

Reg. No.:



Name:

W7758

University of Kerala
First Semester FYUGP Degree Examination, December 2025
Discipline Specific Core Course
CHEMISTRY
UK1DSCCHE101 FUNDAMENTALS OF CHEMISTRY I
Academic Level: 100-199
2024 Admission

Time: 1 Hour 30 Minutes

Max. Marks: 42

Part A.
6 Marks. Time: 6 Minutes
Objective Type. 1 Mark Each. Answer All Questions
(Cognitive Level: Remember/Understand)

Qn. No.	Question	Cognitive Level	Course Outcome (CO)
1.	Write the stable electronic configuration of the element with atomic no.29	Remember	CO-1
2.	Geometry of ClF_3 molecule is -----	Remember	CO-2,3
3.	The enthalpy of neutralization for $\text{HNO}_3 \times \text{NaOH}$ neutralization is -----	Understand	CO-4
4.	Give two examples for primary standard	Understand	CO-5,6
5.	Number of quantum numbers required to designate an orbital is -----	Understand	CO-1
6.	Give the relation between heat of reaction at constant pressure and volume for the reaction $2\text{SO}_2 + \text{O}_2 \rightarrow 2\text{SO}_3$	Understand	CO 4

Part B.
8 Marks. Time: 24 Minutes
Short Answer. 2 Marks Each. Answer All Questions
(Cognitive Level: Understand/Apply)

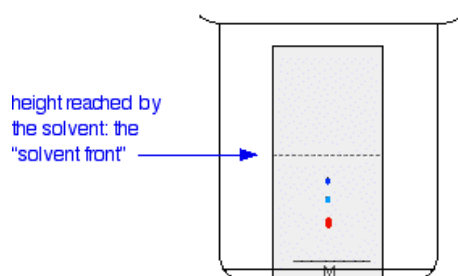
Qn. No.	Question	Cognitive Level	Course Outcome (CO)
7.	Give the set of quantum numbers for the valence electron of potassium	Understand	CO-1
8.	Predict the hybridization and geometry of NH_3 . Comment on the deviation of bond angle from normal tetrahedral bond angle	Understand	CO-2,3
9.	Calculate the temperature at which the reaction $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$ will be spontaneous? $\Delta H = -92 \text{ KJ/mol}$ and $\Delta S = -199 \text{ J/K/mol}$	Apply	CO-4
10.	How many g/mL of NaCl are contained in 0.25 M solution? Given MW of NaCl =58.44	Apply	CO-5,6

Part C.
28 Marks. Time: 60 Minutes
Long Answer. 7 marks each.
Answer all 4 Questions, choosing among options within each question.
(Cognitive Level: Understand/Apply/Analyze)

Qn. No.	Question	Cognitive Level	Course Outcome (CO)												
11.	a. i. How do the periodic properties assist in predicting the chemical behavior and properties of elements? (3 marks) ii. Discuss these concepts with relevant examples to explain their significance? (4 marks) OR b. Discuss the rule for filling of electrons in atomic orbitals?	Understand	CO-1												
12.	a. Construct the MO diagram for O_2^{2+}. Compare its stability with that of O_2 and O_2^- based on their bond orders. OR b. State whether the following statement is true or false and prove your claim with examples. "Geometry of a molecule can be predicted by knowing the hybridization of the central atom".	Apply	CO-2,3												
13.	a. i. Calculate ΔH for this reaction: $H_2C=CH_2(g) + H_2O(l) \longrightarrow CH_3-CH_2-OH(l)$ using the following data: <table border="1"><thead><tr><th>Bond</th><th>Bond energy</th></tr></thead><tbody><tr><td>C-C</td><td>347</td></tr><tr><td>C=C</td><td>611</td></tr><tr><td>C-H</td><td>414</td></tr><tr><td>C-O</td><td>360</td></tr><tr><td>O-H</td><td>464</td></tr></tbody></table> (3 marks) ii. Prove Born Haber cycle as an application of Hess's law. (4 marks) OR b. i. The compound diborane (B_2H_6) is used as a rocket fuel. The equation for the combustion of diborane is shown below. $B_2H_6(g) + 3O_2(g) \rightarrow B_2O_3(s) + 3H_2O(l)$ Calculate the enthalpy of combustion of diborane (B_2H_6) in $kJ\ mol^{-1}$, using the following data. $2B(s) + 3H_2(g) \rightarrow B_2H_6(g) \Delta H = 36\ kJ\ mol^{-1}$ $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l) \Delta H = -286\ kJ\ mol^{-1}$ $2B(s) + 1\frac{1}{2}O_2(g) \rightarrow B_2O_3(s) \Delta H = -1274\ kJ\ mol^{-1}$ (4 marks) ii. Gibb's – Helmholtz equation helps to predict the spontaneity of a process. Justify. (3 marks)	Bond	Bond energy	C-C	347	C=C	611	C-H	414	C-O	360	O-H	464	Apply	CO-4
Bond	Bond energy														
C-C	347														
C=C	611														
C-H	414														
C-O	360														
O-H	464														
14.	a. i) The addition of CH_3COONa to CH_3COOH increases the pH whereas the addition of NH_4Cl to aqueous ammonia solution (NH_4OH) decreases the pH of the system. Give reason. (3 marks) ii) How would you select indicator for $NaOH$ x HCl and $H_2C_2O_4$ x $NaOH$ titrations. (4 marks)	Analyze	CO-5,6												

OR

b. This diagram given below shows the results of a simple thin layer chromatography experiment



- i) Describe briefly, but precisely, what you would have done in order to get to this stage. You can assume that you have been given a suitable thin layer chromatography plate. (3 marks)
- ii) Why is there a cover on the beaker? (2 marks)
- iii) How can we differentiate the various components in the chromatogram? (2 marks)