

KENDRIYA VIDYALAYA SANGATHAN, JABALPUR REGION
SESSION ENDING EXAMINATION 2022-23, CLASS - XI
CHEMISTRY (043)

Max. Marks: 70

Time: 3 Hours

Read the following Instructions carefully.

- There are **35** questions in this question paper with internal choice.
- SECTION A consists of 18 multiple-choice questions carrying 1 mark each.
- SECTION B consists of 7 very short answer questions carrying 2 marks each.
- SECTION C consists of 5 short answer questions carrying 3 marks each.
- SECTION D consists of 2 case- based questions carrying 4 marks each.
- SECTION E consists of 3 long answer questions carrying 5 marks each.
- All questions are compulsory.
- 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.		
1	How many moles of Hydrogen atoms are present in 4 moles of H ₂ ? (a) 2 (b) 4 (c) 8 (d) 12	[1]
2	A well stoppered thermos flask contains some ice cubes. This is an example of (a) Closed system (b) Open system (c) Isolated system (d) Non thermodynamics system	[1]
3	Considering the elements B, Al, Mg, and K, the correct order of their metallic character is: (a) B > Al > Mg > K (b) Al > Mg > B > K (c) Mg > Al > K > B (d) K > Mg > Al > B	[1]
4	The trans- alkenes are formed by the reduction of alkynes with (a) Sn/HCl (b) H ₂ -Pd/C, BaSO ₄ (c) Na/ Liquid NH ₃ (d) NaBH ₄	[1]
5	The types of hybrid orbitals of nitrogen in NO ₂ ⁺ , NO ₂ ⁻ and NH ₄ ⁺ respectively are expected to be (a) sp, sp ³ and sp ² (b) sp, sp ² and sp ³ (c) sp ² , sp and sp ³ (d) sp ² , sp ³ and sp	[1]
6	Which of the following options does not represent ground state electronic configuration of an atom? (a) 1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 3d ⁸ 4s ² (b) 1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 3d ⁹ 4s ² (c) 1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 3d ¹⁰ 4s ¹ (d) 1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 3d ⁵ 4s ¹	[1]
7	Identify disproportionation reaction (a) CH ₄ + 2O ₂ → CO ₂ + 2H ₂ O (b) CH ₄ + 4Cl ₂ → CCl ₄ + 4HCl (c) 2F ₂ + 2OH ⁻ → 2F ⁻ + OF ₂ + H ₂ O (d) 2NO ₂ + 2OH ⁻ → NO ₂ ⁻ + NO ₃ ⁻ + H ₂ O	[1]
8	In the modern periodic table, the period indicates the value of: (a) Atomic number (b) Atomic mass (c) Principal quantum number (d) Azimuthal quantum number.	[1]
9	Which series has the highest energy in the hydrogen spectrum? (a) Lyman (b) Balmer (c) Pfund (d) Paschen	[1]
10	At 500 K, equilibrium constant, K _c , for the following reaction is 5. ½ H ₂ (g) + ½ I ₂ (g) ⇌ HI (g) What would be the equilibrium constant K _c for the reaction 2HI (g) ⇌ H ₂ (g) + I ₂ (g) (a) 0.04 (b) 0.4 (c) 25 (d) 1/5	[1]
11	The formal charge on central oxygen atom in O ₃ molecule is: (a) 0 (b) +1 (c) -1 (d) - 2	[1]
12	Benzene reacts with CH ₃ Cl in the presence of anhydrous AlCl ₃ to form (a) Chlorobenzene (b) Benzyl chloride (c) xylene (d) toluene	[1]
13	The I.U.P.A.C name of the compound is (a) 3, 3, 3 Trimethyl propene (b) 1,1, 1 Trimethyl 2 pentane (c) 3, 3 Dimethyl 1 butene (d) 2, 2 Dimethyl 3 butene.	[1]



