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Printed Pages: 02 | Sub Code: KAS102
Paper Id: 199101 | Roll No.

B TECH
(SEM I) THEORY EXAMINATION 2018-19
CHEMISTRY

Time: 3 Hours | *Total Marks: 100*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

a). Which of the following molecules will show rotational spectrum: H_2, HCl, CH_4, CH_3Cl, CH_2Cl_2, H_2O and SF_6?
b). What is meant by the term polarizability in Raman spectra?
c). Explain why the value of GCV is greater than NCV.
d). Why does magnesium bicarbonate require double amount of lime for softening?
e). Write the monomer of a) Neoprene b) Terylene.
f). Why adry ether solvent important for the preparation of Grignard reagent?
g) Comment on the use of aluminum in place of Zinc for Cathodic protection of iron from rusting.
h) Calculate the cell potential at 298 k for the reaction:
$Al^{3+} + Fe \rightarrow Al + Fe^{2+}$ E^0 cell= –1.62.
The concentration of Al^{3+} and Fe^{2+} are 2.5 and 2.5 M.
i) Write any two applications of Nanotechnology.
j). Arrange the following molecules/ions in order of their increasing bond length: N_2, N_2^+, N_2^{2-}.

SECTION B

2. Attempt any three of the following: 10 x 3 = 30

a) Discuss the structure, preparation, properties and applications of fullerenes?
b) Derive Nernst Equation. The voltage of the cell Pb/$PbSO_4$/Na_2SO_4/Hg is 0.9647 V at 25°C the temperature is 1.74×10^{-4} VK^{-1}. Calculate the values of ΔG, ΔS and ΔH.
c) What is finger print region and functional group region in IR spectroscopy? Two isomers A and B of the molecular formula C_3H_6O gives IR absorption at 1650 cm^{-1} and 1710 cm^{-1} respectively. Assign structural formula to A and B isomers?
d) What is hardness of water? What do you mean by term permutit? Describe Zeolite or Permutit process for softening of hard water.
e) What are organometallic compounds? Explain various methods of preparation of Grignard reagent and also write reactions of Grignard reagent with HCHO, R_2NH, CO_2, CH_3CH_2OH and ester.

SECTION C

3. Attempt any one part of the following: 10 x 1 = 10

(a) What are liquid crystals? Distinguish between Nematic & Smectic liquid crystal and write the applications of liquid crystal?

(b) Explain BMO and ABMO and differentiate between them. Draw molecular orbital diagram of NO^+. Calculate its bond order and predict its magnetic properties.

4. Attempt any one part of the following: 10 x 1 = 10

(a) State the selection rule for Raman spectroscopy. What technological advances have enabled the routine use of Raman spectroscopy? Which of the following spectroscopy (IR or Raman) would you use to measure the vibrational frequency of the following bonds:
i)The stretching frequency of ^{14}N-^{15}N
ii)The $C \equiv C$ Str in Ethyne, $(CH \equiv CH)$
iii)The C=O Str in acetone, CH_3COCH_3
iv)The Re-Re str in compound, $(CO)_5Re\text{-}Re(CO)_5$

(b) What is Beer-Lambert law in UV-Visible absorption spectroscopy? A compound having concentration 10^{-3}g/l resulted absorbance value 0.20 at λ max 510 nm using 1.0 cm cell. Calculate its absorptivity and molar absorptivity values. Molecular weight of compound is 400. Can ultra-violet spectral data be useful to distinguish the following compounds? Give reasons.
(i) Ethyl benzene and styrene.
(ii) CH_2=CH-CH_2-CH=CH_2 and CH_3-CH=CH-CH=CH_2

5. Attempt any one part of the following: 10 x 1 = 10

(a) Define and explain the terms involved in phase rule. Draw a neat labeled phase diagram of water system and c areas and calculate degree of freedom of areas and curves in it. What is the significance of the triple point and metastable curve in the system?
(b) Describe the mechanism of electrochemical or wet corrosion with help of reactions? Explain the cathodic protection method of prevention of corrosion.

6. Attempt any one part of the following: 10 x 1 = 10

(a) Explain reverse osmosis with its advantages. A water sample on analysis gives the following data: Ca^{2+}=20 ppm, Mg^{2+}=25 ppm, CO_2 = 10 ppm, HCO_3^- =150 ppm, K^+ = 10 ppm. Calculate the lime (87% pure) and soda (94% pure) required to soften 10^6 liter of sample water.
(b) Describe proximate analysis of fuels. A coal sample has the following composition by weight: C=90%, O=3%, S=0.5%, N=0.5% and Ash=2.5%. Net calorific value of the coal was found to be 8,490.5 kcal/kg. Calculate the percentage of hydrogen and Gross calorific value.

7. Attempt any one part of the following: 10 x 1 = 10

(a) Write a note on (i) Polymer blends (ii) Polymer composites
(b) Differentiate between elastomers and fibers? Give the preparation, properties and uses of Buna-S, Buna-N and Neoprene.

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