Graphic Era
HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

Mid Term (Odd) Semester Examination October 2024

Roll no.....

Name of the Course and semester: B.Tech, 1st semester
Name of the Paper: Engineering Chemistry
Paper Code: TCH-101
Time: 1.5 hour

Maximum Marks: 50

Note:

(i) Answer all the questions by choosing any one of the sub questions
(ii) Each question carries 10 marks.
(iii) Please specify COs against each question.

Q1. (10 Marks)

a. Give the molecular orbital diagram of CO molecule. Give its magnetic behavior and bond order. Also explain the difference between BMO and ABMO. (CO1)

OR

b. Give the basic principle of spectroscopy. Also explain UV- Visible spectroscopy and its application. (CO1)

Q2. (10 Marks)

a. Draw the molecular orbital diagram of O_2. Also arrange O_2, O_2^+, O_2^{2+} and O_2^- in their increasing order of stability. (CO1)

OR

b. Define Hydrogen bonding. Also differentiate between intermolecular and intramolecular hydrogen bonding. Also give the applications of hydrogen bonding. (CO1)

Q3. (10 Marks)

a. Explain band theory with a suitable example. Also differentiate among conductors, semiconductors and insulators on the basis of band gap. (CO1)

OR

b. Define the reverse osmosis process of water softening. (CO2)

Q4. (10 Marks)

a. Explain the Ion- exchange process of water softening in detail. (CO2)

OR

b. A water sample has the following analysis:
$Mg(HCO_3)_2$= 83mg/L; $Ca(HCO_3)_2$= 134 mg/L; $CaSO_4$= 124 mg/L; $MgCl_2$= 84 mg/L; $CaCl_2$= 94 mg/L; NaCl= 50 mg/L. Calculate the temporary and permanent hardness. (CO2)

Q5. (10 Marks)

a. Define the Lime- soda process of water softening with suitable reactions. Also explain its advantages and disadvantages. (CO2)

OR

b. Define hardness of water, give its causes and types. Also give the measurement of hardness (CO2)