

BTECH- 1ST SEM -

1 YMCA

Roll No.

DEC - 2019

Total Pages : 4

300105

December, 2019

B.Tech.- I SEMESTER

Chemistry (BSC102)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

- 1. It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
- 2. Answer any four questions from Part-B in detail.*
- 3. Different sub-parts of a question are to be attempted adjacent to each other.*

PART - A

1. (a) What is the role of doping on the band structures of solids? (1.5)

(b) Give the structural formula of C_3H_6O which gives one signal in 1H NMR. (1.5)

(c) Give main difference between wet and dry corrosion with example. (1.5)

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12/12

- (d) Predict whether cyclopropene, cyclopropenyl cation and cyclobutadiene are aromatic or non-aromatic. (1.5)
- (e) Give two points how scale and sludge formation can be prevented in boilers. (1.5)
- (f) Give the Schrodinger wave equation for a particle in one dimensional box. (1.5)
- (g) Explain how acetic acid acts as acid in aqueous solution according to Bronsted-Lowry acid base concept. (1.5)
- (h) Define entropy and enthalpy of a reaction. (1.5)
- (i) Draw the Fischer projection formula for (2R)-2-Bromobutane. (1.5)
- (j) What do you understand by term cyclization reaction? Give example. (1.5)

PART - B

- 2. (a) What do you mean by effective nuclear charge? Write Slater's rule to find out effective nuclear charge. (5)
- (b) Explain Fajan's Rule of polarizability and its significance. (5)
- (c) Give the geometries possible for coordination number 4. Using VSEPR theory predict the shape of a AB_3 molecule having 2 lone pair of electrons on central atom A. (5)

- 3. (a) Give the selection rule for IR spectroscopy. Explain stretching and bending vibrations in AB_2 type nonlinear molecule. (5)
- (b) Write a short note on shielding and de-shielding of protons in NMR spectroscopy. (5)
- (c) Discuss the principle of electronic spectroscopy. Explain with reference to butadiene and carbonyl compounds. (5)

- 4. (a) Discuss the potential energy surface diagram of H_2F and its trajectories. (7)
- (b) Give a detailed account for any *four* intermolecular forces of attraction existing in molecules. (8)

- 5. (a) Draw the pi-molecular orbitals for butadiene. (5)
- (b) Give *three* main postulates of CFT. Explain the splitting of d orbitals under octahedral, tetrahedral and square planar ligand field. (10)
- 6. (a) Discuss taking examples of organic molecules types of structural and stereoisomerism. (5)
- (b) Discuss the synthesis of a commonly used analgesic drug molecule taking a suitable example. (5)

(c) Nucleophilic substitution and elimination reactions often compete with each other. Justify this statement giving the conditions when substitution is preferred over elimination. (5)

7. (a) Explain Ellingham diagram listing its uses and limitations. (7)
- (b) Give the equation which relates cell potential and Gibbs free energy at equilibrium. Write three main applications of Nernst equation with examples. (8)
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CHEMISTRY
(BSC-102)

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- (ii) *Answer any four questions from Part-B in detail.*
- (iii) *Different sub-parts of a question are to be attempted adjacent to each other.*

PART-A

1. (a) What is the significance of Ψ and Ψ^2 . (1.5)
- (b) What are the intrinsic & extrinsic semiconductors? (1.5)
- (c) What is hypsochromic shift? (1.5)
- (d) What do you mean by IR active molecule? (1.5)
- (e) What is dipole- induced dipole interactions? (1.5)
- (f) Define critical temperature. (1.5)
- (g) What does an Ellingham diagram signifies? (1.5)

- (h) Differentiate between hard and soft acids? (1, 0)
- (i) Differentiate between enantiomers and diastereomers (1.5)
- (j) Define Walden Inversion. (1.5)

PART-B

2. (a) Derive the expression for E and Ψ for a particle in 1-D box. (5)
 - (b) Draw and explain molecular orbital diagram of O_2 . Compare its bond order and magnetic properties with O_2^+ , O_2^- , O_2^{2-} . (5)
 - (c) Briefly discuss crystal field splitting in tetrahedral complexes. (5)
3. (a) Explain the theory of UV-visible spectroscopy and various types of electronic transitions. (7)
 - (b) Write a short note on following:-
 - (i) Chemical Shift.
 - (ii) Beer-Lambert's Law.
 - (iii) Fundamental Vibrations and overtones.
 - (iv) Fluorescence. (2×4)
- (a) Derive Van der Waals' equation for real gases and extend the derivation to critical phenomenon. (8)
 - (b) Write a short note on PES diagrams. Elaborate saddle point and mountain pass in a potential energy surface diagram. (7)

(a) Briefly explain polarization and polarizability. Discuss the factors influencing polarizability and consequences of polarizability. (5)

(b) What do you understand by electronegativity? Explain its variation across the periodic table. How it effect other properties of elements / molecules? (5)

(c) Discuss the geometry of ClO_3^- and PCl_5 . (5)

(a) What are optical active compounds? Discuss the essential conditions for optical isomerism, elaborate with example. (5)

