

I PUC MODEL PAPER - 1

Time: 3 hours.

Subject: CHEMISTRY

Max. Marks: 70

PART-A

I. Select the correct option from the given choices:

15 × 1 = 15

- The number of significant figures in 5003 is
 a) 1 b) 2 c) 3 d) 4
- The empirical formula of benzene is
 a) CH₂ b) CH c) C₆H₆ d) (CH)₂
- The maximum number of electrons with principle quantum number n is equal to
 a) n² b) 2n² c) 2n d) n
- The number of groups and the periods in the long form of the periodic table are respectively
 a) 15 and 7 b) 18 and 6 c) 18 and 7 d) 16 and 6
- Among the following, the molecule with highest dipole moment
 a) CH₃Cl b) CH₂Cl₂ c) CHCl₃ d) CCl₄
- Intramolecular hydrogen bonding is formed in
 a) O-nitrophenol b) water c) acetaldehyde d) methanol
- Born Haber's cycle is used to calculate
 a) Enthalpy of combustion b) Standard enthalpy of formation
 c) Standard enthalpy of sublimation d) lattice enthalpy
- Work done in reversible isothermal process is given by
 a) -2.303nRT log V₂/V₁ b) +2.303nRT log V₂/V₁
 c) +2.303nRT log V₁/V₂ d) nR / (γ-1) × (T₂ - T₁)
- What would be the value of Δn for the reaction NH₄Cl_(s) ⇌ NH_{3(g)} + HCl_(g)
 a) 1 b) -1 c) 1.5 d) 2
- Acidity of BF₃ can be explained on the basis of
 a) Arrhenius concept b) Lewis concept
 c) Bronsted Lowry concept d) None of these
- Identify disproportionation reaction
 a) CH₄ + 2O₂ → CO₂ + 2H₂O b) CH₄ + 4Cl₂ → CCl₄ + 4HCl
 c) 2F₂ + 2OH⁻ → 2F⁻ + OF₂ + H₂O d) 2NO₂ + 2OH⁻ → NO₂⁻ + NO₃⁻ + 2H₂O
- In which of the following, functional group isomerism is not possible
 a) Alcohols b) aldehydes c) alkyl halides d) carboxylic acid
- Nucleophile is a species that should have
 a) A pair of electrons to donate b) +ve charge
 c) -ve charge d) electron deficient species
- Anti-Markownikoff's addition of HBr is not observed in
 a) Propene b) 1-Butene c) 2-Butene d) 2-Pentene

15. The number of sigma and pi bonds present in 1,3-butadiene are respectively
 a) 9 and 2 b) 8 and 2 c) 9 and 3 d) 9 and 1

II. Fill in the blanks by choosing the appropriate word from those given in the brackets:

(alkaline KMnO_4 , increases, adiabatic compression, N_2 , Urea)

5 × 1 = 5

16. CO is isoelectronic with -----.
17. The temperature of the system increases during an _____ by convention.
18. Ionic product of water ----- with increase in temperature.
19. The first organic compound prepared by F. Wohler from inorganic compound is -----
20. The composition of Bayer's reagent is -----.

PART-B

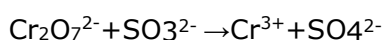
III. Answer any five of the following. Each question carries two marks. 5 × 2 = 10

21. Define spontaneous process? Give an example.
22. Prove that $\text{pH} + \text{pOH} = \text{pK}_w$
23. Oxygen has lower ionization enthalpy than nitrogen. Explain.
24. The dipole moment in BF_3 is zero. Explain.
25. Give any two differences between BMO and ABMO.
26. Explain the classification hydrogen bonds with an example.
27. Calculate the oxidation number of i) S in H_2SO_4 ii) P in H_3PO_4
28. For the compound $\text{CH}\equiv\text{C}-\text{CH}=\text{CH}-\text{CHO}$
- i) Write the bond-line formula for the above compound.
- ii) Mention whether the compound is saturated or unsaturated?
29. Explain Markonikov's rule with suitable example.

PART-C

IV. Answer any three of the following. Each question carries three marks. 3 × 3 = 9

30. Define ionization energy of an element. How does it vary along a period and down a group in the periodic table?
31. Explain the shape, hybridization of BCl_3 molecule using VBT theory?
32. Explain electronic configuration, bond order and magnetic property of nitrogen molecule using MOT
33. Write Lewis dot structure for CO_3^{2-} molecule. Calculate the formal charge on each oxygen atom present in it.
34. Balance the chemical equation by oxidation number method (in acidic medium)



V. Answer any three of the following. Each question carries three marks. 3 × 3 = 9

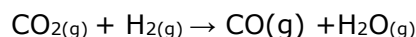
35. Define the following
- a) Molality b) Molarity c) Mole fraction
36. Explain the significance of quantum numbers.

37. For the element with atomic number 25,

- i) Write the electronic configuration
- ii) How many unpaired electrons present in it?
- iii) To which block of the periodic table it belongs?

38. Derive the relation between C_p and C_v for an ideal gas.

39. a) How are ΔH and ΔU are related in the equation given below



b) Give the relationship between enthalpy change and entropy change.

40. How are K_p and K_c related? Give one reaction each in which (i) $K_p > K_c$ (ii) $K_p = K_c$

PART-D

VI. Answer any two of the following. Each question carries five marks. $2 \times 5 = 10$

41. a) Explain functional isomerism with example.
b) Define hemolytic and heterolytic fission.
c) What are free radicals? (2+2+1)
42. a) Explain the principle and calculations involved in the estimation of Nitrogen in the organic compound using Dumas method.
b) What are nucleophiles? (4 + 1)
43. a) Complete the reaction
 $\text{CH}_3\text{-CH=CH}_2 + \text{HCl} \text{ ----->}$
 $\text{CH}_2=\text{CH}_2 + \text{H}_2 \text{ ----->}$
 $2\text{CH}_3\text{-Cl} + 2\text{Na} \text{ ----->}$
b) Explain ozonolysis of ethene. (write the reaction involved) (3 + 2)
44. a) Explain the mechanism of chlorination of benzene.
b) Give an example of benzenoid and non benzenoid. (3 + 2)

VII. Answer any four of the following. Each question carries three marks. $4 \times 3 = 12$

45. Compound contains 4.07% Hydrogen 23.9% Carbon and 71.96% chlorine. Its molecular mass is 98.96 gm. What are its empirical formula and molecular formula?
46. Calculate the pH of 0.025 M $\text{Ba}(\text{OH})_2$.
47. Calculate the wave number and wavelength of second line in Balmer series of hydrogen spectrum. (Given: $R_H = 1.09677 \times 10^7 \text{ m}^{-1}$)
48. Calculate the energy of one mole of photon of radiation whose frequency is $5 \times 10^{14} \text{ Hz}$.
49. The standard enthalpies of combustion of carbon, hydrogen and C_6H_6 are $-393.5 \text{ kJ mol}^{-1}$, $-285.83 \text{ kJ mol}^{-1}$ and $-3267 \text{ kJ mol}^{-1}$ respectively. Calculate the standard enthalpy of formation of C_6H_6 .
50. 2 moles of an ideal gas expand isothermally and reversibly from a pressure at 10 atm. to 1 atm. at 27°C . Calculate the maximum work done.
51. Calculate ΔG° for the conversion of oxygen to ozone; if K_p is 2.47×10^{-29} at 298K. ($R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)
52. Calculate a) hydrolysis constant b) degree of hydrolysis and c) the pH of 0.1M sodium ethanoate. The dissociation constant of acetic acid is 1.8×10^{-5} .