

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA, ODISHA
Odd Mid Semester Examination for Academic Session 2024–25

COURSE NAME: **B.Tech.**

SEMESTER: **02nd**

BRANCH NAME: **Section: D, E, F, G, H, I, & J**

SUBJECT NAME: **CHEMISTRY**

FULL MARKS: **30**

TIME: **90 Minutes**

Answer All Questions.

The figures in the right-hand margin indicate Marks. *Symbols carry usual meaning.*

- Q1.** *Answer all Questions.* **[2 × 3]**
- a) Explain why the size of cation is less and that of anion is more than the corresponding atom. - CO1
 - b) How would you express temperature in terms of enthalpy for a spontaneous process at equilibrium? - CO2
 - c) What is a chromophore and an auxochrome? - CO3
- Q2.** **[4 + 4]**
- a) What is ionization enthalpy and its periodic trends? Explain why ionization enthalpy of beryllium is higher than boron and ionization enthalpy of oxygen is lower than nitrogen and fluorine. - CO1
 - b) What is electronegativity of an element and its periodic trends? How would you determine the acidic or basic character of XOH molecule in water based on difference in electronegativity? - CO1
- OR**
- a) What is electron gain enthalpy and electron affinity and its periodic trends? Explain why the first electron gain enthalpy for most elements is negative but the second electron gain enthalpy is positive, except noble gases. - CO1
 - b) What are atomic, ionic, and van der Waals radii? Explain the trend of atomic radius across the period and along the group. - CO1
- Q3.** **[5 + 3]**
- a) Derive the integrated form of the Clapeyron-Clausius equation. - CO2
 - b) The latent heat of vaporization of benzene at its boiling point 80 °C is 7413 cal mol⁻¹. What is the vapor pressure of benzene at 27 °C? - CO2
- OR**
- a) Derive the expression for Van't Hoff Isotherm and isochore. - CO2
 - b) For the following reaction $\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightleftharpoons 2\text{NH}_{3(g)}$, the free energy changes at 25 and 35 °C are -3.98 and -3.37 kcal mol⁻¹. Calculate the heat of reaction at 32.5 °C. - CO2
- Q4.** **[4 + 4]**
- a) What are the types of electronic transitions observed in UV-Visible spectroscopy? Arrange these transitions according to their increasing energy. - CO3
 - b) State Lambert's and Beer's Law individually and derive their corresponding equation. - CO3
- OR**
- a) What are the various shifts observed in the absorption and intensity of UV-Visible spectrum? Explain with a suitable diagram. - CO3
 - b) What are the possible electronic transitions would be observe in the UV-Visible spectrum of α,β -unsaturated carbonyl compounds? What changes will be expected in the spectrum on increasing the polarity of solvents? - CO3