GOVERNMENT OF KARNATAKA
KARNATAKA SCHOOL EXAMINATION & ASSESSMENT BOARD

Class: I Year PUC   **MODEL QUESTION PAPER**   **Academic Year:** 2023-24

Subject: Chemistry (34)   **Maximum Marks:** 70

Time: 3.15hours   **Number of questions:** 52

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: **15 × 1= 15**

1. The number of significant figures in 0.523 is

    a) 3   b) 4   c) 2   d) 1

2. Molarity is defined as the number of moles of solute present in

    a) one litre of solution   b) one litre of solvent

    c) one kg of solution   d) one kg of solvent

3. Rutherford's α - ray scattering experiment is related to the size of the

    a) nucleus   b) atom   c) electron   d) neutrons

4. Mendeleev`s periodic table is based on

    a) atomic weight   b) atomic number

    c) number of neutrons   d) number of electrons

5. In XeF_4 molecule, number of lone pairs and shared pairs of electrons respectively are

    a) 4, 1   b) 2, 4   c) 4, 3   d) 4, 2

6. Which of the following is true for ionic compounds?

    a) conduct electricity in solid state   b) have directional bonds

    c) soluble in polar solvents   d) are non-electrolytes in molten state

7. The second law of thermodynamics introduced the concept of:

    a) enthalpy   b) work   c) entropy   d) internal energy

8. The difference between heat of reaction at constant pressure and heat of reaction at constant volume is greater than RT when

    a) $\Delta n_g = 1$ b) $\Delta n_g > 1$ c) $\Delta n_g < 1$ d) $\Delta n_g \neq 1$

9. If a catalyst is used in a reversible reaction,

    a) backward reaction becomes faster   b) forward reaction becomes faster

    c) equilibrium constant decreases   d) equilibrium is attained more quickly

10. Lewis acids are

    a) proton donors   b) electron pair acceptors

    c) electron pair donors   d) proton acceptors

11. During reduction, oxidation number

    a) increases   b) decreases

    c) do not changes   d) depends on the reaction

12. The property catenation is more marked in the case of

    a) silicon   b) carbon   c) tin   d) copper

13. Methoxy methane and ethyl alcohol are

    a) position isomers   b) chain isomers

    c) functional isomers   d) metamers

14. According to Markownikoff's rule, when hydrogen halides add to an unsymmetrical alkene, the hydrogen of HX attaches to

    a) carbon at the end of the molecule

    b) carbon in the middle of the molecule

    c) carbon with least number of hydrogen atoms

    d) carbon with maximum number of hydrogen atoms

15. Which of the following hydrocarbon damage DNA and cause cancer in the human body

    a) 1,2-Benzanthracene   b) 1,2-Benzpyrene

    c) 3-Methylcholanthrene   d) all of these

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

    (aromatisation, zero, increases, 8 electrons, - CH_2-, - CH_3)   **5 × 1 =5**

16. The outer shell of the most stable atoms contains _____.

17. The standard enthalpy of formation of element is taken as _____ by convention.

18. When the pH of a solution decreases, its hydrogen ion concentration is _____.

19. In a homologous series of aliphatic hydrocarbons, the successive members differ from each other in molecular formula by a _____ group.

20. n-Hexane on heating to 773K, under 10-20atm pressure in the presence of oxides of vanadium, molybdenum forms benzene. The process is called _____.

PART - B

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

21. Define entropy? What happens to the entropy when liquid changes into vapour?

22. What is the heterogeneous equilibrium? Give an example.

23. What are isoelectronic species? Select isoelectronic pair among the following: Na^+, Cl^-, F^-, Li^+

24. Give any two limitations of octet rule.

25. Define hydrogen bond? Name a compound having intra molecular H-bond.

26. Helium is monoatomic. Explain on the basis of Molecular Orbital Theory.

27. Using the stock notation, represent the following compound (i) $HauCl_4$, (ii) Fe_2O_3.

28. For the compound $CH \equiv C - CH = CH - CH_3$

    i) Write the bond-line formula for the above compound.

    ii) Mention whether the compound is saturated or unsaturated?

