can be exported? (4)

Q. 7. a) What is the purpose of 'guide' command in MATLAB? What ...

PART B

5. (a) Write notes on (i) Anodic Sacrificial Protection (ii) pitting corrosion [4]

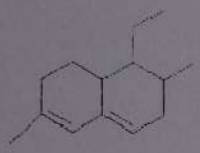
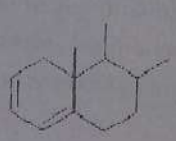
(b) Explain rusting of iron with the help of electrochemical theory of corrosion [3]

(c) Discuss the factors affecting corrosion [3]

6. (a) Butadiene shows absorption at higher wavelength than ethylene. Explain with the help o molecular orbital diagram and Ψ function. [4]

(b) Calculate the number of vibrational degrees of freedom in following compounds:
(i) CO_2 (ii) H_2O [2]

(c) Calculate the λ_{max} for the following compounds

(i)  (ii)  [4]

7. (a) Calculate the CFSE of the following compounds
(i) $[Cr(H_2O)_6]^{3+}$, (ii)$[Co(NH_3)_6]^{3+}$, (iii)$[Zn(Cl)_4]^{2-}$ [6]

(b) Briefly explain the crystal field splitting in (i) octahedral and (ii) square planar complexes [4]

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Exam.Code:0905
Sub. Code: 6650

1128
B.E. (Mechanical Engineering)
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 Unit.

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I. Answer the following briefly:

a) Why increase in volume of a gas for a given decrease in pressure is less in an adiabatic expansion than in isothermal expansion.

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i) Ethyl alcohol and Diethyl ether
ii) Acetic Acid and Ethyl Acetate (5,5)

VII. a) Give the number of unpaired electrons in a strong and weak octahedral field for

i) Cr^{3+}

ii) Co^{2+}

iii) Fe^{3+}

b) What do you mean by Crystal Field Stabilization Energy (CFSE)? How do CFSE value relate to the corresponding colors in d-metal complexes. (6,4)

x-x-x