**TEMPLATE 5**

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| **University of Kerala** | | |
| Discipline: Polymer Chemistry |  | Time: 1 Hour 30 Minutes (90 Mins.) |
| Course Code: UK1DSCPOC101 |  | Total Marks: 42 |
| Course Title: Fundamentals of Chemistry-I |  |  |
| Type of Course: DSC |  |  |
| Semester: 1 |  |  |
| Academic Level: 100-199 |  |  |
| Total Credit: 4, Theory: 3 Credit  (Applicable for 4 Credit Course with 1 Credit Practical Also) |  |  |

Part A. 6 Marks. Time: 6 Minutes

Objective Type. 1 Mark Each. Answer All Questions

(Cognitive Level: Remember/Understand)

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| **Qn.**  **No.** | **Question** | **Cognitive**  **Level** | **Course**  **Outcome (CO)** |
| 1. | What did ancient Greek philosophers primarily speculate about the nature of matter? | Remember | CO-1 |
| 2. | Who is often referred to as the "father of nanotechnology"? | Remember | CO-2 |
| 3. | **In Bohr's model, electrons move in----------** | Understand | CO-3 |
| 4. | What does the sign of the wave function (ψ) indicate? | Understand | CO-3 |
| 5. | Why does ionization enthalpy decrease down a group in the periodic table? | Understand | CO-4 |
| 6. | Give one example of a secondary standard. | Understand | CO-5 |

Part B. 8 Marks. Time: 24 Minutes

Short Answer. 2 Marks Each. Answer All Questions

(Cognitive Level: Understand/Apply)

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| **Qn.**  **No.** | **Question** | **Cognitive**  **Level** | **Course**  **Outcome (CO)** |
| 7. | Clarify how the rejection of the phlogiston theory marked a pivotal change in chemical science. | Understand | CO-1 |
| 8. | Critically enlist the limitations of Rutherford’s model of atom. | Understand | CO-3 |
| 9. | State the possible values of the magnetic quantum number (mₗ) for an electron in an orbital with angular momentum quantum number l = 3 | Apply | CO-4 |
| 10. | Describe common ion effect and its application in reducing the solubility of salts during precipitation. | Apply | CO-5 |

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)

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| **Qn.**  **No.** | **Question** | **Cognitive**  **Level** | **Course**  **Outcome (CO)** |
| 11. | (a) i. Explain the concepts of normalization and orthogonality in the context of quantum mechanics. (4 marks)  ii. Differentiate the roles of radial and angular wave functions in defining atomic orbitals. (3 marks)  OR  (b) Explain the experimental observations, theoretical explanation, and significance of Photoelectric Effect. | Understand | CO-3 |
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| 12. | (a) Explain the stability of the +2 and +3 oxidation states in manganese and chromium. Discuss why Mn(II) is more stable than Mn(III), while Cr(III) is more stable than Cr(II).  OR  (b) i.Determine how are quantum numbers related to the energy levels of electrons in an atom? (4 marks)  ii. How do quantum numbers determine the shape and orientation of atomic orbitals? (3 marks) | Understand | CO-4 |
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| 13. | (a) Compare and contrast the atomic models proposed by J.J. Thomson, Ernest Rutherford, and Niels Bohr. In your analysis, discuss how each model addressed the limitations of its predecessor and contributed to the understanding of atomic structure.  OR  (b) Illustrate the contributions of Friedrich Wöhler and Marie Sklodowska-Curie. | Apply | CO-1 |
| 14 | (a) i. To what systems will you apply fractional distillation? Explain the principle. (2 marks)  ii. How will you use complexometric titration to determine water hardness? (5 marks)  OR | Apply | CO-5 |
| (b) i. Why is potassium permanganate (KMnO₄) added slowly initially during titration. Explain the chemistry (3 marks).  ii. Elucidate the various parameters that affect the solubility of precipitates in gravimetric analysis. (4 marks) |  |  |

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| **Cognitive Level** | **Marks** | **Percentage** |  | **Course Outcomes** | **Marks** | **Percentage** |
| Remember | 2 | 4.8 |  | CO-1 | 10 | 23.8 |
| Understand | 22 | 52.4 |  | CO-2 | 1 | 2.4 |
| Apply | 18 | 42.8 |  | CO-3 | 11 | 26.2 |
|  |  |  |  | CO-4 | 10 | 23.8 |
|  |  |  |  | CO-5 | 10 | 23.8 |
| **TOTAL** | **42** | **100** |  | **TOTAL** | **42** | **100** |