Subject Code: KAS102

PAPER ID-311411

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM I) THEORY EXAMINATION 2024-25
CHEMISTRY

TIME: 3 HRS **M.MARKS: 100**

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

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

Q no.	Question	CO	Level
a.	Illustrate, why N_2 is diamagnetic while O_2 is paramagnetic.	1	K3
b.	Describe point defects in solids and their impact on material properties.	1	K2
c.	Illustrate, why HCl is IR active and N_2 is IR inactive molecule?	2	K3
d.	Define the term auxochromes and chromophores?	2	K1
e.	Calculate the triple point in water system.	3	K4
f.	Calculate the EMF of the cell: $Zn(s)\|Zn^{2+}(0.2M)\|\|Ag^{+}(0.002M)\|Ag(s)$ at 25oC, The standard EMF of the cell is 1.54V.	3	K4
g.	Define calorific value.	4	K1
h.	Illustrate, Why does magnesium bicarbonate require double amount of lime for softening?	4	K3
i.	What do you understand by thermosetting polymer?	5	K2
j.	Explain the term functionality of a polymer. What is the functionality of ethene	5	K2

SECTION B

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

Q no.	Question	CO	Level
a.	Illustrate the structure, preparation, properties & applications of an allotrope of carbon with truncated icosahedron geometry.	1	K3
b.	Explain Finger print region in IR spectroscopy. Two Isomers I and II of the molecular formula C_3H_6O give I.R. absorption band near 3550 cm^{-1} and 1717 cm^{-1} respectively. Assign structural formula to A and B consistent with their IR absorption bands.	2	K3
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 in equilibrium and degree of freedom in each case.	3	K4
d.	What are ion exchange resins? How water can be softened by demineralization process. State the merits and demerits of the process.	4	K5
e.	Explain the general methods of synthesis of organometallic compounds, particularly the Grignard reagent, and discuss their applications in various industrial processes.	5	K2

SECTION C

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

Q no.	Question	CO	Level
a.	Illustrate the band theory of metallic bond and classify the solids on the basis of it.	1	K3
b.	Draw molecular orbital diagram of the CO and NO molecule. Also find bond orders and predict their magnetic behaviors.	1	K3

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

Q no.	Question	CO	Level
a.	Illustrate the principle of UV-Spectroscopy? Discuss the different types of electronic transitions. Predict the possible electronic transitions for ethyl alcohol, toluene, benzene and diphenyl ether.	2	K3
b.	Discuss the quantum theory of Raman Spectroscopy and how the Stokes and anti -Stokes lines appear in the Raman Spectroscopy?	2	K3

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

Q no.	Question	CO	Level
a.	Describe the working principle of a lead storage battery. What are the causes and effects of corrosion, and how can it be prevented?	3	K4
b.	Derive Nernst Equation. The voltage of the cell $Pb/PbSO_4/Na_2SO_4/Hg$ is 0.9647 V at 25 ^0C the temperature coefficient is 1.74×10^{-4} $VK^{-1.}$ Calculate the values of $\triangle G$, $\triangle S$ and $\triangle H$.	3	K4

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

Q no.	Question	CO	Level
a.	Discuss the construction of a bomb calorimeter. A sample of fuel contains: C=93%; H=6% and ash = 1%. The following data were obtained, when the above coal was tested in bomb calorimeter :	4	K5
b.	What is hardness of water? Explain the basic principle of lime-soda process. Calculate the amount of lime and soda required for softening 30000 liters of water, using 20 ppm of sodium aluminate as coagulant. Impurities in water are as follows: Ca^{2+} =160 ppm, Mg^{2+} = 96 ppm, dissolved CO_2 = 34 ppm and HCO_3^- = 403 ppm.	4	K5

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

Q no.	Question	CO	Level
a.	What are Organometallic compounds? Explain their classification, synthetic method and applications.	5	K3
b.	Explain the preparation, properties and applications of the following polymers: 1.Nylon 6,6 2.Buna-N 3.Terylene 4.PHBV	5	K3