I PUC MID-TERM EXAMINATION OCTOBER-2023 (SET-2)

Time : 3 Hrs. 15 Mins. SUBJECT : CHEMISTRY (34) Max Marks : 70

Instructions:

1. Question paper has FIVE parts having 52 questions. All parts are compulsory.
2. a. Part-A carries 20 marks. Each question carries 1 mark.
   b. Part-B carries 10 marks. Each question carries 2 marks.
   c. Part-C carries 18 marks. Each question carries 3 marks.
   d. Part-D carries 10 marks. Each question carries 5 marks.
   e. Part-E carries 12 marks. Each question carries 3 marks.
3. In Part-A questions, first attempted answer will be considered for awarding marks.
4. Write balanced chemical equations and draw neat, labelled diagrams and graphs wherever necessary.
5. Direct answers to the numerical problems without detailed steps and specific unit for final answer will not carry any marks.
6. Use log tables and simple calculator if necessary (use of scientific calculator is not allowed).

PART – A

I Select the correct option from the given choices. 5x1 =15

1. Which of the following has same empirical and molecular formula
   a) C_2H_4 b) C_2H_6 c) H_2O d) $C_6H_{12}O_6$
2. The volume occupied by 1 mole of any gas or vapour at STP is
   a) 44.8L b) 11.2L c) 22.4L d) all of these
3. An expression to calculate the radii of the stationary states for electron of hydrogen atom is
   a) $r_n = a_o^2$ b) $r_n = a_o n$ c) $r_n = n a_o^2$ d) $r_n = n^2 a_o$
4. The number of wavelengths per unit length is called
   a) Frequency b) Wave number c) Velocity of light d) All of these
5. Group 18 elements are called
   a) Noble gas b) Halogens c) Alkali metals d) Chalcogens
6. In case of tetrahedral geometry, the bond angle is
   a) 90° b) 109°28' c) 120° d) 108°C
7. The molecule with zero dipole moment is
   a) H_2O b) NH_3 c) CH_3Cl d) CO_2
8. Intermolecular hydrogen bonding exists in
   a) Water b) Ammonia c) o-nitro phenol d) both (a) & (b)
9. Which of the following is an intensive property
   a) Mass b) Temperature c) Volume d) All of these
10. Born - Haber cycle is used to calculated
    a) Lattice enthalpy b) Enthalpy of combustion
    c) Enthalpy of formation d) Enthalpy of solution
11. Free expansion of gas in vacuum is
    a) Positive b) Negative c) Zero d) none of these
12. Propanone and propanal are
    a) Chain isomers b) position isomers c) Functional isomers d) None of these
13. Sulphur will be present in sodium fusion extract as
    a) Na_2S b) NaCN c) Na_2SO_3 d) Na_2SO_4

(P.T.O.)

14) The electrophile among the following species is
a) H_2O b) C_2H_5OH c) SO_3 d) NH_3

15. The Prussian blue colour obtained in the test of nitrogen present in an organic compound is due to
a) Potassium ferrocyanide b) ferric ferrocyanide
c) Ferrous ferrocyanide d) Sodium ferrocyanide

II Fill in the blanks by choosing the appropriate word : 5x1=5
(Bent shape, Zero, T-shape, cycloalkanes, butane-1,4-dioic acid, 52.9 pm)

16. The radius of the first Bohr orbit is _____.
17. The shape of the molecule type AB_2E containing two bonding pairs and one lone pair of electrons is _____
18. Standard enthalpy of formation of element is _____.
19. _____ are a saturated cyclic compounds.
20. IUPAC name of the compound $HOOC-CH_2-CH_2-COOH$ is _____.

