Roll No. | | | | | | | | | | | | | **Total No. of Pages : 03**

Total No. of Questions : 09

B.Tech. (Chemistry Groups) (2018 Batch) (Sem.–1,2)

CHEMISTRY-I

Subject Code : BTCH-101-18

M.Code : 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 are the important features of crystal field theory?

b) Can oxidation state be negative? Discuss.

c) What is the difference between conduction band and valence band?

d) Why is fluorescence so sensitive?

e) Give one main point of difference between wet and dry corrosion.

f) Write the transition state for the following S_N2 reaction :

$(CH_3)_3N + (CH_3)_3S^+ \rightarrow (CH_3)_4N^+ + (CH_3)_2S$

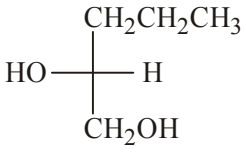
g) Why *d* and *f* orbitals show poor shielding effect?

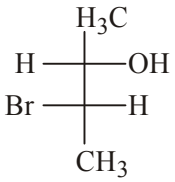
h) How do vander Waals interactions occur?

i) The following compounds show only one signal in ^1H NMR. Write their structural formula.

C_5H_{12} C_2H_6O

j) Indicate R or S configuration at stereogenic center(s). Assign priorities to each group.





SECTION-B

2. a) Obtain the time-dependent Schrodinger wave equation for a particle. (6)

   b) Give the physical meaning of wave function. (2)

3. a) What is crystal field theory? How does this theory account for the fact that $[CoF_6]^{3-}$ is paramagnetic but $[Co(NH_3)_6]^{3+}$ is diamagnetic though both are octahedral. (6)

   b) Discuss the role of doping on the band structure of solids. (2)

4. a) Why is UV-Visible spectroscopy called electronic spectroscopy? Explain various types of transitions for organic molecules that take place in UV-Visible range. (5)

   b) How is fluorescence used in medicine? What is the unit of fluorescence intensity? (3)

5. a) Derive the van der Waals equation for describing P-V-T relationship in real gases. (5)

   b) The van der Waals constants of a gas are: a = 0.751 dm^6 atm mol^{-2} and b = 0.0226 dm^3 mol^{-1}. Calculate critical constants. (3)

SECTION-C

6. a) Calculate the standard free energy change ($\Delta G°$) of the reaction :

   $CO(g) + ½\ O_2(g) \rightarrow CO_2(g)$ $\Delta H° = -282.84$ kJ

   The standard entropy of $CO_2(g)$, $CO(g)$ and $O_2(g)$ are 213.80,197.90 and 205.01 J K^{-1} mol^{-1}, respectively. Is this reaction feasible at standard state? (4)

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

7. a) Discuss the molecular geometries of the following :

i) BCl_3

ii) PCl_5

(Atomic number: B = 5, P = 15) (4)

b) What is effective nuclear charge? Which element has the highest effective nuclear charge? (2)

c) What is ionization energy? Which elements have the highest ionization energy?

(2)

8. a) Discuss isomerism in transitional metal complexes. (5)

b) The following compound has only one stereogenic center. Why then does it have four stereoisomers? Explain. (3)

9. a) Explain S_N2 mechanism by taking an example of alkyl halide as a substrate. (4)

b) Write short notes on the following organic reactions :

i) Oxidation reactions

ii) Ring opening reactions (4)

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.