



INDIAN SCHOOL SOHAR
TERM - I EXAMINATION (2024-2025)
CHEMISTRY (043)

CLASS: XI

DATE: 22 /09/2024

MAX.MARKS: 70

TIME : 3 HOURS

General Instructions:

- (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.

1.	The molarity of a solution by mixing 750ml of 0.5M HCl with 250mL of 2MHCl will be :	
	a) 0.975M	b) 0.875M
	c) 1.00M	d) 1.75M
2.	The entropy change can be calculated by using the expression $\Delta S = q_{rev} / T$. When water freezes in a glass beaker, choose the correct statement amongst the following :	
	a) ΔS (system) decreases but ΔS (surroundings) remains the same.	b) ΔS (system) increases but ΔS (surroundings) decreases.
	c) ΔS (system) decreases but ΔS (surroundings) increases.	d) ΔS (system) decreases and ΔS (surroundings) also decreases.
3.	For a specific reaction, which of the following statements can be made about K, the equilibrium constant?	
	a) It always remains the same at different reaction conditions.	b) It increases if the concentration of one of the products is increased.
	c) It changes with changes in the temperature.	d) It increases if the concentration of one of the reactants is increased.
4.	Which one of the following is not equal with 1 mol O ₂ .	
	a) 16 g Oxygen	b) N _A no of molecules of O
	c) 22.4 L of Oxygen gas	d) None of these
5.	The wavelength associated with the golf ball, weighing 200 g and moving at a speed of 5 m/hour is of the order.	
	a) 10 ⁻¹⁰ m	b) 10 ⁻²⁰ m
	c) 10 ⁻³⁰ m	d) 10 ⁻⁴⁰ m
6.	Calculate the number of Moles of Cu(C ₂ H ₃ O ₂) ₂ present in 200, if molar mass is 181g/mol.	
	a) 1.1 mol	b) 1 mol
	c) 0.9 mol	d) 1.2 mol
7.	Electromagnetic radiation with maximum wavelength is :	
	a) Ultra- violet	b) Radio waves
	c) X-ray	d) Infra-red

8.	The q is when heat is transferred from the surroundings to the system and w is.....When a gas undergoes expansion		
	a) positive, negative	b) negative, positive	
	c) positive, positive	d) negative, negative	
9.	Which of the following terms are unitless?		
	a) Molality	b) Molarity	
	c) Formality	d) Mass percent	
10.	When the system $A + B \rightleftharpoons C + D$ is at equilibrium,		
	a) the sum of the concentrations of A and B must equal the sum of the concentrations of C and D.	b) both the forward and the reverse reactions have stopped.	
	c) the forward reaction has stopped.	d) neither the forward nor the reverse reaction has stopped.	
11.	Rutherford's scattering experiment is related to the size of the:		
	a) Nucleus.	b) Atom.	
	c) Electron.	d) Neutron	
12.	A compound's empirical formula and molecular mass are CH_2O and 180 g respectively. What will be the molecular formula of the compound?		
	a) $\text{C}_9\text{H}_{18}\text{O}_9$	b) CH_2O	
	c) $\text{C}_6\text{H}_{12}\text{O}_6$	d) $\text{C}_2\text{H}_4\text{O}_2$	
	In the following questions (Q. No. 13 to 16) a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices:		
	(a) Assertion and reason both are correct statements and reason is the correct explanation for assertion.		
	(b) Assertion and reason both are correct statements but the reason is not the correct explanation for assertion.		
	(c) Assertion is a correct statement but the reason is wrong.		
	(d) Assertion is a wrong statement but the reason is correct.		
13.	Assertion: According to Thomson model of atom, mass of the atom is assumed to be uniformly distributed over the atom. Reason: According to Thomson model of atom, positive charge is concentrated in the centre of the atom.		
14.	Assertion: An aqueous solution of ammonium acetate can act as buffer solution Reason: An aqueous solution of any pure liquid can act as buffer solution		
15.	Assertion: A reaction in which randomness of the system increases, will always be spontaneous. Reason: According to the second law of thermodynamics, the spontaneous reaction is accompanied by increase in randomness of the universe.		
16.	Assertion: One atomic mass unit is defined as one twelfth of the mass of one carbon-12 atom. Reason: Carbon-12 isotope is the most abundant isotope of carbon and has been chosen as standard.		
	SECTION-B		
	This section contains 5 questions with internal choice in one question. The following questions are very short answer types and carry 2 marks each.		
17.	When liquid benzene is oxidized at constant pressure at 300 K. The change in enthalpy is -3728. KJ, What is the change in internal energy at the same temperature? ($R = 8.314 \times 10^{-3} \text{ kJ/mol K}$)		2x1
18.	What do mean by molarity .Calculate the molarity of NaOH in the solution prepared by dissolving its 4 g in enough water to form 250 mL of the solution?		2x1

[illegible]