14	A system absorbs reversibly 600 J of heat and performs 250 J of work. The increase in the internal energy of system is:- (a) 850 kJ (b) 600 kJ (c) 350 kJ (d) 250 kJ	[1]
15	Given below are two statements labelled as Assertion (A) and Reason (R) Assertion: Combustion of 16 g of methane gives 18 g of water. Reason: In the combustion of methane, water is one of the products. Select the most appropriate answer from the options given below: (a) Both A and R are true and R is the correct explanation of A. (b) Both A and R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.	[1]
16	Given below are two statements labelled as Assertion (A) and Reason (R) Assertion: The boiling point of n-alkanes increases with increase in number of carbon atoms. Reason: Vander Waals force of attraction increases with increase in number of carbon and molecular mass. Select the most appropriate answer from the options given below: (a) Both A and R are true and R is the correct explanation of A. (b) Both A and R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true	[1]
17	Given below are two statements labelled as Assertion (A) and Reason (R) Assertion: Hyperconjugation involves delocalisation of s electrons of C—H bond of an alkyl group directly attached to an atom of unsaturated system or to an atom with an unshared p orbital. Reason: Hyperconjugation explains the stability of alkenes. Select the most appropriate answer from the options given below: (a) Both A and R are true and R is the correct explanation of A. (b) Both A and R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.	[1]
18	Given below are two statements labelled as Assertion (A) and Reason (R). Assertion: For any chemical reaction at a particular temperature, the equilibrium constant is fixed and is a characteristic property. Reason: Equilibrium constant is independent of temperature. Select the most appropriate answer from the options given below: (a) Both A and R are true and R is the correct explanation of A. (b) Both A and R are true but R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.	[1]
SECTION B		
This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.		
19	Among the elements of the second period Li to Ne, pick out the element: (i) with the highest first ionisation energy, (ii) with the largest atomic radius. Give the reason for your choice.	[2]
20	Copper oxide obtained by heating copper carbonate or copper nitrate contains copper and oxygen in the same ratio by mass. Which law is illustrated by this observation? State the law. Or What is the difference between molality and molarity?	[2]
21	Define ozonolysis. Write the chemical equation showing ozonolysis of propene. Or Write the product in each of the following reactions: (i) $3 \text{CH} \equiv \text{CH} \xrightarrow{\text{Red hot Fe tube, 873 K}}$ (ii) $\text{CH}_3\text{COONa} + \text{NaOH} \xrightarrow{\text{CaO, } \Delta}$	[2]
22	The value of K_c for the reaction $2\text{X}(\text{g}) \rightleftharpoons \text{Y}(\text{g}) + \text{Z}(\text{g})$ is 1×10^{-4} At a given time, the composition of reaction mixture is $[\text{X}] = 2 \times 10^{-5} \text{ mol}$, $[\text{Y}] = 1 \times 10^{-5} \text{ mol}$ and $[\text{Z}] = 1 \times 10^{-5} \text{ mol}$ In which direction will the reaction proceed?	[2]

23	Predict in which of the following, entropy increases/decreases. Give reason: (i) Temperature of crystalline solid is raised from 0 K to 115 K. (ii) $\text{H}_2(\text{g}) \rightarrow 2\text{H}(\text{g})$	[2]
24	In an estimation of sulphur by Carius method, 0.468 g of an organic compound gave 0.668 g of barium sulphate. Find the percentage of sulphur in the compound. (At. wt. of Ba = 137, S = 32, O = 16 u)	[2]
25	The first ionization enthalpy values (in kJ mol^{-1}) of group 13 element are: <div style="display: flex; justify-content: space-around; margin: 5px 0;"> BAlGaInTl </div> <div style="display: flex; justify-content: space-around; margin: 5px 0;"> 801577579558589 </div> How would you explain this deviation from the general trend?	[2]

SECTION C

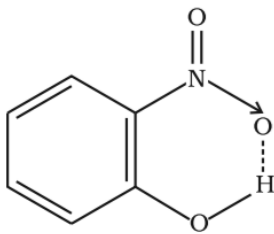
This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

26	State Heisenberg's uncertainty principle. Calculate the uncertainty in the position of an electron if the uncertainty in its velocity is $5.7 \times 10^5 \text{ m/s}$.	[3]
27	Balance given ionic equation by ion electron method: $\text{MnO}_4^- + \text{Fe}^{2+} \rightarrow \text{Mn}^{2+} + \text{Fe}^{3+}$ (in acidic medium) Or $\text{Cr}_2\text{O}_7^{2-} + \text{SO}_2 \rightarrow \text{Cr}^{3+} + \text{SO}_4^{2-}$ (in acidic medium)	[3]
28	Define Isomerism. Explain the type isomerism shown by following pair of compounds: (a) But-1-ene and But-2-ene b. Ethanol and Dimethyl Ether	[3]
29	On the basis of Le Chatelier's principle explain how temperature and pressure can be adjusted to increase the yield of ammonia in the following reaction. $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g}) \quad \Delta H = -92.38 \text{ kJ mol}^{-1}$ What will be the effect of addition of argon to the above reaction mixture at constant volume? Or The species: H_2O , HSO_4^- and NH_3 can act both as Bronsted acids and bases. For each case give the corresponding conjugate acid and conjugate base.	[3]
30	A compound contains 32% carbon, 4% hydrogen and rest oxygen. If molecular mass of compound is 150. calculate the empirical and molecular formula compound.	[3]

