

354

B.Tech. Examination, 2014

(First Semester)

(M.E. and E.C. Branch)

ENGINEERING CHEMISTRY

Paper - I

Time Allowed : Three Hours

Maximum Marks : 100

Note : All questions are compulsory.

SECTION - A

Note : Attempt all parts :

$2 \times 10 = 20$

Q. 1. *U* (a) What is meant by bonding and antibonding molecular orbitals ?

(b) Discuss the applications of fullerenes.

(2)

(c) How many phases and components are present in the following system:

Water \rightleftharpoons Water - vapour

- (d) Which part of an electrochemical cell formed by two metals, suffer corrosion-cathode or anode?
- (e) Explain chirality and optical-activity.
- (f) Explain E, Z system of configuration of geometrical isomerism.
- (g) Write short notes on Nucleophiles and Electrophiles.

SECTION - B

Note : Attempt any five :

5×10=50

Q. 2. (a) On the basis of MOT, prove that the molecule of oxygen is paramagnetic in nature, also calculate the bond order of O_2 , O_2^+ and O_2^- .

- (b) Derive an expression for the density (e) of a cubic crystal

(3)

2(h) Explain Energy of Activation.

- (i) Define the terms :

Polymer, Monomer and Degree of polymerization

(4)

- Q. 3. (a) In Bragg's reflection of x-ray a reflection was found at 30° with lattice plane of spacing 1.87°

A. If this is a second order reflection, calculate

the wave length of X-rays.

- Q. 4. (b) What is meant by Intermolecular and Intramolecular H-bonding. Explain the various

applications of H-bonding.

- Q. 4. (a) What is the difference between chemical cell

and concentration cell. Write down the formula

of E.M.P. of concentration cell.

(5)

- Q. 5. (b) Write the half-cell reactions and the reaction of the cell :



- Q. 5. (a) What is meant by Electrochemical corrosion ?

Explain its mechanism.

- (b) Explain fuel cells with their classification and

applications.

- Q. 6. (a) Give the mechanism of Cannizaro reaction

taking a suitable example.

- Q. 6. (b) Differentiate between SN^1 and SN^2 reaction

(6)

Q.7. (a) Explain the Zealite method for softening of

water.

(b) What are ion-exchange resins, Explain advantages.

SECTION - C

Note : Attempt any two of the following questions : $2 \times 15 = 30$

Q.8. (a) Define the following terms :

- (i) Bathochromic shift
- (ii) Hypochromic shift
- (iii) Hyperchromic shift

Q.9. (b) Enumerate the characteristics of a good fuel.

water-vapour system.

(7)

(c) "IR Spectra is often characterized as molecular finger prints." Comment with.

Q.9. (a) Give the reactions of carbonyl compounds

with Grignard's reagent.

(b) Explain oxidation-reduction titration.

(c) Explain conducting polymers with their applications.

Q.10. Write notes on any three of the following :

- (i) Liquid crystals
- (ii) State phase rule and its application to. Ice-

water-vapour system.

(8)

3 ✓ (iii) Confirmations of butene

(iv) LDPE and HDPE

2 ✓ (v) Biofuels



ow does an

5260

B.Tech. Examination, 2013

Second Semester

(C.S. & I.T. Branch)

Paper : I

ENGINEERING CHEMISTRY

Time Allowed : Three Hours

Maximum Marks : 100

Note : (i) Attempt all questions.

(ii) All questions carry equal marks.

(iii) Make suitable assumptions, structure, fig.

where required.

(iv) Be precise in your answer.

5260

P.T.O.

(3)

attempt any four of the following

questions :

$$5 \times 4 = 20$$

(e) What is hydrogen bond ? How does an

intermolecular hydrogen bond differ from intera

(a) Write down the molecular orbitals of NO, NO⁻

molecular hydrogen bond.

and NO⁺, arrange them in increasing order of

stability.

Q. 2. Attempt any four of the following

questions :

$$5 \times 4 = 20$$

(b) Discuss the structure of Graphite and hence

comment on its conducting nature.

(a) What is polymerisation/copolymerisation ?

(b) Describe the classification of polymers on the

basis of molecular forces.

n-butane.

(c) Define relative stability of the conformation of

(d) Write order of reactions with example.

X(c)

Write different type of organic reactions with example.

