B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

ANNUAL EXAMINATION 2026

SUBJEST: CHEMISTRY (043)

SET -2

Class: XI | Duration: 3 Hrs
Date: 20/02/2026 | Max. Marks: 70

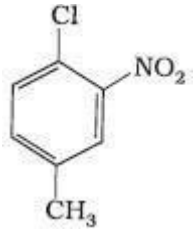
Read the following instructions carefully.

(a) There are 33 questions in this question paper with internal choice.
(b) SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
(c) SECTION B consists of 5 short answer questions carrying 2 marks each.
(d) SECTION C consists of 7 short answer questions carrying 3 marks each.
(e) SECTION D consists of 2 case - based questions carrying 4 marks each.
(f) SECTION E consists of 3 long answer questions carrying 5 marks each.
(g) All questions are compulsory.
(h) Use of log tables and calculators is not allowed

SECTION A

The following questions are multiple -choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

Q. No		Marks
1	Arrange the halogens F_2, Cl_2, Br_2, I_2, in order of their increasing reactivity with alkanes. (a) $I_2 < Br_2 < Cl_2 < F_2$ (b) $Br_2 < Cl_2 < F_2 < I_2$ (c) $F_2 < Cl_2 < Br_2 < I_2$ (d) $Br_2 < I_2 < Cl_2 < F_2$	1
2	Arrange the following in decreasing order of their boiling points. (A) n–butane (B) 2–methylbutane (C) n-pentane (D) 2,2–dimethylpropane (a) A > B > C > D (b) B > C > D > A (c) D > C > B > A (d) C > B > D > A	1
3	Which of the following is responsible for ruling out the existence of definite paths or trajectories of electrons? (a) Pauli's exclusion principle. (b) Heisenberg's uncertainty principle. (c) Hund's rule of maximum multiplicity. (d) Aufbau principle	1
4	What is the mass percent of carbon in carbon dioxide? (a) 0.034% (b) 27.27% (c) 3.4% (d) 28.7%	1

5	Which of the following is not a general characteristic of equilibria involving physical processes? (a) Equilibrium is possible only in a closed system at a given temperature. (b) All measurable properties of the system remain constant. (c) All the physical processes stop at equilibrium. (d) The opposing processes occur at the same rate, and there is a dynamic but stable condition.	1
6	Which molecule/ion out of the following does not contain unpaired electrons? (a) Na^+ (b) B^+ (c) Ca^+ (d) Mg^+	1
7	In an adiabatic process, no transfer of heat takes place between system and surroundings. Choose the correct option for free expansion of an ideal gas under adiabatic condition from the following. (a) $q = 0, \Delta T \neq 0, w = 0$ (b) $q \neq 0, \Delta T = 0, w = 0$ (c) $q = 0, \Delta T = 0, w = 0$ (d) $q = 0, \Delta T < 0, w \neq 0$	1
8	The acid-base pair that differs by one _____is called a conjugate acid-base pair. (a) electron (b) proton (c) hydroxide ion (d) hydroxyl ion	1
9	We know that the relationship between K_c and K_p is $K_p = K_c (RT)^{\Delta n}$ What would be the value of Δn for the reaction $NH_4Cl (s) \Leftrightarrow NH_3 (g) + HCl (g)$ (a) 1 (b) 0.5 (c) 1.5 (d) 2	1
10	The statement that is not correct for periodic classification of elements is: (a) The properties of elements are periodic function of their atomic numbers. (b) Non metallic elements are less in number than metallic elements. (c) For transition elements, the 3d-orbitals are filled with electrons after 3p-orbitals and before 4s-orbitals. (d) The first ionisation enthalpies of elements generally increase with increase in atomic number as we go along a period.	1
11	The IUPAC name for (a) 1-Chloro-2-nitro-4-methylbenzene (b) 1-Chloro-4-methyl-2-nitrobenzene (c)2-Chloro-1-nitro-5-methylbenzene (d) m-Nitro-p-chlorotoluene 	1
12	In Chlorination of benzene, which of the following acts as an electrophile? (a) Cl^+ (b) Cl^- (c) Cl (d) $FeCl_3$	1

Directions: (Q13-16) Each of these questions contains two statements, Assertion and Reason. Select one of the codes (a), (b), (c), and (d) given below.
a. Assertion is correct, reason is correct; reason is a correct explanation for assertion.
b. Assertion is correct, reason is correct; reason is not a correct explanation for assertion
c. Assertion is correct, reason is incorrect
d. Assertion is incorrect, reason is correct.