SECTION D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

31	Many orbitals are possible in an atom. Qualitatively these orbitals can be distinguished by their size, shape, and orientation. An orbital of smaller size means there is more chance of finding the electron near the nucleus. Similarly, shape and orientation mean that there is more probability of finding the electron along with certain directions than along others. The principal quantum number determines the size and to large extent the energy of the orbital. Azimuthal quantum number, 'l' is also known as orbital angular momentum or subsidiary quantum number. Each shell consists of one or more subshells or sub-levels. The number of sub-shells in a principal shell is equal to the value of n. Magnetic orbital quantum number. The fourth quantum number is known as the electron spin quantum number (m_s). An electron spins around its own axis, much in a similar way as the earth spins around its own axis while revolving around the sun. (i) What does magnetic orbital number describe? (ii) What is the total number of orbitals associated with the principal quantum number $n = 3$? (iii) Write the value of four quantum numbers for the valence electron of the sodium atom. Or (iii) Out of 6s and 4f orbitals, which has higher energy and why?	[4]
32	Once an organic compound is extracted from a natural resource or synthesized in the laboratory, it is essential to purify it. Various methods used for the purification of organic compounds are based on the nature of the compound and the nature of the impurity present in it. Finally, the purity of a compound is ascertained by determining its boiling point and melting point. Most of the pure compounds have sharp melting and boiling points. New	[4]

	<p>methods of checking the purity of an organic compound are based on different types of chromatographic and spectroscopic methods.</p> <p>(i) Give two examples of adsorbent used in chromatography.</p> <p>(ii) How will you separate a mixture of ammonium chloride and common salt?</p> <p>(iii) Alcohol (boiling point 97°C) was mixed with a hydrocarbon (boiling point 68°C) by mistake. Suggest a suitable method to separate the two compounds. Explain the reason for your choice.</p> <p style="text-align: center;">Or</p> <p>(iii) Name the method used to separate:</p> <p>(a) glycerol from spent lye in soap industry.</p> <p>(b) aniline from aniline water mixture</p>	
SECTION E		
The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.		
33	<p>(i) What is the value of ΔG when ice and water are in equilibrium?</p> <p>(ii) What is intensive property? Which of the following is an intensive property? Surface tension, Mass, Volume, Enthalpy, Density</p> <p>(iii) A swimmer coming out from a pool is covered with a film of water weighing about 18 g. How much heat must be supplied to evaporate this water at 298 K? Calculate the internal energy of vaporisation at 100 °C.</p> <p>$\Delta_{\text{vap}}H^\circ$ for water at 373 K = 40.66 kJ mol⁻¹</p> <p style="text-align: center;">Or</p> <p>(i) State Hess's law.</p> <p>(ii) Give a brief note on the following thermodynamic terms: (a) Standard enthalpy of combustion, (b) Standard enthalpy of formation.</p> <p>(iii) For the reaction:</p> <p>$2A(g) + B(g) \longrightarrow 2D(g)$ $\Delta U^\circ = -10.5 \text{ kJ}$ and $\Delta S^\circ = -44.1 \text{ J K}^{-1} \text{ mol}^{-1}$ Calculate ΔG° for the reaction and predict whether the reaction may occur spontaneously</p>	[5]
34	<p>(i) How will you bring out the following conversions: a) Ethyne to ethane b) Benzene to m-nitrochlorobenzene c) Ethanol to ethene</p> <p>(ii) In the presence of peroxide addition of HBr to propene takes place according to anti Markovnikov's rule but peroxide effect is not seen in the case of HCl and HI. Explain.</p> <p style="text-align: center;">Or</p> <p>(i) Draw Newman and Sawhorse projections for the eclipsed and staggered conformations of ethane. Which of these conformations is more stable and why?</p> <p>(ii) Explain the following: a) Wurtz reaction b) β – Elimination reaction</p>	[5]
35	<p>(i) Discuss the shape of SF₄ using VSEPR theory.</p> <p>(ii) Using Molecular Orbital theory, Compare the relative stability of the following species: O₂, O₂⁺, O₂⁻, O₂²⁻</p> <p>(iii) Identify and Write the type of hydrogen bonding present in following molecule:</p> <p>(iv) Explain why BeH₂ molecule has a zero-dipole moment although the Be–H bonds are polar.</p> <div style="text-align: right;">  </div>	[5]