

24U124

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Name :

Reg. No :

FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2024

(FYUGP)

CC24U CHE1 MN101 - BASIC INORGANIC AND NANOCHEMISTRY

(B.Sc. Chemistry - Minor Course)

(2024 Admission - Regular)

Time: 2.0 Hours

Maximum: 70 Marks

Credit: 4

Part A (Short answer questions)

Answer *all* questions. Each question carries 3 marks.

1. State Hund's Rule of Maximum Multiplicity and explain how it affects the filling of electrons in degenerate orbitals [Level:2] [CO1]
2. Explain the differences between an orbit and an orbital in the context of atomic structure. [Level:2] [CO1]
3. Describe a coordinate bond? Explain its formation using the example of the ammonium ion (NH_4^+). [Level:2] [CO2]
4. Describe bond order. How it is related to bond length and bond strength. [Level:2] [CO2]
5. Briefly explain the inert pair effect. Why is it more prominent in heavier p-block elements like lead (Pb) and tin (Sn)? [Level:2] [CO3]
6. Explain how precision of an analytical method impact the reliability of results. [Level:2] [CO4]
7. Explain precipitation reaction, and how is it utilized in the separation of cations? [Level:2] [CO4]
8. Briefly describe the procedure for performing a titration using the double burette method. [Level:2] [CO4]
9. Describe nanomaterials and explain their significance in modern technology. [Level:2] [CO5]
10. Explain the advantages and disadvantages of using the electric arc discharge method for synthesizing carbon nanotubes? [Level:2] [CO5]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

Answer *all* questions. Each question carries 6 marks.

11. Using the set of quantum numbers $n=3$, $l=1$, and $m_l=0$, determine the type of orbital and its characteristics. Describe the shape and orientation of this orbital. [Level:2] [CO1]

12. Explain the sp hybridization in acetylene (C₂H₂). How are the sp hybrid orbitals arranged in terms of geometry? [Level:2] [CO2]
13. Predict the shape of ClF₃ using VSEPR theory and explain why it adopts a T-shaped structure. [Level:2] [CO2]
14. Describe the structure of the modern periodic table. How are elements arranged in terms of periods and groups? Discuss how the arrangement helps in predicting the chemical properties of elements. [Level:2] [CO3]
15. Explain how the equivalence point is determined in a redox titration using an example of potassium permanganate and oxalic acid. [Level:2] [CO4]
16. Explain the differences between molarity, molality, and normality. [Level:2] [CO4]
17. Explain the mechanical properties of carbon nanotubes (CNTs) [Level:2] [CO5]
18. Describe carbon nanotubes (CNTs) and explain their significance in nanotechnology. [Level:2] [CO5]

(Ceiling: 36 Marks)

Part C (Essay questions)

Answer any *one* question. The question carries 10 marks.

19. Discuss the Bohr model of the atom in detail. How does it explain the spectral lines of hydrogen? What are the merits and limitations of the Bohr model? [Level:2] [CO1]
20. Explain equivalent mass. Discuss how to calculate equivalent mass for acids, bases, and redox reactions, and provide examples to illustrate its application in determining concentrations of solutions. [Level:2] [CO4]

(1 × 10 = 10 Marks)