PART-B

III Answer any FIVE of the following. Each question carries TWO marks: 5x2=10

21. Define enthalpy of reaction. Illustrate with an example.
22. What is spontaneous process? Give an example.
23. What is meant by electronegativity of an atom? How does it vary in a group?
24. Explain ionic bond in NaCl.
25. The resultant dipole moment of NH_3 is greater than NF_3. Give reason.
26. Write the formation of sigma and pi bond diagrammatically.
27. Explain positional isomerism with example.
28. Explain detection of carbon in the organic compound by cupric oxide method.
29. Write the bond line structure of
a) 2-methyl but-2-ene
b) Isopropyl alcohol.

PART-C

IV Answer any THREE of the following. Each question carries THREE marks. 3x3=09

30. Give three general characteristic properties of s-block elements.
31. Define electron gain enthalpy? How does it vary along a period and a group.
32. Explain sp^3 hybridisation by taking methane molecule (CH_4) as an example.
33. Define hydrogen bond. Explain intramolecular hydrogen bonding with example.
34. Give the electronic configuration, bond order and magnetic property of lithium molecule based on molecular orbital theory.

V Answer any THREE of the following. Each question carries THREE marks. 3x3=09

35. Write any three postulates of Dalton's atomic theory.
36. a) What are chemical properties of substances? Give example.
b) Give the relation between °F and °C. **(2+1)**
37. Give the postulates of Bohr's theory of atomic model.
38. a) If n = 3. What are the possible values of 'l' and m_l
b) State Aufbau principle. **(2+1)**
39. a) What are extensive properties? Give example.
b) What is adiabatic process? **(2+1)**
40. State and illustrate Hess's law of constant heat summation.

(P.T.O.)

PART - D

VI Answer any TWO of the following. Each question carries FIVE marks. **2x5=10**

41. a) Explain the principle and calculations involved in the estimation of nitrogen in the organic compound by Dumas method.
    b) Carbon forms large number of compounds. Why? **(4+1)**

42. a) Define chromatography. Mention its type which depends on selective adsorption.
    b) Indicate the number of σ and π bond present in

$$CH_3-CH_2-\overset{\overset{OH}{|}}{C}=CH_2$$

    c) What are free radicals? **(2+2+1)**

43. a) Give the difference between inductive effect and electromeric effect.
    b) Explain the detection of nitrogen by sodium fusion extract. **(3+2)**

44. a) For the molecule $CH_3-CH_2-CO-CH_3$
        i) Identify functional group
        ii) Write the bond line formula
        iii) Write the preceding homologue
    b) What are Heterocyclic compounds? Give example.

PART- E

VII Answer any FOUR of the following. Each question carries THREE marks. **4x3=12**

45. How many grams of oxygen (O_2) are required to completely react with 0.300 gm of hydrogen (H_2) to yield H_2O?
    Also calculate the amount of water formed.

46. An organic compound contains 26.66% carbon, 2.22% hydrogen and 71.12% oxygen. The molecular mass of the compound is 90. Find molecular formula.

47. If the velocity of the electron in Bohr's first orbit is $2.19\times10^{6}\ ms^{-1}$, calculate de-Broglie wavelength associated with it. Given $\left(h = 6.62\times10^{-34}\ kg\ m^2s^{-1}\right)$

48. Calculate wave number and frequency of yellow radiation having wavelength 5800 Å ?
    $\left[\left(c = 3\times10^{8}\ m/s\right)\ Given\right]$

49. The energy associated with the first orbit in the hydrogen atom is -2.18×10^{-18} Jatom^{-1}. What is the energy associated with the fifth orbit?

50. One mole of an ideal gas expands isothermally and reversibly from 5 atmospheres to 1 atmosphere at 50°C. Calculate the work done.

51. Calculate the enthalpy of formation of liquid benzene. Given that enthalpy of formation of CO_2 and H_2O are -393.5kJ and -285.83kJ respectively and enthalpy of combustion of benzene is $-3267\ kJ\ mol^{-1}$

52. Calculate standard free energy change for the reaction for which the value of equilibrium constant is 1.5×10^{10} at 300K (R = 8.314 $JK^{-1}\ mol^{-1}$).

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