13	Assertion (A): Sodium chloride, formed by the transfer of electrons by chlorine and sodium metal, is a stable compound. Reason (R): This is because sodium and chloride ions acquire an octet in sodium chloride formation.	1
14	Assertion : Methane can be obtained by Wurtz reaction. Reason : Wurtz reaction leads to the formation of symmetrical alkane having an even number of carbon atoms.	1
15	Assertion: Some salts are sparingly soluble in water at room temperature. Reason : The entropy increases on dissolving the salts.	1
16	Assertion: In a reaction $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$ Zn is a reductant but itself get oxidized. Reason: In a redox reaction, oxidant is reduced by accepting electrons and reductant is oxidized by losing electrons.	1

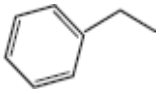
SECTION B

Directions (Q.No.17-21):This section contains 5 questions . The following questions are very short answer types and carry 2 marks each.

17	If 500 mL of a 5 M solution is diluted to 1500 mL, what will the molarity of the solution be obtained? **OR** In three moles of ethane (C_2H_6), calculate the following: (i) Number of moles of carbon atoms (ii) Number of moles of hydrogen atoms	2
18	Draw Sawhorse projections for the eclipsed and staggered conformations of ethane. Which of these conformations is more stable and why?	2
19	Explain why (a) Explain why the electron gain enthalpy of fluorine is less negative than that of chlorine. (b) Be has higher $\Delta_i H$ than B	2
20	Draw and name the shape of the following molecules: (i) ClF_3 (ii) XeF_4	2
21	PCl5, PCl3 and Cl2 are at equilibrium at 500 K and having concentration 1.59M PCl3, 1.59M Cl2 and 1.41 M PCl5. Calculate Kc for the reaction, $PCl_5 \leftrightarrow PCl_3 + Cl_2$	2

SECTION C

Directions (Q. No. 22-28): This section contains 7 questions with no internal choice. The following questions are short answer type and carry 3 marks each.

22	Calcium carbonate reacts with aqueous HCl to give $CaCl_2$ and CO_2 according to the reaction given below: $CaCO_3$ (s) + 2HCl (aq) $\rightarrow$ $CaCl_2$(aq) + CO_2(g) + H_2O(l) What mass of $CaCO_3$ is required to react completely with 25 mL of 0.75 M HCl .	3
23	(a) What is principal quantum number. (b) What is the lowest value of n that allows d orbitals to exist? (c) How many electrons will be present in the sub-shells having m_s value of $-1/2$ for n = 4?	3
24	Balance the following equation by oxidation number method. MnO_4^- + Fe^{2+} → Mn^{2+} + Fe^{3+} (in acidic medium)	3
25	Explain the relation between Kp and Kc. For reaction in equilibrium $H_2(g) + I_2(g) \leftrightarrow 2HI(g)$	3
26	How would you explain the fact that first ionization enthalpy of sodium is lower than that of magnesium, but its second ionization enthalpy is higher than that of magnesium?	3
27	(i) Write bond line formula for Propan-2-ol (ii) Give IUPAC name for  (iii) Indicate the number of σ and π bonds in $CH_2=C=CH_2$ **OR** Write the isomers of C_3H_6O. Give IUPAC names of all the isomers and indicate the functionals groups present in them.	3
28	Calculate the standard enthalpy of formation of CH_3OH from the following data: (i) CH_3OH (l) + 3/2 O_2 (g) ———> CO_2 (g) + $2H_2O$ (l); ΔrH^e = – 726 kJ mol^{-1} (ii) C(s) + O_2 (g) ———> CO_2 (g); ΔcH^e = -393 kJ mol^{-1} (iii) H_2(g) + ½ O_2(g) ———> H_2O (l); Δ_fH^e = -286 kJ mol^{-1}	3
SECTION D		

