BK BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
SENIOR SECONDARY CO-ED DAY CUM BOYS' RESIDENTIAL SCHOOI

ANNUAL EXAMINATION (2024-25)

SUBJECT- CHEMISTRY (043)

Class: XI
Date: /02/2025

Duration: **3 Hrs**
Max. Marks: **70**

General Instructions:

(1) *There are 33 questions in all. All questions are compulsory.*
(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
(3) All the sections are compulsory.
(4) Section A contains sixteen questions, twelve MCQ and four Assertion Reasoning based of 1 mark each, Section B contains five questions of two marks each, Section C contains seven questions of three marks each, Section D contains two case study-based questions of four marks each and Section E contains three long answer questions of five marks each.
(5) There is no overall choice. However, an internal choice has been provided in one question in Section B, one question in Section C, one question in each CBQ in Section D, and all three questions in Section E. You have to attempt only one of the choices in such questions.
(6) Use of calculators is not allowed.

SECTION-A **(16 X 1=16 Marks)**

1. Which of the following compounds has the highest oxidation state of Mn?
   (a) $KMnO_4$ (b) K_2MnO_4
   (c) MnO_2 (d) MnO

2. Which quantum number specifies the orientation of an orbital?
   (a) Principal quantum number (b) Azimuthal quantum number
   (c) Magnetic quantum number (d) Spin quantum number

3. Which type of bond is present in O_2 molecule?
   (a) Single covalent bond (b) Double covalent bond
   (c) Ionic bond (d) Hydrogen bond

4. Identify the IUPAC name of CH_3-CH(OH)-CH=CH_2.
   (a) Butane (b) But-3-en-2-ol
   (c) 2-Butene (d) Propene

5. What is the enthalpy change for the reaction below?
   $H_2 + Cl_2 \rightarrow 2HCl$; $\Delta H = -184$ kJ
   (a) Exothermic reaction (b) Endothermic reaction
   (c) Neutral reaction (d) No reaction

6. Which Of the following compounds have 10 sigma bonds?
   (a) CH_4 (b) C_2H_6
   (c) C_3H_8 (d) C_4H_{10}

7. Which element has an electronic configuration $[Ne]3s^23p^5$?
   (a) Sodium (b) Magnesium
   (c) Chlorine (d) Fluorine

8. What is the oxidation state of carbon in CH_4?
   (a) +4 (b) - 4
   (c) +2 (d) 0

9. The SI unit for temperature is:
   (a) Fahrenheit (b) Celsius
   (c) Kelvin (d) Rankine

10. Find out the number of neutrons, protons, and electrons of $_{17}Cl^{37}$ respectively.
   (a) 20, 20, 17 (b) 17, 17, 20
   (c) 20, 17, 17 (d) 17, 17, 17

11. What does it indicate having a higher equilibrium constant?
   (a) the reaction occurs faster (b) the rate of backward reaction is faster
   (c) both the backward and forward reactions are equal (d) reaction may be slower than usual

12. A reaction is given by $aA + bB \rightarrow cC + dD$. How do you represent an equilibrium constant?
   (a) $[A]^a[B]^b/[C]^c[D]^d$ (b) $[C]^c[D]^d/[A]^a[B]^b$
   (c) [A][B]/[C][D] (d) [C][D]/[A][B]

For Questions 13 and 16, two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below.

(a) If both Assertion and Reason are true and Reason is correct explanation of Assertion.
(b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(c) If Assertion is true but Reason is false.
(d) If both Assertion and Reason are false.

13. Assertion (A): The boiling point of water is high due to hydrogen bonding.
   Reason (R): Hydrogen bonding increases the intermolecular forces of attraction.

14. Assertion (A): Benzene undergoes substitution reactions readily.
   Reason (R): Benzene is an aromatic compound with a delocalized π-electron system.

