NEET/ 90 marks MCQs

Some Basic Concepts of Chemistry/ Atomic Structure/ Chemical Bonding

Instructions:

- Each question carries either 4 marks (Part-I) and 2 marks (Part-II) as indicated.

Part I: 4-Marks Questions

1. What is the mass of 0.5 moles of glucose ($C_6H_{12}O_6$)? (Atomic mass: C=12, H=1, O=16)

   A) 90 g B) 180 g C) 45 g D) 360 g

2. A compound on analysis gave the following percentage composition: C = 24.27%, H = 4.07%, Cl = 71.65%. Its empirical formula is: (Atomic mass: C=12, H=1, Cl=35.5)

   A) CH_2Cl B) $C_2H_4Cl_2$ C) $CHCl_2$ D) CH_3Cl

3. If 20 g of $CaCO_3$ is reacted with 20 g of HCl, which is the limiting reagent?

   $CaCO_3$ (s) + 2HCl (aq) → $CaCl_2$ (aq) + H_2O (l) + CO_2 (g)

   (Atomic mass: Ca=40, C=12, O=16, H=1, Cl=35.5)

   A) $CaCO_3$ B) HCl C) $CaCl_2$ D) H_2O

4. Calculate the molarity of a solution prepared by dissolving 4.9 g of H_2SO_4 in 250 mL of water. (Atomic mass: H=1, S=32, O=16)

   A) 0.1 M B) 0.2 M C) 0.4 M D) 0.5 M

5. How many atoms are present in 98 grams of H_2SO_4? (Atomic mass: H=1, S=32, O=16; Avogadro's number = 6.022×10^{23})

A) $7\times6.022\times10^{23}$ B) $3\times6.022\times10^{23}$ C) 6.022×10^{23} D) $1\times6.022\times10^{23}$

6. An electron transitions from the n=5 to n=2 energy level in a hydrogen atom. In which series does this line appear?

A) Lyman B) Balmer C) Paschen D) Brackett

7. Calculate the wavelength of an electron (mass = 9.1×10^{-31} kg) moving with a velocity of 2.2×10^{6} m/s. (Planck's constant, $h=6.626\times10^{-34}$ J s)

A) 3.3×10^{-10} m B) 1.5×10^{-9} m C) 2.0×10^{-11} m D) 4.5×10^{-12} m

8. What is the energy of an electron in the second Bohr orbit of a hydrogen atom? (Given: Ground state energy of H atom = -13.6 eV)

A) -3.4 eV B) -1.51 eV C) -0.85 eV D) -13.6 eV

9. Calculate the maximum number of electrons that can be present in a subshell for which l=3.

A) 6 B) 10 C) 14 D) 18

10. The energy of an electron in the nth Bohr orbit for a hydrogen-like species is directly proportional to:

A) Z^2/n^2 B) n^2/Z^2 C) Z/n D) n/Z

11. Arrange the following molecules in increasing order of their bond angles: H_2O, NH_3, CH_4.

A) $H_2O<NH_3<CH_4$ B) $NH_3<H_2O<CH_4$ C) $CH_4<NH_3<H_2O$ D) $H_2O<CH_4<NH_3$

12. According to VSEPR theory, what is the geometry of SF_4?

A) Tetrahedral B) Square planar C) See-saw D) Trigonal bipyramidal

13. What is the hybridization of the central atom in XeF_4?

A) sp^3 B) sp^3d C) sp^3d^2 D) sp^3d^3

14. Which of the following molecules has a dipole moment of zero?

A) NH_3 B) H_2O C) CO_2 D) SO_2

15. What is the bond order of O_2^{2-} according to Molecular Orbital Theory?

A) 0 B) 0.5 C) 1 D) 2

Part II: 2-Marks Questions

16. Which of the following is an intensive property?

A) Volume B) Mass C) Density D) Energy

17. What is the number of significant figures in 0.002040?

A) 3 B) 4 C) 5 D) 6

18. The empirical formula and molecular formula of a compound are related by:

A) Molecular Formula = Empirical Formula + n

B) Molecular Formula = n / Empirical Formula

C) Molecular Formula = Empirical Formula × n

D) Molecular Formula = Empirical Formula - n

19. Which law is implicitly obeyed when a chemical equation is balanced?

A) Law of Definite Proportions B) Law of Multiple Proportions

C) Law of Conservation of Mass D) Gay-Lussac's Law of Gaseous Vol.

20. What is the basicity of orthophosphoric acid (H_3PO_4)?

A) 1 B) 2 C) 3 D) 4

21. According to Aufbau principle, which orbital is filled immediately after 3p?

A) 3d B) 4s C) 4p D) 3s

22. Heisenberg's uncertainty principle states that it is impossible to simultaneously determine with absolute precision:

A) Energy and time B) Position and momentum

C) Velocity and mass D) Charge and spin

23. Which phenomenon confirms the particle nature of light?

A) Diffraction B) Interference C) Photoelectric effect D) Refraction

24. The number of radial nodes (or spherical nodes) in a 3s orbital is:

A) 0 B) 1 C) 2 D) 3

25. Isotones have:

A) Same atomic number but different mass numbers.

B) Same mass number but different atomic numbers.

C) Same number of neutrons but different atomic numbers.

D) Same number of electrons but different number of protons.

26. Which type of bond is formed by the complete transfer of electrons between atoms?

A) Covalent bond B) Ionic bond C) Metallic bond D) Hydrogen bond

27. Which of the following theories explains the shapes of simple molecules based on the repulsion between electron pairs?

A) Valence Bond Theory (VBT)

B) Molecular Orbital Theory (MOT)

C) Valence Shell Electron Pair Repulsion (VSEPR) Theory

D) Crystal Field Theory (CFT)

28. The bond length is maximum in which of the following?

A) N_2 B) N_2^+ C) N_2^- D) N_2^{2-}

29. Which of the following exhibits hydrogen bonding?

A) CH_4 B) H_2S C) HF D) HCl

30. The concept of resonance is used to explain:

A) The delocalization of electrons.

B) The formation of multiple bonds.

C) The breaking of bonds during reactions.

D) The strength of ionic bonds.