

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH
BRANCH: AI&ML/CS/ECE/EEE

SEMESTER : I
SESSION : MO/2022

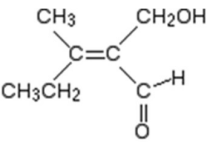
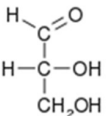
SUBJECT: CH101 CHEMISTRY

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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|---|-----|-----|
| Q.1(a) Use the following information to calculate the heat of sublimation for potassium:
Heat of formation for KCl(s) = -437 kJ/mol; Electron affinity for Cl = -349 kJ/mol;
ionization energy for K = 418 kJ/mol; Lattice energy for KCl = 717 kJ/mol; Heat of
formation for Cl(g) = 122 kJ/mol; Bond dissociation energy for Cl ₂ (g) = 243 kJ/mol. | [5] | 1 3 |
| Q.1(b) Draw and explain the splitting pattern of d-orbitals in square planar crystal field. Is
MnCr ₂ O ₄ / FeFe ₂ O ₄ / ZnFe ₂ O ₄ likely to have a normal or inverse spinel structure? | [5] | 1 2 |
| Q.2(a) What are the essential criteria for effective combination of atomic orbitals to form
stable molecular orbitals? Discuss the formation of bonding and antibonding molecular
orbitals with the applications of linear combination of atomic orbitals (LCAO) method. | [5] | 2 2 |
| Q.2(b) Predict whether cyclopentadiene anion is aromatic or not?
(i) Decide whether the structure drawn is the E- or Z- isomer. | [5] | 2 3 |
|  | | |
| (ii) Decide whether the structure drawn is the R or S configuration. | | |
|  | | |
| Q.3(a) Draw and explain the concentrations vs time plot for reactant and products of parallel
reactions. | [5] | 3 2 |
| Q.3(b) What is the Michaelis-Menten equation? What is the behavior in the limit of low and
high substrate concentration? | [5] | 3 2 |
| Q.4(a) What is Lambert-Beer's law? With the help of a neat diagram, compare the electronic
transitions possible for C-C, C=C & C=O bonds. | [5] | 4 2 |
| Q.4(b) What do you mean by the term 'chemical shift'? Discuss the proton NMR signals for the
following: (i) CH ₃ CH ₂ CH ₂ Br (ii) C ₂ H ₅ OH. | [5] | 4 2 |
| Q.5(a) Determine the degrees of freedom for the KCl-NaBr-H ₂ O system. Draw and explain the
phase diagram of water. | [5] | 5 2 |
| Q.5(b) Explain the working principle H ₂ -O ₂ fuel cell with suitable diagram. | [5] | 5 2 |

:::17/03/2023 M:::