Reg. No.: ……..

Name:……...

U7494

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**University of Kerala**

First Semester Degree Examination, November 2024

Four Year Under Graduate Programme

Discipline Specific Core Course

CHEMISTRY

**UK1DSCCHE101 - FUNDAMENTALS OF CHEMISTRY I**

Academic Level: 100-199

**Time: 1½ Hours** **Max.Marks:42**

**Part A.**

**Answer All Questions, Objective Type. 1 Mark Each.**

**(Cognitive Level: Remember/Understand)**

**6 Marks. Time: 6 Minutes**

| Qn. No. | Question | Cognitive Level | Course Outcome (CO) |
|---|---|---|---|
| 1. | What quantum number indicates the shape of an orbital? | Remember | CO-1 |
| 2. | Calculate the bond order of $O_2^+$. | Remember | CO-2,3 |
| 3. | State second law of thermodynamics? | Understand | CO-4 |
| 4. | Name an internal redox indicator | Understand | CO-5,6 |
| 5. | What is the molecular geometry for ammonia? | Understand | CO-2,3 |
| 6. | What is entropy? | Understand | CO-4 |

**Part B.**

**Answer All Questions, Short Answer. 2 Marks Each.**

**(Cognitive Level: Understand/Apply)**

**8 Marks. Time: 24 Minutes**

| Qn. No. | Question | Cognitive Level | Course Outcome (CO) |
|---|---|---|---|
| 7. | Explain Hund's rule with an example. | Understand | CO-1 |
| 8. | Give explanations for the observed bond angle in water? | Understand | CO-2,3 |
| 9. | Calculate the bond energy for H-Cl bond. Given that the enthalpies of formation of HCl(g), H(g) and Cl(g) are -92.2 $kJmol^{-1}$, 217 $kJmol^{-1}$ and 121.4 $kJmol^{-1}$. | Apply | CO-4 |
| 10. | 25 ml $H_2SO_4$ solution required 48.75 ml of 0.02 M NaOH for complete titration. Calculate the molarity of $H_2SO_4$. | Apply | CO-5,6 |

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

| Qn. No. | Question | Cognitive Level | Course Outcome (CO) |
|---|---|---|---|
| 11. | a. Write the electronic configuration of copper (Z=29). Explain the rules you followed for it.<br>OR<br>b. Discuss the significance of quantum numbers and write the n, l and m values of 3s electrons. | Understand | CO-1 |
| 12. | a. Predict the geometry and shape of ethane, ethene and ethyne molecules from the type of hybridization?<br>OR<br>b. Apply Born-Haber cycle, for the calculation of lattice energy of $MgCl_2$. Give the significance of lattice energy in solids. | Apply | CO-2,3 |
| 13. | a. How can you correlate molar heat capacities with $\Delta U$ and $\Delta H$? Discuss about the significance of Kirchoff's equation.<br>OR<br>b. i. Predict the feasibility of a process using different thermodynamic conditions. (3 marks)<br>ii. Enthalpy and entropy changes of a reaction are 40.63 kJ $mol^{-1}$ and 108.8 $JK^{-1}$ $mol^{-1}$ respectively. Predict the feasibility of the reaction at 27°C. (4 marks) | Apply | CO-4 |
| 14. | a. What are acid-base indicators? Discuss and analyse their use in the titration curves for the titration of<br>i) a strong acid with a strong base<br>ii) a weak acid with a strong base<br>iii) a strong acid with a weak base<br>OR<br>b. Analyze the role of the common ion effect in the precipitation reactions during inorganic qualitative analysis and evaluate its impact on the solubility of salts and the separation of cations in a solution. | Analyze | CO-5,6 |