GOVERNMENT OF KARNATAKA

DEPARTMENT OF SCHOOL EDUCATION (PRE-UNIVERSITY)

MODEL QUESTION PAPER

Class: I Year PUC **Academic Year:** 2024-25

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

Time: 3.00 Hours **No. of Questions:** 48

Instructions

1. Question paper has FIVE parts. All parts are compulsory.
2. a. Part-A carries 20 marks. Each question carries 1 mark.
   b. Part-B carries10 marks. Each question carries 2 marks.
   c. Part-C carries18 marks. Each question carries 3 marks.
   d. Part-D carries10 marks. Each question carries 5 marks.
   e. Part-E carries 12 marks. Each question carries 4 marks.
3. In Part-A questions, **first attempted answer** will be considered for awarding marks.
4. Write balanced chemical equations and draw neat labeled 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).
7. For a question having circuit diagram/figure/graph/diagram, alternate questions are given at the end of question paper in a separate section for visually challenged students.

PART-A

I. Select the correct option from the given choices. 15×1=15

1. The prefix used for the multiple 10^{-6} is

   a) Macro b) micro c) nano d) milli

2. If two volumes of gas give one volume of $A_{2(g)}$ and one volume of $B_{2(g)}$, then molecular formula of the gas will be (i) A_2B_2 (ii) A_4B_4 (iii) AB

   a) only (i) b) only (iii) c) both (i) and (ii) d) only (ii)

3. An atom of an element contains 19 electrons. Its nucleus has 20 neutrons. Its mass number is

   a) 29 b) 28 c) 01 d) 39

4. The chemical properties of atoms are controlled by number of

   a) nucleus b) protons c) electrons d) neutrons

5. Choose the correct order of atomic and ionic radii of chlorine atom and chloride (Cl^-) ion (in ppm) is

   a) 136 and 90 b) 167 and 99 c) 99 and 99 d) 186 and 90

6. The valency of noble gases is _____.

   a) 3 b) 2 c) 1 d) 0

7. Conversion of $O_2 \rightarrow O_2^+$ involves removal of electron from

a) Antibonding π (Pi) orbital b) Bonding π (Pi) orbital

c) Antibonding σ (sigma) orbital d) Bonding σ (sigma) orbital

8. The example for intensive property is

a) internal energy b) temperature c) enthalpy d) heat capacity

9. The change in internal energy (ΔU) for an isolated system when there is no transfer of energy as heat or as work will be equal to.

a) q b) w c) 0 d) 1

10. **Statement 1**: Equilibrium is possible only in a closed system at a given temperature.

Statement II: At equilibrium all measurable properties of the system remain constant.

Identify the correct statement

a) Both statement I and II are correct

b) Both statement I and II are incorrect

c) Statement I is correct and statement II is incorrect.

d) Statement I is incorrect and statement II is correct.

11. Match the following elements in compounds with their oxidation state:

Element	Oxidation state
A) Oxygen in potassium superoxide	i) +1
B) Hydrogen in metal hydrides	ii) $\frac{1}{2}$
C) Sodium in rock salt	iii) zero
D) Silver in silver amalgam	iv) –1

a) A) → i); B) → ii); C) → iii); D) → iv) b) A) → ii); B) → iv); C) → i); D) → iii)

c) A) → ii); B) → iii); C) → i); D) → iv) d) A) → iii); B) → iii); C) → i); D) → ii)

12. Which of the following will not show resonance

a) C_6H_6 b) C_6H_{12} c) CH_3NO_2 d) $C_6H_5COO^-$

13. An important property of carbon that has made carbon to be a backbone element of organic compounds.

a) catenation b) allotropy c) isotopes d) tetravalency

14. Spatial arrangements of atoms which can be converted into one another by rotation around a C – C single bond are called.

a) Rotamers b) Metamers c) Mesomers d) Chain isomers

15. Which of the following reagent will produce trans alkenes from reduction of alkynes

a) H_2/Pt b) H_2/Pd c) H_2/Ni d) Na / liquid NH_3

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

(**strong acid, azo, weak base, charges, Rubidium, Fluorine**) **5×1=5**

16. The element discovered by spectroscopic method is _____.

17. The electrovalence is always equal to _____ on the ion.
18. If Bronsted acid is a strong acid then its conjugate base is a _____.
19. The element, which has the same oxidation state in all of its compounds is _____.
20. Compound 'A' contains nitrogen but Kjeldahl method is not applicable to estimate the amount of nitrogen in compound 'A'. Then compound 'A' is _____ compound.

