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

Total No. of Questions : 18

B.Tech. (Chemistry Group) (2018 & Onwards) (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

**Answer briefly :**

1. Which have high melting point and why ;

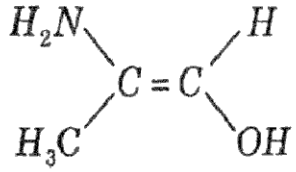
   $HgCl_2$ or $CaCl_2$

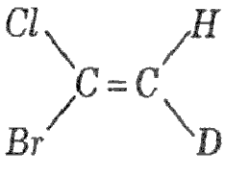
2. Why is TMS used as an internal standard in NMR spectroscopy?

3. Define e.m.f. of cell.

4. Write down the equation of state of real gas.

5. Give cis and trans notation to the following :

i) 

ii) 

6. How do you explain anomalous electronic configuration of Cu ($4s^1\ 3d^{10}$)?

7. Can oxidation state be negative? Discuss.

8. Give one example of Hard and soft acid each.

9. What is isomerism?

10. For a cell reaction A(s) + 2B (aq) → A2+ (aq) + 2B (s) at 298 K, the equilibrium constant is $1.0 \times 10^4$. Calculate $E^0$ cell.

## SECTION-B

11. a) Solve the Schrodinger wave equation for particle in one-dimensional box. (6)

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

12. 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.

13. a) What are vander Waals forces? Discuss them briefly. (5)

    b) The vander 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)

14. a) Explain Principles of UV-Vis Spectroscopy. How do you distinguish between different types of transitions involved in UV-Vis spectroscopy? (5)

    b) On the basis of IR spectroscopy, how can you distinguish between the following : (3)

        i) Alkane, alkene and alkyne

        ii) Aldehyde and ketone

## SECTION-C

15. a) Derive Nernst equation. (4)

    b) Calculate the mean ionic activity co-efficients of 0.1 mol/kg HC1, given the e.m.f of the cell :

$$H_2 \text{ (latm)/ HC1 (a), AgCl (s)/Ag}$$

    is 0.3524V and that standard electrode potential of Ag-AgCl is 0.2224V at 25°C. (4)

16. 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)

17. Explain the following terms :

a) Chirality (2)

b) Enatiomers (2)

c) Diastereomers (2)

d) Optical activity (2)

18. a) Discuss the synthesis of a commonly used drug molecule by taking a suitable example. (4)

b) Write short notes on the following organic reactions :

i) Oxidation reactions (2)

ii) Ring opening reactions (2)

**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.**