(4)

- (d) What is activation energy? How does the nature of activation barrier change in the presence of catalyst?

(5)

- (c) What is cause of absorption in UV & IR regions?

- (d) Define the terms, chromophores, auxochrome, bathochromic effect and hyperchromic effect.

- (e) Define nucleophilic substitution reaction with its affecting factors.

Q. 3. Attempt any four of the following questions : $5 \times 4 = 20$

- (e) Draw molecular orbital diagram for HF molecule & calculate its bond order.

Q. 4. Attempt any four of the following questions : $5 \times 4 = 20$

- (a) Derive Nernst's equation for single electrode potential and explain the term involved in it.

- (b) For one component system (water), find degree of freedom at its triple point of the phase diagram.

for CO_2 and H_2O molecules.

(7)

(6)

(c)

How many NMR signals do you expect from each of the following compound. Indicate also the splitting pattern of various signal:

- (d) Which of the following metals could provide cathodic protection to iron, Al, Cu, NiZn, CO, Mn, Pb.

cathodic protection to iron, Al, Cu, NiZn, CO,

(i) Acetone

(ii) Ethyl alcohol

(d) Describe analysis of coal by using proximate

- (e) What is Alder reaction, write its mechanism & applications.

Q. 5. Attempt any four of the following

questions :

$$5 \times 4 = 20$$

method.

(e) Write difference between a free radical and an ion.

- (a) Describe zeolite process and its advantage.
- (b) Write down the absorption frequency for the

following functional groups. OH, >C=O, C=N,



H

5254

B.Tech. Examination, 2013

(First Semester)

(M. E. and E. C. Branch)

ENGINEERING CHEMISTRY

Paper - I

Time : Three Hours]

[Maximum Marks : 100

Note :- Attempt any five question. Each question carry equal marks.

Section - A

$2 \times 10 = 20$

1. (a) Define Hydrogen bonding.
- (b) Discuss the conducting nature of graphite.
- (c) Define order and molecularity of reaction.
- (d) Define the term phase and component.
- (e) What is rusting? Give the chemical formula of rust.
- (f) Define Hyper conjugative effect.
- (g) What is Diels - Alder reaction?

[P. T. O.

(h) Write the conformation of n-butane.

(i) Write the structure of Bakelite.

(j) Define calorific value of fuel.

Section - B

$$5 \times 10 = 50$$

Note :- Attempt any **five** of the following questions.

2. (a) What is molecular orbital theory (M.O.)? Discuss the M.O. diagram of N_2 molecule.
- (b) Derive Bragg's equation.
3. (a) What is meant by space lattice of a crystal? Draw a unit cell for the following types :
 - (i) Simple Cubic
 - (ii) Face - Centred Cubic
 - (iii) Body - Centred Cubic
- (b) Discuss the Electrochemical theory of corrosion.
4. (a) Describe the construction of a galvanic cell. Write the electrode reaction.
- (b) What is Fuel-cell? Discuss the working H_2-O_2 fuel cell.
5. (a) Write notes on Inductive effect. Explain with suitable examples.

(b) Write the mechanism of Aldol-Condensation reaction.

6. (a) Derive the integrated rate expression for first order reaction.

(b) In the first order reaction, half of the reaction is completed in 100 seconds. How long will it take for the 99% reaction to occur?

7. (a) Define phase rule. Explain the phase diagram of water-system.

(b) Explain the absolute configuration (R, S - System of nomenclature) of optical isomers with suitable example.

Section - C

$$2 \times 15 = 30$$

Note : Attempt any **two** of the following questions.

8. (a) What is the nucleophilic substitution reaction? Discuss the mechanism of SN^1 reaction with suitable example.
- (b) Arrange the following alkyl amines with their increasing basic strength order :
 - (i) H_3C-NH_2
 - (ii) $(H_3C)_2 NH$

- (iii) $(CH_3)_3N$
- (iv) NH_3
- (c) Write the mechanism of Cannizaro reaction.
9. (a) Give the preparation, properties and uses of following polymers :
- (i) Nylon 6,6
 - (ii) PVC
 - (iii) Teflon
 - (iv) SBR
- (b) Discuss about the different types of Acid-Base titration with suitable example.
- (c) How many NMR signals are expected in the spectrum of the following compounds :
- (i) $CH_3 - CH_2 - OH$
 - (ii) $CH_3 CHO$
10. Write notes on any three of the following :
- (i) Optical isomerism of Lactic acid.
 - (ii) Fullerenes
 - (iii) Carbocation and free radicals
 - (iv) Bomb Calorimeter
 - (v) Vulcanization.