PART-B

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

21. State Heisenberg's uncertainty principle. Mention any one significance of uncertainty principle.
22. a) The bond angle of SO_2 molecule is less than 120^o (reduced to 119°). Give reason.
    b) Mention the shape of SO_2 molecule. (1 + 1)
23. Mention two factors that determines the percentage covalent character of the ionic bond.
24. The ΔH_f^o of Al_2O_3 is –1676 kJ. Write the thermochemical equation for decomposition of Al_2O_3 into respective aluminium elements and oxygen molecule.
25. Define specific heat capacity. Write the relation between C_P, C_V and R.
26. Plot a graph of concentration vs time, for the attainment of chemical equilibrium for a reversible reaction: $H_{2(g)} + I_{2\,(g)} \leftrightarrow 2HI_{(g)}$ from either direction.
27. What are the effects of the following conditions on equilibrium for a given reaction:
    $N_{2(g)} + 3H_{2(g)} \leftrightarrow 2NH_{3(g)}$
    i) addition of argon gas at constant volume. ii) increase in pressure
28. Give any two differences between inductive effect and electromeric effect.
29. Among primary, secondary and tertiary carbocation, which is most stable? Give reason.
30. What happens to the boiling points of isomeric alkanes with increase in branching? Give reason.

PART-C

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

31. Define ionization enthalpy. Mention any two factors that affects the ionization enthalpy.
32. Write three conditions for the linear combination of atomic orbitals.
33. Using molecular orbital theory, calculate bond order and magnetic property of carbon C_2 molecule.
34. a) What is Lewis symbol? Give one significance of these symbols.
    b) Write the Lewis symbol of ozone molecule. (2 + 1)
35. In the following redox reaction: $2Fe + 2HCl \rightarrow FeCl_2 + H_2$
    i) What is the oxidation number of iron in $FeCl_2$?
    ii) What type of redox reaction is it?
    iii) Identify the species undergo oxidation.

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

36. a) What is molecular formula? How it is related to empirical formula?

b) Give an example for a compound whose empirical formula and molecular formula are same. (2 + 1)

37. A neutral atom has two electrons, eight electrons and six electrons in K, L and M shells respectively. From this predict,

i) its atomic number

ii) total number of s-electrons

iii) total number of p-electrons.

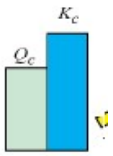
38. a) Write Gibb's equation, to give the relation between free energy change, enthalpy change and entropy change.

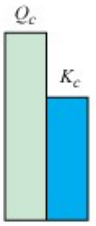
b) What are the conditions of ΔH and ΔS for a reaction to be spontaneous at any temperature? (2 + 1)

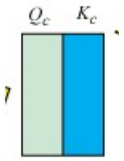
39. a) What are buffer solutions? Give an example for neutral buffer.

b) Write Henderson–Hasselbalch equation to calculate pH of acidic buffer. (2 + 1)

40. For the following figures, predicting the direction of reaction.

i) 

ii) 

iii) 

PART-D

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

41. a) For the compound $Cl_2CHCH_2CH_2OH$

i) Write the IUPAC name and bond line formula

ii) Identify functional group

b) Suggest a method to separate the constituents of the following mixtures:

i) Mixture of two miscible liquids

ii) A mixture of plant pigment (3+2)

42. a) Complete the following reactions

i) $2CH_4 + O_2 \xrightarrow{Cu/523K/100\ atm}$

ii) $CH_4 + O_2 \xrightarrow{Mo_2O_3/\Delta}$

iii) $2CH_3 - CH_3 + 3O_2 \xrightarrow{(CH_3COO)Mn/\Delta}$

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

43. a) Write the mechanism of chlorination of benzene.

b) Define polymerization. Mention any one use of polymer. (3+2)

PART–E

(NUMERICAL PROBLEMS)

VII. Answer any THREE of the following. Each question carries four marks. 3×4=12

44. Naturally occurring chlorine consists of two isotopes with atomic weights 34.9 and 39.5 and their abundance 75.6% and 24.24% respectively. Calculate the relative atomic weight of chlorine.

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

46. The combustion of one mole of benzene at 298 K and 1 atm liberates 3267.0 kJ of heat. Calculate the standard enthalpy of formation (ΔH_f^o) of benzene. Standard enthalpies of formation of $CO_2(g)$ and $H_2O(l)$ are –393.5 kJ mol^{-1} and – 285.83 kJ mol^{-1} respectively.

47. The value of *Kp* for the reaction, $CO_2(g) + C(s) \leftrightarrow 2CO\ (g)$ is 3.0 at 1000 K. If initially $P_{CO_2} = 0.48$ bar and $P_{CO} = 0$ bar and pure graphite is present, calculate the equilibrium partial pressures of CO.

48. In Carius method of estimation of sulphur, 0.466 g of barium sulphate formed from 0.32 g of organic compound. Calculate the percentage of sulphur. (Given atomic mass of S = 32 u and molar mass of barium sulphate = 233 g mol^{-1})

PART–F

(For visually challenged students only)

40. Write the relationship between dissociation constant of acid and dissociation constant of base. Give the importance of these two. 3