29	Entropy refers to the measure of the level of disorder in a thermodynamic system. It is measured as a joule per Kelvin(J/K) and denoted by the symbol 'S'. For any spontaneous process, the entropy of the system should increase. Entropy is the measure of the number of possible microscopic configurations of the atoms and molecules or accordance with the microscopic state of the system. Solids have lowest entropy due to the more regular crystalline structure liquids have an intermediate entropy as they are more ordered than gas but less ordered then solids. Gases are known to have the highest entropy as they have the most disorder. In order to define the relationship that exists between entropy and enthalpy. Gibbs free energy is used to measure the amount of available energy that a chemical reaction provides. (i) Predict in which of the following, entropy increases/decreases: (a) A liquid crystallizes into a solid. (b) Temperature of a crystalline solid is raised from 0 K to 115 K. (ii) Why is the Molar Entropy of vaporization for water more than ethanol? (iii) For the reaction, $2Cl(g) \rightarrow Cl_2(g)$, what are the signs of ΔH and ΔS? **OR** Entropy of diamond is less than that of graphite. What conclusion do you draw?	2+1+1
30	Aromatic compounds are those organic compounds that contain one or more rings with pi electrons delocalized all the way around them. The term "aromatic" was assigned before the physical mechanism determining aromaticity was discovered, and referred simply to the fact that many such compounds have a sweet or pleasant odour; however, not all aromatic compounds have a sweet odour, and not all compounds with a sweet odour are aromatic compounds. The properties of aromatic hydrocarbons translate into their uses. One of the main uses for aromatic hydrocarbons is as a non-polar solvent for other molecules. Thus, aromatic hydrocarbons can be used as additives in gasoline, paints, lacquers, and other solutions. Their low reactivity also contributes to their use as a solvent. For example, toluene is	1+1+2
	an aromatic molecule that is used as a solvent in paint thinners. The aromatic compound benzene is used in high-octane fuel production as well as the production of other chemicals, such as pesticides, detergents, dyes, and more. Benzene was once a common additive in gasoline, but due to the discovery of carcinogenic nature in humans, it's use has been reduced to mainly high-octane fuels. **I.** The reaction of benzene with chlorine in the presence of anhydrous $FeCl_3$ is classified as i) Nucleophilic substitution ii) Electrophilic substitution iii) Nucleophilic addition iv) Electrophilic addition **II.** Which of the following is false about benzene? i) It is a planar molecule. i) It can be converted into cyclohexane by hydrogenation in the presence of nickel catalyst. ii) The C atoms in a benzene ring are sp2 hybridized. iii) There are 6 isomeric dichlorobenzenes. **III**. What are aromatic compounds ? Give one example.	

SECTION-E

Directions (Q. No. 31-33) carries 5 marks

31	i) Explain +I and -I effect with examples. ii) An organic compound contains 69% carbon and 4.8% hydrogen, the remainder being oxygen. Calculating the masses of carbon dioxide and water produced when 0.20 g of this compound is subjected to complete combustion. OR (a) Which bond is more polar in the following pairs of molecules: H_3C-H, H_3C-Br (b) Write resonance structures of CH_3COO^- (c) Define electrophile and nucleophile with an example. (d) Explain why $(CH_3)_3C^+$ is more stable than CH_3CH_2+ and $^+CH_3$ is the least stable cation.	2+3 1+1+1+2
32	(a) Explain sp sp^2 and sp^3 hybridisation with suitable examples. **OR** Use the molecular orbital energy level diagram to show that (a) N_2 would be expected to have a triple bond. [2] (b) F_2 a single bond [2] (c) Ne_2 no bond [1]	5
33	(i) Define Pauli's Exclusion Principle. (ii) Write the electronic configurations of the following ions: (a) Na^+ (b) Fe^{2+} (iii) Find the energy of each of the photons which (a) correspond to light of frequency 3×10^{15} Hz. (b) have a wavelength of 0.50 Å. **OR** (a) Define Hund's rule of maximum multiplicity. (b) An atom of an element contains 29 electrons and 35 neutrons. Deduce (i) the number of protons and (ii) the electronic configuration of the element. (c) Calculate the wavelength of an electron moving with velocity of 2.05×10^7 ms^{-1}	1+2+2=5

**********ALL THE BEST**********