Sub Code:KAS102

Paper Id: 199102 Roll No: | | | | | | | | | | | | | |

B. TECH.
(SEM-I) THEORY EXAMINATION 2019-20
CHEMISTRY

Time: 3 Hours *Total Marks: 100*

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

SECTION A

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

Qno.	Question	Marks	CO
a.	Compare and arrange the following in the increasing order of stability: N_2, N_2^+, N_2^-, N_2^{2-}	2	1
b.	Define schottky defect. Give example.	2	1
c.	What is Stokes and anti-stokes lines in Raman spectrum?	2	2
d.	'IR spectra are often characterized as finger print region'. Comment on it.	2	2
e.	Explain why does part of a nail inside the wood undergoes corrosioneasily?	2	3
f.	Predict the number of phases in saturated NaCl system.	2	3
g.	A water sample contains 10ppm of $CaCl_2$,3.2 mg/litre of NaCl, 21.1 °Fr of Al_2O_3. Calculate total hardness of water.	2	4
h.	A sample of coal has following composition by mass C =70 %, O = 8 %, H = 10%, N = 3 %, S = 2%, Ash = 7 %. Calculate H.C.V. and L.C.V of the fuel.	2	4
i.	Simple molecules do not polymerize. Justify.	2	5
j.	Illustrate various applications of polymer composites.	2	5

SECTION B

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

Qno.	Question	Marks	CO
a.	With the help of molecular orbital diagram, explain the formation of NO and O_2molecule. Calculate their bond order and predict their magnetic behavior.	10	1
b.	State and derive the Lambert-Beer's law. The percentage transmittance of an aqueous solution of unknown compound is 20% at 25° C and 300 nm for a 2 x 10^{-5} M solution in a 4 cm cell. Calculate the absorbance and the molar extinction coefficient.	10	2
c.	Using phase rule outline the salient features of the phase diagram of water system highlighting the name of system (areas, curves and points), phase inequilibrium and degree of freedom in each case.	10	3
d.	Discuss the principle and working of bomb calorimeter. A sample of coal contain C=80%, H=15% and ash=5%. The following data were obtained when the above coal was tested in bomb calorimeter: Weight of coal burnt= 0.98 g Weight of water taken= 1000 g Water equivalent of bomb, thermometer, stirrer & calorimeter= 2500g Rise in temperature= 2.5°C Fuse wire correction= 8 Cal Acid correction= 50 Cal Cooling Correction= 0.02°C Calculate gross and net calorific values of the coal, (if the latent heat of vaporization is 580 cal/g)	10	4
e.	Write down the preparation, properties and applications of – i) Buna-N ii) Nylon 6,6 iii) Terylene (iv) Neoprene (v) Kevlar	10	5

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SECTION C

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

Qno.	Question	Marks	CO
a.	Discuss the preparation, properties and applications of an allotrope of carbon having truncated icosahedron geometry.	10	1
b.	Illustrate the concept of liquid crystals. Classify them on the basis of temperature and mention their important applications.	10	1

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

Qno.	Question	Marks	CO
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 bond? (ii) the stretching frequency of ^{14}N, ^{15}N (ii) the C=O structure in ethyne (CH≡CH)	10	2
b.	Write short notes on (**any TWO**) (i) UV Shift (ii) Applications of IR spectroscopy (iii)Molecular vibration	10	2

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

Qno.	Question	Marks	CO
a.	Describe electrochemical theory of corrosion. How corrosion can be prevented by sacrificial anodic protection and impressed current cathodic protection.	10	3
b.	What is Nernst equation? The emf of a cell measured by means of a hydrogen electrode against a saturated calomel electrode at 298K is 0.4188 V. If the pressure of the H_2 (g) was maintained at 1atm, calculate the pH of the unknown solution, given potential of reference calomel electrode is 0.2415 V.	10	3

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

Qno.	Question	Marks	CO
a.	Calculate the amount of lime and soda required for 125000 L of H_2O with following analysis using 10 ppm of $NaAlO_2$ as coagulant. **Analysis of raw water:** Ca^{2+} = 95 ppm, Mg^{2+} =36 ppm, CO_2 =66 ppm, HCO_3^- = 244 ppm, H^+ = 2 ppm, **Analysis of treated water:** CO_3^{2-} =45 ppm, OH^-= 34 ppm.	10	4
b.	i. Outline demineralization process of water softening. Compare the merits and demerits of zeolite process with demineralization process. ii. Write the reaction involved in Calgon treatment of water.	10	4

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

Qno.	Question	Marks	CO
a.	What are conducting polymers? Discuss the classification and applications of conducting polymers.	10	5
b.	What are Grignard reagents? Write at least five applications of Grignard reagent.	10	5