H

2004

B. Tech. Examination, 2012

(First Semester)

(M. E. and C. E. Branch)

ENGINEERING CHEMISTRY

Paper - I

Time : Three Hours] [Maximum Marks : 100

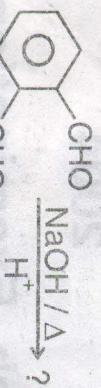
Note :- Attempt all questions. Each question carry equal marks.

SECTION-A

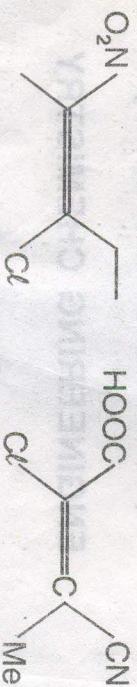
1. (a) Describe the paramagnetic character of O_2 molecule by M. O. theory. 2
- (b) Describe briefly the conduction property of graphite. 2

[P. T. O.

- (c) Complete the following reactions and name these. 2



- (d) Write E or Z configuration of following : 2



- (e) Describe briefly the "Flipping of Proton". 2

- (f) Describe briefly the effect of hydrogen bonding on the vibrational frequencies. 2

- (g) Describe briefly the coordination polymerisation. 2

- (h) Differentiate between thermoplastic and thermosetting polymers. 2



- (i) Define Pseudo-unimolecular reaction with help of suitable example. 2

- (j) Give the chemical reaction for the corrosion of iron exposed in air or water. 2

SECTION-B Duration of Question A 5x10=50

Note :- Attempt any five of the following questions.

2. (a) Draw the molecular orbital diagram and calculate the bond order of He_2^+ , O_2^- , NO .

- (b) A metal crystallises as body centered cubic lattice with the edge length of unit cell equal to 0.304 nm, if the molar mass of metal is 50.3 g mol^{-1} , find out its density.

3. (a) What is Gibb's phase rule? Give the phase diagram of one component three phase system with explanation.

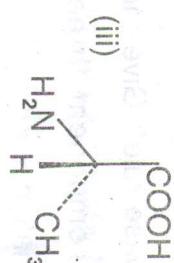
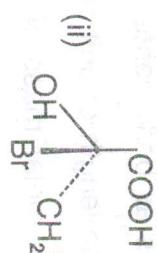
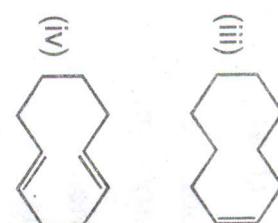
- (b) Find out the e.m.f. of the cell having standard reduction potential of Pb and Zn electrodes are -0.126 and -0.763 volts respectively.

$\text{Zn} / \text{Zn}^{+2} (0.1 \text{ m}) \parallel \text{Pb}^{+2} (1 \text{ m}) / \text{Pb}$

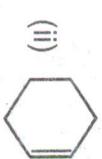
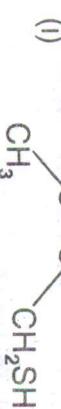
4. Write the mechanism of :

- (a) Beckman rearrangement
(b) Cannizaro reaction

5. (a) Assign configuration to the following compounds :



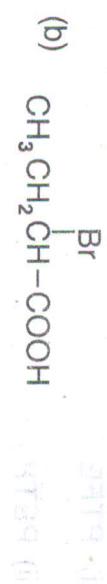
(b) Assign E/Z nomenclature to the geometric isomers of compounds :

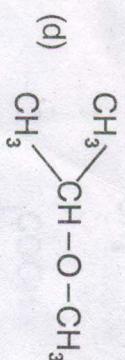
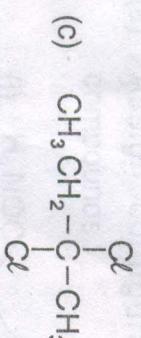


6. (a) Describe cation exchange resin with suitable example with their application to treat hardness of water.

(b) Describe ionic polymerisation with help of PVC preparation in presence of BF_3 and H_2O .

