

Roll No.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Total No. of Pages : 03

Total No. of Questions : 09

B.Tech (All Batches Chemistry) (2018 Batch) (Sem.-1)

**CHEMISTRY-I**

Subject Code : BTCH-101-18

Paper ID : [75343]

Time : 3 Hrs.

Max. Marks : 60

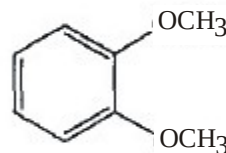
## INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

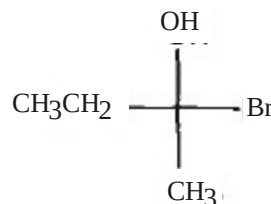
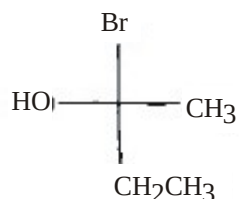
## SECTION-A

### 1. Answer briefly :

- a) What is fluorescence?
- b) What do you understand by effective nuclear charge?
- c) What is optical activity?
- d) What is the essential condition for a molecule to be IR active?
- e) Discuss entropy.
- f) What is the usefulness of Ellingham diagrams?
- g) What do you understand by polarizability?
- h) Write the electronic configurations for  $H_2$  and  $H_2^+$  in term of molecular orbital theory.
- i) How many signals would you expect to see in the  $^1H$  NMR spectrum of the following :



- j) Indicate whether each of the following structures has the R or S configuration. Assign priorities to each group. What is the relationship between the two structures?

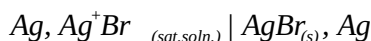


## SECTION-B

- Q2 a) Solve the Schrodinger wave equation for a particle in one-dimensional box. (6)  
 b) What will happen if the walls of the one-dimensional box are suddenly removed? (2)
- Q3 a) With the help of a diagram, explain the splitting of d-orbital energy levels in tetrahedral ligand field? Account for the non-existence of tetrahedral complexes with low spin configurations. (6)  
 b) Discuss the relationship that exists between crystal field splitting and pairing energy in determining whether a given complex will be high or low spin. (2)
- Q4 a) Discuss the principle of electronic spectroscopy. Explain with reference to  $\text{CH}_2=\text{CH}_2$ , 1, 3-butadiene and carbonyl compounds. (6)  
 b) What is fluorescence? Discuss its applications in medicine. (2)
- Q5 a) What are van der Waals forces? Discuss them briefly. (5)  
 b) What do you understand by potential energy surface? Explain with an example. (3)

## SECTION-C

- Q6 a) Calculate the solubility product of AgBr in water at  $25^\circ\text{C}$  from the cell :



The standard potentials are  $E_{\text{AgBr,Ag}}^\ominus = 0.07 \text{ V}$ ;  $E_{\text{Ag}^+,\text{Ag}}^\ominus = 0.80 \text{ V}$  (4)

- b) What advantages does the use of “ion-exchange resin” provide over “zeolite process” for softening of hard water? (4)

- Q7 a) Explain the concept of hard soft acids and bases. (4)
- b) Discuss the geometry of the following :  $\text{BF}_3$ ,  $\text{H}_2\text{O}$  (4)
- Q8 a) What is optical activity? What is the essential condition for a compound to be optically active? Explain. (4)
- b) Draw structural isomers for  $\text{C}_3\text{H}_8\text{O}$  and  $\text{C}_4\text{H}_{10}\text{O}$ ? (4)
- Q9 a) Discuss the synthesis of a commonly used drug molecule by taking a suitable example. (3)
- b) Discuss the  $\text{S}_{\text{N}}2$  mechanism of alkyl halides in terms of kinetics, stereochemistry and reactivity of alkyl halides. (5)