MORNING

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[Total No. of Questions:- 09] [Total No. of Pages:- 02]

Uni. Roll No.....

Program/ Course:- B.Tech. (Sem:- 1/2)
Name of Subject:- Chemistry
Subject Code:- BSC-18105 (For 2018 Batch Students only)
Paper ID:- 15933

Time Allowed:- 03 Hours **Max. Marks:- 60**

NOTE:-

1) **Parts A** and **B** are **compulsory.**
2) **Part-C** has two Questions Q8 and Q9 and both are compulsory, but with internal choice.
3) Any missing data may be assumed appropriately.

Part – A

[Marks: 02 each]

Q1.

a) Determine the number of NMR signals of Ethyl alcohol (impure) and 2,2-dichloro butane molecule using spin-spin splitting concept?

b) What do you mean by Dipole-induced dipole interactions and mention the factors which influence Vander Waal forces?

c) Define extrinsic and intrinsic semiconduction?

d) Differentiate between Spectrochemical Series and Electrochemical Series?

e) How Demineralization, Desalination, Disinfection and Deionization are related to each other for required specification of water for domestic purposes?

f) An α,β-unsaturated ketone of molecular mass 210 has an absorption band with λ_{max} at 450 nm and molar absorption coefficient value of 11000. A solution of this ketone showed absorbance of 0.4 with a 0.01 m cell. Calculate the concentration in grams per litre and Transmittance?

Part – B

[Marks: 04 each]

Q2. Show oxidation and reduction reactions carried out by $K_2Cr_2O_7$ and $NaBH_4$ upon isopropyl alcohol and methyl vinyl ketone respectively. Also mention alternative oxidising and reducing agent for carrying out such reactions?

Q3. Arrange the following functional groups in order of increasing wave number, although these groups contain common carbonyl group. Justify your answer with relevant reasons?

Aldehyde, Amide, Ketone, Acid chloride, Carboxylic acid, Anhydride, Ester

Q4. Write down Vander Waals equation of state for real gas including Volume-Pressure correction and discuss behaviour of gas on basis of such correction?

Q5. Explain Crystal field splitting in octahedral complex $[Fe(CN)_6]^{4-}$. Also calculate CFSE in d^3 and d^7 system of tetrahedral complex?

Q6. What do you mean by Cryohydric point, Double resonance, Triple point of water and Gibb's free energy change?

Q7. Draw Fischer projection formulae for pairs of enantiomers and diastereomers of tartaric acid. Which of these stereoisomers are optically active and inactive?

Part – C

[Marks: 12 each]

Q8. (i) What are Orbital and Spin selection rule of UV-Visible spectroscopy? Illustrate your answer by taking different types of transitions?

(ii) Explain the impact of increase in polarity of solvent on most probable transition in case of ethene and methyl amine molecule along with diagrammatic representation? Do mention the relevant shifts associated with it.

OR

(i) Discuss Zeolite method for softening of hard water along with its advantages and limitations?

(ii) Calculate the amount of lime (75% pure) and soda (91% pure) required for softening of one billion litres of water containing $Ca(HCO_3)_2 = 35$ ppm, $MgSO_4 = 20$ ppm, $CaSO_4 = 25$ ppm, $Mg(HCO_3)_2 = 30$ ppm, $CaCl_2 = 27$ ppm, $NaCl = 50$ ppm, $SiO_2 = 75$ ppm and $FeSO_4.7H_2O = 40$ ppm.

[Marks: 12 each]

Q9. (i) Draw Fischer projection representation of (2R,3S)-3-chlorobutan-2-ol molecule and convert it into Sawhorse and Newman's projection formula.

(ii) What happens when propene molecule reacts with hydrogen bromide in presence and absence of benzoyl peroxide? Write down the mechanism of both reactions?

OR

(i) Construct and describe phase diagram of $KI-H_2O$ system. Also explain formation of eutectic mixtures by addition of suitable salts to ice.

(ii) Calculate the half cell potential of an electrode of an iron rod dipped in a 91% dissociated solution of 0.2 M $FeSO_4$. Given that $E^0_{Fe/Fe2+} = 0.44$ V.

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