(b) Discuss stereoisomerism in transitional metal compound with suitable examples. (5)

(c) Draw and discuss energy diagram for different conformational isomers of butane. (5)

7. (a) Explain elimination reaction with detailed mechanism by taking suitable example along with rules governing major product formation. Describe how elimination reaction competes with substitution reaction. (8)

(b) Give synthesis of an antihistamine and antipyretic drug. (7)

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Dec., 2018
B.Tech. Ist Semester
CHEMISTRY
(HAS-105C)

Time : 3 Hours]

[Max. Marks : 75

Instructions:

- (i) *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
- (ii) *Answer any four questions from Part-B in detail.*
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PART-A

1. (a) Justify the use of silicone oils as temperature efficient lubricants. (1.5)
- (b) Why reduced phase rule is considered in two component system? (1.5)
- (c) What is the meaning of alkalinity of water and how it is caused? (1.5)
- (d) What is the significance of overvoltage with respect to corrosion? (1.5)

- (e) Define saponification number of a lubricant. (1.5)
- (f) Define calorific value of a fuel along with its units of measurement. (1.5)
- (g) What do you understand by degree of freedom of a system in equilibrium? (1.5)
- (h) Compare hot lime soda process and cold lime soda process of water softening. (1.5)
- (i) What do you mean by corrosion inhibitors? (1.5)
- (j) How fuels are classified? Give only names of different categories. (1.5)

PART-B

- 2. (a) 'Properties of polymers are affected by their structure', justify the statement. (10)
 - (b) Discuss metastable equilibrium with the help of a well labelled phase diagram. (5)
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- 3. (a) Describe a method to determine alkalinity of a given water sample. (5)
 - (b) How water softening is carried out using ion exchange resins? What do you understand by exhausted ion exchange resin and regeneration of ion exchange resin? (5)

- (c) 100 ml of a water sample on titration with N/50 H_2SO_4 required 4.7 ml of the acid to phenolphthalein end-point. When a few drops of methyl orange are added to the same solution and the titration further continued, the yellow colour of the solution just turned red after addition of another 10.5 ml of the acid solution. Calculate the type and extent of alkalinity present in the water sample. (5)
4. (a) Explain electrochemical theory of corrosion by taking a suitable example. (5)
- (b) How the nature of metal affect rate of corrosion? Briefly explain. (5)
- (c) How lubricants are classified on the basis of their mechanism of action? (5)
5. (a) Discuss proximate analysis of a fuel and its importance. (10)
- (b) Briefly explain composition properties and applications of oil gas and water gas. (5)
6. (a) Define and discuss each term used in Gibb's phase rule. (7.5)
- (b) What do you understand by (i) Iodine value, (ii) acid value and (iii) viscosity-index of a lubricant. Discuss significance of these properties for a lubricant. (7.5)

7. (a) What are thermoplastics and thermoset polymers?
Discuss any two thermoplastics along with their preparation, properties and applications.

(5)

(b) Discuss the problem of scale and sludge formation in boilers. How this problem can be minimised?

(5)

(c) Discuss cathodic and anodic method of prevention against corrosion.

(5)

December, 2019
B.Tech.- I SEMESTER
Chemistry (BSC102)

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80013**December, 2019****B.Tech - 1st SEMESTER (Reappear)****Chemistry (HAS-105C)****Time : 3 Hours]****[Max. Marks : 75****Instructions :**

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2. *Answer any four questions from Part-B in detail.*
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PART - A

1. (a) Give the monomer units of (i) PVC, (ii) polyethylene and (iii) Teflon. (1.5)
- (b) What do you understand by vulcanization of rubber? (1.5)
- (c) Define and explain triple point giving suitable example. (1.5)
- (d) What do you understand by metastable equilibrium? (1.5)

- (e) Differentiate temporary and permanent hardness of water. (1.5)
- (f) What are the advantages and disadvantages of lime soda process for softening of water? (1.5)
- (g) Give a brief account of consequences of corrosion. (1.5)
- (h) How does the pH of corroding medium affect the rate of corrosion of a metal? (1.5)
- (i) Define lubrication and give an example of solid lubricant. (1.5)
- (j) What makes graphite to be a good lubricant? (1.5)

PART - B

- 2. (a) Define the terms – 'Phase', 'Component' and 'Degrees of Freedom' and explain them with suitable examples. (5)
 - (b) Apply phase rule to one component system consisting of more than one solid phase. (10)
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- 3. (a) Giving suitable examples, explain renewable and non-renewable resources of fuel. (10)
 - (b) Discuss the importance of chemistry in our daily life. (5)

4. Discuss the classification of polymers on the basis of molecular interactions. (15)
5. (a) Explain the scale and sludge formation in boilers. (10)
- (b) Explain EDTA method for determination of hardness of water. (5)
6. (a) What do you understand by barrier protection and how is it carried out? (5)
- (b) Differentiate natural rubber and synthetic rubber giving their utility in our daily life. (5)
- (c) Give a brief account of cathodic and anodic protection. (5)
7. What are the lubricant additives and why they are used to mix with commonly used lubricants? Discuss the important types of additives and explain their functions. (15)
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