B. Sc. DEGREE END SEMESTER EXAMINATION : OCTOBER 2022
SEMESTER 1 : CHEMISTRY
COURSE : 19U1CRCHE1 : THEORETICAL AND INORGANIC CHEMISTRY I
(For Regular – 2022 Admission and Improvement / Supplementary - 2021/2020/2019 Admissions)

Time : Three Hours   Max. Marks: 60

PART A
Answer All (1 mark each)

1. Give a definition for the term scientific observation.
2. Define molarity of a solution. Also define millimolarity.
3. Explain the term precision with respect to analytical result.
4. Which indicator can be used in the titration of strong base vs strong acid.
5. The energies of two radiations with wavelengths 6000 A° and 2000 A° are in the ratio………………………
6. What is the designation for an orbital with n = 2 and l =0?
7. The radial electron probability for 1s orbital is ………………symmetrical.
8. The magnetic quantum number value for the valence electron of potassium(Z=19)is ………………

(1 x 8 = 8)

PART B
Answer any 6 (2 marks each)

9. What does the method of induction mean in science?
10. 120 g of NH_2CONH_2 is dissolved in 324 mL of water. Calculate the mole fraction of urea in the solution.
11. Explain the terms permanganometry and dichrometry.
12. Calculate the wavelength of the radiation emitted when the electron in the hydrogen atom excited to the 5th energy level returns to the 2nd energy level. Also mention to which part of the electromagnetic spectrum does this line fall. (Rydberg constant = 1.097 x 10^7 m^{-1}).
13. Why doesn't the wave nature of a moving cricket ball become evident to an observer?
14. Give any three limitations of Bohr's theory.
15. What are the values of n, l and m of an electron in the 4s orbital?
16. Explain the term degeneracy.

(2 x 6 = 12)

PART C
Answer any 4 (5 marks each)

17. Differentiate between scientific theory and a scientific law.
18. Distinguish between the terms normality, molarity and molality
19. Discuss the principles of iodimetric and iodometric titrations.

20. What is Rutherford's atom model and explain its limitations?

21. How will you convert the Cartesian coordinates of an electron in hydrogen atom to spherical polar coordinates to get an easy solution of time independent Scrodinger equation. Distinguish the radial and angular wavefunctions obtained from these solution?

22. Explain the terms radial distribution function and radial distribution curves. Draw the radial distribution curves for 1s, 2s and 2p orbitals of hydrogen atom.

(5 x 4 = 20)

PART D
Answer any 2 (10 marks each)

23. Discuss the theory of titrations involving $KMnO_4$, $K2Cr_2O_7$ and I_2 and Ceric Sulphate.

24. a) Define the following terms: i) relative error ii) absolute error iii) median iv) variance v) standard deviation.
    b) Desribe the different ways to minimize errors in a measurement.

25. Derive and explain the concept of de Broglie wavelength of electrons? Explain the experimental procudure conducted by Davisson and Gerner which validate de Broglie concept? What must be the velocity of a beam of electrons if they are to display a de Broglie wavelength of 10 nm? (Mass of an electron = 9.1×10^{-31} kg)

26. Derive the wave equation for a particle in a three-dimensional box applying the separation of variables method.

(10 x 2 = 20)