7. What is chemical shift? Write the number of signals in the following molecule with their splitting.





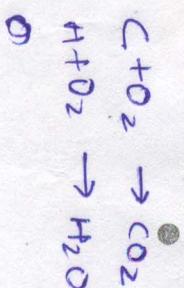
SECTION-C

10x3=30

Note :- Attempt any one of the following.

8. (a) What is Shielding and Deshielding? Give the characteristic features of solvent and reference material used in NMR technique.
- (b) What is hardness of water? How is it removed by Zeolite and calgon process.
- (c) What are biodegradable polymers? Write example with their application.
9. (a) Give the method for the preparation of the following polymers :
- (i) Buna-S
 - (ii) PTFE
 - (iii) PETP

10. (a) Write a short note on different types of electronic transitions in UV-visible spectroscopy.
- (b) Write a short note on following :
- (i) Tacticity
 - (ii) Diels-Alder reaction
 - (iii) Concentration cells
- (c) What is high and low calorific value? Calculate the minimum weight of air required for the combustion of 1 kg of fuel containing C = 90%, H = 3.5%, O = 3.0%, S = 0.5%, H₂O = 1%, N = 0.05% and rest ash.



585

B.Tech. Examination, 2014

(Second Semester)

(C.S. & I.T. Branch)

Paper - I

ENGINEERING CHEMISTRY

Time Allowed : Three Hours

Maximum Marks : 100

- Note :**
- (i) Attempt all questions.
 - (ii) All questions carry equal marks.
 - (iii) Make suitable assumptions, structure, fig where required.
 - (iv) Be precise in your answer.
- Q. 1.** Attempt any four of the following question :

(2)

- (a) Calculate the bond order of N_2^- , O_2^+ , NO^- and NO^+ .

- (b) Explain the paramagnetic character of oxygen

with the help of molecular orbital theory.

- (c) What do you understand by fullerenes ?

- (d) What do n , d , λ and θ signifies in the Bragg's

law $n\lambda = 2d \sin \theta$.

- (e) Explain the structure of graphite. Also explain

the reasons for its electrical and lubricating properties.

(3)

- (a) Calculate the cell potential for the cell containing $0.10 \text{ M } \text{Ag}^+$ and $4.0 \text{ M } \text{Cu}^{2+}$ at 298 K . Given :

$$E^\circ_{\text{Ag}^+/\text{Ag}} = 0.80 \text{ V}, E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34 \text{ V}.$$

- (b) Derive the equation for half life of first order

reaction.

- (c) With the help of phase diagram of water

calculate the degree of freedom at triple point.

- (d) Explain four methods for prevention of

corrosion.

- (e) Derive Nernst's equation for single electrode

potential and explain the term involved in it.

- Q. 2. Attempt any four of the following questions : $5 \times 4 = 20$

(4)

Q. 3. Attempt any two of the following questions: $2 \times 10 = 20$

(a) Explain the mechanism of nucleophilic substitution reaction by taking suitable examples.

(b) Give the mechanism of the following reactions:

(i) Beckman rearrangement

(ii) Aldol condensation

(iii) Cannizaro reaction

(c) What is optical isomerism? Draw the potential energy diagram for the various conformation of n-butane.

(5)

Q. 4. Attempt any two of the following questions: $2 \times 10 = 20$

(a) Explain vulcanisation and state the improvement in properties of rubber after vulcanisation is carried out.

(b) Briefly explain the mechanism of addition and condensation polymerisation.

(c) What are synthetic rubbers? How does butyl rubber differ from Buna-S? What are graft and block co-polymers?

Q. 5. Attempt any two of the following questions: $2 \times 10 = 20$

(a) (i) A coal has the following composition by weight

(6)

C = 90%, O = 3.0%, S = 0.5%, N = 0.5%

and ash = 2.5%. Net calorific value of the

coal was found to be 8490.5. Kcal/kg.

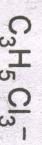
Calculate the % of hydrogen and gross

calorific value of coal.

(ii) Write short note on Bio gas.

(b) (i) Give the structure consistent with the

following NMR data :



(a) singlet δ 2.20, 3H

(b) singlet δ 4.20, 2H

(7)

(ii) Define the term chromophore and auxochrome in UV spectroscopy.

(c) Explain the zeolite method for softening of

water.