



Reg. No.: .....

Name: .....

## University of Kerala

First Semester FYUGP Degree Examination, December 2025

Discipline Specific Core Course

### CHEMISTRY

#### UK1DSCCHE101 - FUNDAMENTALS OF CHEMISTRY I

Academic Level: 100-199

2025-Admission onwards

Time: 1 Hour 30 Minutes(90 Mins.)

Max. Marks: 42

Part A. 6 Marks.Time:6 Minutes.(Cognitive Level:Remember(RE)/Understand(UN)) Objective Type. 1 Mark  
Each.Answer all questions

Qn No.	Question	CL	CO
1	..... quantum number will be different for the two electrons in the same orbital.	RE	1
2	Write one example for molecule having intramolecular hydrogen bonding.	RE	2
3	The colour of methyl orange in acidic solution is-----	UN	4
4	Mention any two factors affecting Ionization energy.	UN	1
5	Give the mathematical expression of the first law of thermodynamics.	UN	3
6	Give the hybridization of carbon in ethylene.	UN	2

Part B.8 Marks.Time:24 Minutes.(Cognitive Level:Understand(UN)/Apply(AP))Short Answer. 2 marks each.Answer all questions

Qn No.	Question	CL	CO
7	Compare the molecular geometries of $\text{NH}_3$ , and $\text{H}_2\text{O}$ based on VSEPR theory.	UN	2
8	Derive the relationship between $C_p$ and $C_v$ . <input type="checkbox"/>	UN	3
9	Determine the quantum numbers (n, l, m) for $2p_x$ and $3p_z$ orbitals.	AP	1
10	Sketch a rough titration curve for a strong acid–weak base titration and indicate the nature of the pH at the equivalence point. Explain your reasoning.	AP	4

Part C. 28 Marks.Time:60 Minutes (Cognitive Level:Apply(AP)/Analyse(AN)/Evaluate(EV)/Create(CR)) Long Answer.7 marks each.Answer all 4 Questions choosing among options \* within each question

Qn No.	Question	CL	CO
11	<p>A)</p> <p>a) What are the periodic trends in ionization energy and electronegativity? Apply those periodic trends to arrange the elements P, S, Cl, and Ar, in increasing ionization energy and Mg, Al, Si, P in decreasing electronegativity.</p> <p>b) A newly discovered element has its last electron entering the 3d subshell. Based on this information, determine:</p> <p>i. The possible values of n and l.</p> <p>ii. The range of <i>ml</i> values.</p> <p>iii. The total number of electrons that can fit in this subshell.</p> <p>OR</p> <p>B)</p> <p>a) Using the periodic table, classify the elements with atomic numbers 12, 17, and 28 into their respective blocks. Show how electronic configuration helps in each case.</p> <p>b) Using Hund's rule and Aufbau principle, write the electronic configuration of <math>\text{Mn}^{2+}</math> and explain why it is more stable than <math>\text{Mn}^{3+}</math>.</p>	AP	1, 1
12	<p>A)</p> <p>Apply LCAO method to construct the M.O. diagrams of <math>\text{O}_2^{2+}</math> and <math>\text{O}_2^{2-}</math>. Calculate the bond orders.</p> <p>OR</p> <p>B)</p> <p>Using the Born–Haber cycle, analyse the energetics of formation of an ionic compound NaCl. Discuss how each energy term contributes to the overall enthalpy of formation.</p>	AN	2, 2
13	<p>A)</p> <p>Evaluate how <math>\Delta G</math> functions as a criterion for predicting the spontaneity of a chemical process.</p> <p>OR</p> <p>B)</p> <p>a) Evaluate the different types of heat capacities and the relation between them. (4 marks)</p> <p>b) What is the enthalpy change in the following decomposition reaction of HCl?</p> $2\text{HCl} \rightarrow \text{H}_2 + \text{Cl}_2$ <p>The average bond enthalpies (<math>\text{kJ mol}^{-1}</math>) for the concerned bonds are:</p> <p>H-Cl = <math>431 \text{ kJ mol}^{-1}</math></p> <p>Cl-Cl = <math>242 \text{ kJ mol}^{-1}</math></p> <p>H-H = <math>436 \text{ kJ mol}^{-1}</math> (3 marks)</p>	EV	3, 3

Qn No.	Question	CL	CO
14	<p>A)</p> <p>Develop a protocol to determine the concentration of ferrous ion in a solution using redox titration with potassium permanganate.</p> <p>OR</p> <p>B)</p> <p>You are required to prepare a standard solution of oxalic acid (<math>\text{H}_2\text{C}_2\text{O}_4</math>) for a titration experiment aimed at determining the concentration of calcium ions in a water sample. Assume that 1.575 g of oxalic acid is dissolved in 250 mL of distilled water.</p> <p>(i) Calculate the molarity of the oxalic acid solution. (Molar mass of oxalic acid = 90.03 g/mol)</p> <p>(ii) Determine the normality of this solution, considering that oxalic acid is a diprotic acid and can donate two protons (<math>\text{H}^+</math> ions) in a reaction.</p>	CR	4, 4