15. Assertion: Chain isomerism is observed in compounds containing four or more than four carbon atoms
   Reason: Only alkanes show chain isomerism

16. Assertion: 1.231 has three significant figures.
   Reason: All numbers right to the decimal point are significant.

SECTION-B (5 X 2=10 Marks)

17. Define empirical formula and molecular formula with examples. 2

18. What is the oxidation number of the underlined elements in each of the following compound? 2

   (i) $K\underline{Mn}O_4$ (ii) $K_2\underline{Cr_2}O_7$

19. Define oxidation and reduction reaction by oxidation number method. 2

20. Explain homogeneous equilibria. 2

21. Explain the term conformation of ethane. 2

OR

Convert the Following (i) Benzene to Nitro benzene (ii) Ethene to Ethane. 2

SECTION-C (7 X 3=21 Marks)

22. Derive the relationship between Kp and Kc for a gaseous reaction. 3

23. Balance the following redox reaction in an acidic medium using the ion-electron method: 3
$MnO_4^- + Fe^{2+} \rightarrow Mn^{2+} + Fe^{3+}$

24. (i) Calculate the total number of electrons present in one mole of methane. 3
(ii) Find (a) the total number and (b) the total mass of neutrons in 7 mg of ^{14}C. (Assume that mass of a neutron = 1.675×10^{-27}kg).

25. Explain the terms molality molarity and mole fraction. 3

26. Write the mechanism of free radical substitution reactions of methane with chlorine. 3

27. Explain Cp-Cv = R

Or

Explain the terms (i) Entropy (ii) Enthalpy (iii) Internal energy of the system 3

28. Explain the resonance effect with an example. 3

SECTION-D **(2 X 4= 8 Marks)**

Case Study Based Questions

Read the passage and answer the questions below: 4

29. Orbitals are region or space wher.e there is maximum probability of finding electrons.

Qualitatively, these orbitals can be distinguished by their size, shape and orientation.

An orbital of small size means there is more chance of finding the electron near the nucleus.

Shape and orientation means the direction in which probability of finding electron is maximum. Atomic orbitals can be distinguished by quantum numbers. Each orbital is designated by three quantum numbers n, I and m1 (magnetic quantum number) which define energy, shape and orientation but these are not sufficient to explain spectra of multi-electrons atoms. Spin quantum number (ms) determines the spin of electron. Spin angular momentum of electron has two orientations relative to chosen axis which are distinguished by spin quantum numbers ms which can take values +1/2 and -1/2.

Value of 'l'	0	1	2	3	4
Notation for subshell	s	p	d	f	g

(a) How many orbitals are associated with n = 3?
(b) Describe the orbitals represented by n = 2, l = 1
(c) How many electrons are possible in an orbital?
(d) What is shape of 's' and 'p' orbitals?

Read the passage and answer the questions below:

Hydrocarbons are divided into alkanes, alkenes, and alkynes based on the type of bonds they contain. Alkanes are saturated hydrocarbons, while alkenes and alkynes are unsaturated. The reactivity of hydrocarbons depends on the type of bond and the functional groups attached.

30. (a) Why are alkenes more reactive than alkanes? 2
(b) Write the IUPAC name of CH≡CH. 1
(c) Write the general formula for alkynes. 1

SECTION-E (3X 5=15 Marks)

31. (a) According to IUPAC nomenclature, write the name and symbol for the elements with the following atomic numbers. 3+2

(i) 101

(ii) 110

(iii) 114

(b) Which of the following species will have the largest and the smallest size?

Na , Na^+ , Mg, Mg^{2+}

OR

(a) Use the periodic table to answer the following questions.

(i) Identify an element with four electrons in the outer subshell.

(ii) Identify an element that would tend to lose one electron.

(iii) Identify an element that would tend to gain one electron.

(b) Why do elements in the same group have similar physical and chemical properties?

32. (a) Explain the ozonolysis of ethene. Write the reaction. 3+2

(b) Explain the aromaticity and Isomerism with an example.

OR

(a) Explain Freidal Craft alkylation and acylation reactions.

(b) (i) Depict ethane in the staggered form of Newman's projection.

(ii) Write the molecular formula of the 5^{th} member of the alkene series.

(iii) Write the IUPAC name of the products obtained by the ozonolysis of propene.

33. (a) Write Lewis dot symbols for atoms of the following elements: Mg, Na, B, O 2+3

(b) Define the Octet rule. Write its significance and limitations.

OR

(a) Discuss the shape of the following molecules using the VSEPR model:

$BeCl_2$, BCl_3

(b) Write the molecular electronic configuration of F_2.

----------ALL THE BEST ----------