29. Write geometrical isomers of but-2-ene.

PART - C

IV. Answer **any three** of the following. Each question carries **three** marks.   **3 × 3 = 09**

30. Define electronegativity of an element. How does it vary along a period and down a group in the periodic table?

31. Explain the shape of ammonia molecule using VSEPR theory?

32. a. Define dipole moment. What is its unit?

    b. Sigma bond is stronger than pi bond. Give reason.

33. Write Lewis dot structure for NO_2^- molecule. Calculate the formal charge on each oxygen atoms present in it.

34. Balance the chemical equation by oxidation number method (in acidic medium)

$$Fe^{+2} + MnO_4^- \rightarrow Fe^{+3} + Mn^{2+}$$
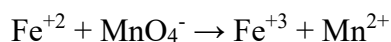
V. Answer **any three** of the following. Each question carries **three** marks.   **3 × 3 = 09**

35. Write the any three postulates of Dalton's atomic theory.

36. Write any three limitations of Bohr model of an atom.

37. For the element with atomic number 24.

    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 relationship between C_p and C_v for an ideal gas.

39. State Lechatlier's principle. What is the effect of temperature on the equilibrium if the reaction is exothermic?

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 × 5 = 10**

41. a) What is the type of hybridisation of carbon atoms marked as a, b and c in the following compound?

$$H_3C^a - HC^c = C^b = CH_2.$$
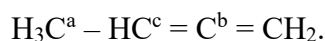
b) What is carbocation? Write the decreasing order of stability among 1^0, 2^0 and 3^0 carbocations. $(3 + 2)$

42. a) Explain the principle and calculations involved in the estimation of carbon in the organic compound.

    b) What are electrophiles? $(4 + 1)$

43. a) An alkene 'A' on ozonolysis gives a mixture of ethanal and propan-2-one. Write the chemical reaction and IUPAC name of 'A'.

   b) Explain Wurtz reaction with a suitable example.   (3 + 2)

44. a) Explain the mechanism of nitration of benzene.

   b) Draw the staggered conformation of ethane.   (3 + 2)

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

45. 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.

46. Dinitrogen and dihydrogen react with each other to produce ammonia according to the following chemical equation.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3 (g)$$
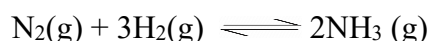
   Calculate the mass of ammonia produced if 2×10^3 g dinitrogen reacts with 1×10^3 g of dihydrogen.

47. Calculate the wave number and wave length of first line in Balmer series of hydrogen spectrum. (Given: $R_H = 1.09677 \times 10^7 \, m^{-1}$)

48. Calculate the energy of one mole of photon of radiation whose frequency is 5×10^{14} Hz.

49. The standard enthalpies of combustion of carbon, hydrogen and C_6H_6 are -393.5 kJmol^{-1}, -285.83 kJmol^{-1} and -3267 kJmol^{-1} respectively. Calculate the standard enthalpy of formation of C_6H_6.

50. Calculate the total work done when one mole of a gas expands isothermally and reversibly from an initial volume of 10 dm^3 to a final volume of 20 dm^3 at 298 K. (R = 8.314 JK^{-1} mol^{-1})

51. Calculate ΔG^0 for the hydrolysis of sucrose. The equilibrium constant K_C is 2×10^{-3} at 300 K. (R = 8.314 JK^{-1} mol^{-1})

52. Reaction between N_2 and O_2 take place as follows

$$2N_2(g) + O_2(g) \rightleftharpoons 2N_2O (g)$$
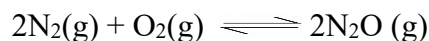
   If a mixture of 0.482 mol of N_2 and 0.933 mol of O_2 is placed in a 10L vessel and allowed to form N_2O at a room temperature at which $K_c = 2 \times 10^{-37}$, determine the composition of equilibrium mixture.