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Register No. 11211

Half-Yearly Examination - 2025
CHEMISTRY

Time : 3.00 Hrs. Marks : 70

PART - I

I. Choose the correct answer. 15x1=15

1. The number of water molecule in a drop of water weighing 0.018g is
   a) 6.022×10^{26} b) 9.9×10^{22} c) 6.022×10^{23} d) 6.022×10^{20}
2. The maximum number of electrons that can be accommodated in a given shell is
   a) $2(2\ell+1)$ b) $2n^2$ c) $4\ell+2$ d) $2\ell+1$
3. What would be the IUPAC name for an element with atomic number 113?
   a) unun unium b) ununtrium c) ununbium d) ununnilium
4. The cause of permanent hardness of water is due to
   a) $Ca(HCO_3)_2$ b) $Mg(HCO_3)_2$ c) $CaCl_2$ d) $MgCO_3$
5. The value of the gas constant R is
   a) 0.082 dm^3atm b) 0.987Cal $mol^{-1}k^{-1}$ c) 8.3J $mol^{-1}k^{-1}$ d) 8 erg $mol^{-1}k^{-1}$
6. In an adiabatic expansion of an ideal gas
   a) $W = -\Delta U$ b) $W = \Delta U + \Delta H$ c) $\Delta U = O$ d) $W = O$
7. The heat of neutralisation of water molecule is ΔH?
   a) -47.32kJ b) -57.32kJ c) -67.33kJ d) -27.32kJ
8. In a chemical equilibrium, the rate constant for the forward reaction is 2.5×10^2 and the equilibrium constant is 50, the rate constant for the reverse reaction is
   a) 11.5 b) 5 c) 2×10^2 d) 2×10^{-3}
9. Phenol dimerises in benzene having van't Hoff factor 0.54. What is the degree of association?
   a) 0.46 b) 92 c) 46 d) 0.92
10. Which of the following molecule contain no π bond?
    a) SO_2 b) H_2O c) NO_2 d) CO_2
11. Which of these represents the correct order of their increasing bond order?
    a) $C_2 < C_2^{2-} < O_2^{2-} < O_2$ b) $O_2^{2-} < O_2 < C_2^{2-} < C_2^{*}$
    c) $C_2^{2-} < C_2+ < O_2 < O_2^{2-}$ d) $O_2^{2-} < C_2^{*} < O_2 < C_2^{2-}$
12. The IUPAC name of the compound $CH_3 - CH = CH - C \equiv CH$ is
    a) Pent - 4-yn-2-ene b) Pent – 3 – en – 1 – yne c) Pent – 2 – en – 4- Yne d) Pent – 1 – yn – 3 – ene
13. Which one of the following is not liquid are purifying method
    a) crystallization b) distillation c) differential extraction d) chromatography
14. Which of the following species is not electrophilic in nature?
    a) Cl^{+} b) BH_3 c) H_3O^{+} d) $N^{+}O_2$
15. The general formula for cycloalkanes
    a) C_nH_n b) C_nH_{2n} c) C_nH_{2n-2} d) C_nH_{2n+2}

PART - II

II. Answer any six questions. Question No.24 is compulsory. 6x2=12

16. Define gram equivalent mass?
17. State and explain Pauli Exclusion Principle.
18. Give the general electronic configuration of lanthanides and actinides?
19. Distinguish between diffusion and effusion.
20. State the third law of thermodynamics.

21. Define: Reaction Quotient.
22. What is Dipole Moment?
23. Explain inductive effect with suitable example.
24. Complete the following:

    i) 2 - Butyne $\xrightarrow{\text{Lindlar Catalyst}}$?

PART- III

III. Answer any six questions. Question No.29 is compulsory. 6x3=18

25. Distinguish between Oxidation and Reduction.
26. Give the electronic configuration of Mn^{2+} and Cr^{3+}.
27. Give the uses of heavy water.
28. Write briefly the Ideal Gas equation.
29. The equilibrium constant Kp for the reaction.
    $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ is 8.19×10^2 at 298K and 4.6×10^{-1} at 498K. Calculate ΔH^0 for the reaction.
30. Define: Molality.
31. Which bond is stronger σ or π ? why?
32. Identify the functional group in the following compounds?
    a) acetaldehyde b) dimethyl ether c) methylamine
33. Explain Markownikoff's Rule with suitable example.

PART - IV

IV. Answer all the questions. 5x5=25

34. a) An organic compound present in vinegar has 40% carbon, 6.6% hydrogen and 53.4% oxygen. Find the empirical formula of the compound.

    (OR)

    b) Explain Pauling's method calculation of ionic radius?
35. a) (i) Differentiate ortho and para hydrogen.
    (ii) Define Aufbau's Principle.

    (OR)

    b) Derive the values of critical constants in terms of Vander Waals constants.
36. a) List the characteristics of internal energy.

    (OR)

    b) Derive the relationship between Kp and Kc.
37. a) State Raoult's Law and obtain expression for lowering of vapour pressure when non-volatile solute is dissolved in solvent.

    (OR)

    b) Discuss the formation of N_2 molecule using Mo theory.
38. a) (i) Define Optical Isomerism.
    (ii) Differentiate between electrophile and nucleophiles.

    (OR)

    b) Explain the structure of benzene.