Total No. of Questions : 18

B.Tech. (Agricultural Engg. / Automation & Robotics / Automobile Engg. / BT / CE / Computer Engg. / CSE / Electrical & Electronics Engg. / EE / ECE / Electronic & Electrical Engg. / FT / IT / ME) (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. What do you understand by effective nuclear charge?

2. Why d and f orbital show poor shielding effect?

3. What is the essential condition for a molecule to be IR active?

4. What is isomerism?

5. How do Vander Waals interactions occur?

6. Can oxidation state be negative? Discuss.

7. How many signals would you expect to see in the ^1H NMR spectrum of the following:

$$CH_3CH_2CH_2CH_3$$
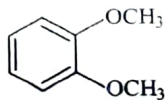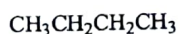
8. What are the shapes PCl_5 and H_2O?

9. Define entropy and gibbs free energy.

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10. Write down the Nernst equation and define electric potential.

SECTION-B

11. a) Obtain the time-dependent Schrödinger wave equation for a particle. (6)

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

12. Write short notes on :

    a) Shielding and deshielding of protons (4)

    b) Factors affecting vibrational frequency (4)

13. 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)

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

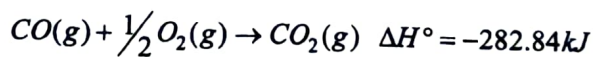   b) Explain the different type of molecular forces. (3)

SECTION-C

15. a) Calculate the solubility product of AgBr in water at 25°C from the cell : (4)

    $$a.\ Ag, Ag^+ Br_{(sat,sol)} \mid AgBr_{(s)}, Ag$$

    The standard potentials are $E^{\circ}_{AgBr,Ag} = 0.07V; E^{\circ}_{Ag^+,Ag} = 0.80V$

    b) Calculate the standard free energy change (ΔG°) of the reaction : (4)

    $$CO(g) + \tfrac{1}{2}O_2(g) \rightarrow CO_2(g) \quad \Delta H^{\circ} = -282.84kJ$$

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

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 :

(4 × 2)

a) Chirality

b) Enatiomers

c) Diastereomers

d) Optical activity

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

(4)

b) Discuss the S_N2 mechanism of alkvl halides in terms of kinetics, stereochemistry and reactivity of alkyl halides.

(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.