	$\text{Li(g)} + \text{Cl(g)} \rightarrow \text{LiCl(s)}$ Given that $\Delta_{\text{sub}}H^\circ$ of Li = $160.67 \text{ kJmol}^{-1}$ $\Delta_{\text{diss}}H^\circ$ of Cl_2 = $244.34 \text{ kJmol}^{-1}$ Δ_iH° of Li(g) = $520.07 \text{ kJmol}^{-1}$ Δ_eH° of Cl(g) = $-365.26 \text{ kJmol}^{-1}$ Δ_fH° of LiCl = $-401.66 \text{ kJmol}^{-1}$	
	SECTION-D	
	<i>The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks. Read the passage carefully and answer the questions that follow.</i>	
29.	Read the passage given below and answer the questions which follow: Chemical equilibrium occurs in a reversible reaction when the rate of the forward reaction equals the rate of the backward reaction, resulting in no net change in the concentrations of reactants and products. At this point, the system is said to be in a dynamic equilibrium, where the reactions continue to occur, but the amounts of reactants and products remain constant. Le Chatelier's Principle helps predict how a system at equilibrium responds to external changes. According to this principle, if a system at equilibrium is disturbed by changes in concentration, pressure, or temperature, the system will shift its position to counteract the disturbance and restore equilibrium. For example, increasing the concentration of a reactant will shift the equilibrium toward the product side to reduce the added reactant. Several factors affect the rate of reaction, influencing how quickly equilibrium is achieved. Concentration affects the rate because a higher concentration of reactants typically leads to more collisions and a faster reaction. Temperature also plays a crucial role: increasing temperature generally increases the reaction rate by providing more kinetic energy to the molecules, though it can shift the equilibrium position depending on whether the reaction is exothermic or endothermic. Pressure affects reactions involving gases, where an increase in pressure shifts the equilibrium toward the side with fewer moles of gas. Finally, the presence of a catalyst speeds up both the forward and reverse reactions equally, allowing the system to reach equilibrium faster without altering the position of equilibrium. Answer the following:- - In a reaction, if the value of Gibbs free energy is greater than zero what does it infer? - K is greater than 1 - K is less than 1 - K is equal to 1 - Cannot deduce K from Gibbs free energy. - What did the Q depicted in the equation; $\Delta G = \Delta G^\circ + RT \ln Q$? - reaction coefficient - reaction quotient - equilibrium constant - free energy - How can Le Chatelier's Principle be applied to industrial processes to optimize the yield of desired products? OR Explain how Le Chatelier's Principle predicts the response of a system at equilibrium to a change in concentration	
30.	Read the passage given below and answer the questions which follow: Thermodynamics is a branch of physics that studies the relationships between heat, work, and energy in a system. A key concept in thermodynamics is entropy, which measures the disorder or randomness of a system; it tends to increase in natural processes, reflecting the second law of thermodynamics. Enthalpy is another important thermodynamic property, representing the total heat content of a system at constant pressure; it is used to describe the energy required for a process, such as chemical reactions. Gibbs free energy combines enthalpy and entropy to determine the spontaneity of a process. The Gibbs free energy change (ΔG) predicts whether a	1+1+2

	process will occur spontaneously: if ΔG is negative, the process is spontaneous; if positive, it is non-spontaneous. Together, these concepts help explain how energy is transferred and transformed in physical and chemical processes. Answer the following- I. Thermodynamics is not concerned about_____. a) Energy changes involved in a chemical reaction b) The extent to which a chemical reaction proceeds. c) The rate at which a reaction proceeds. d) The feasibility of a chemical reaction II. A gas expands in vacuum. The work done by the gas is a) zero b) minimum c) maximum d) cannot be predicted. III. The standard heat of formation of Fe_2O_3 (s) is $824.2 \text{ kJ mol}^{-1}$ Calculate heat change for the reaction $4\text{Fe(s)} + 3\text{O}_2 \text{ (g)} \rightarrow 2\text{Fe}_2\text{O}_3\text{(s)}$ OR Change in internal energy is a state function while work is not, why?	
	SECTION-E	
	<i>The following questions are long answer types and carry 5 marks each. All questions have an internal choice.</i>	
31.	I. Calculate ΔG° for the reaction $4\text{NH}_3\text{(g)} + 5\text{O}_2\text{(g)} \rightarrow 4\text{NO(g)} + 6\text{H}_2\text{O (g)}.$ Given that ΔG° for the formation of $\text{NH}_3\text{(g)}$, NO(g), $\text{H}_2\text{O (l)}$ are -16.8 kJmol^{-1}, $+86.7 \text{ kJmol}^{-1}$ and $-237.2 \text{ kJmol}^{-1}$ respectively. Predict the feasibility of the reaction under the reaction. II. For the reaction $\text{A(s)} \rightarrow \text{B(s)} + \text{C(s)}$, Calculate the entropy change at 298K and 1atm if absolute entropies are $\text{A} = 130 \text{ JK}^{-1}\text{mol}^{-1}$, $\text{B} = 203 \text{ JK}^{-1}\text{mol}^{-1}$ and $\text{C} = 152 \text{ JK}^{-1}\text{mol}^{-1}$ III. State Hess's Law. On which law of thermodynamics is Hess law based? OR I. Calculate the enthalpy change for the process $\text{CCl}_4 \text{ (g)} \rightarrow \text{C(g)} + 4\text{Cl(g)}$ And calculate bond enthalpy of C-Cl in $\text{CCl}_4\text{(g)}$. Given: $\Delta_{\text{vap}}H^\circ (\text{CCl}_4) = 30.5 \text{ kJmol}^{-1}$ $\Delta_{\text{f}}H^\circ (\text{CCl}_4) = -135.5 \text{ kJmol}^{-1}$ $\Delta_{\text{a}}H^\circ (\text{C}) = 715.0 \text{ kJmol}^{-1}$ where $\Delta_{\text{a}}H^\circ$ is enthalpy of atomization $\Delta_{\text{a}}H^\circ (\text{Cl}_2) = 242 \text{ kJmol}^{-1}$ II. Calculate the standard entropy change for a reaction $\text{X} \rightleftharpoons \text{Y}$ if the value of $\Delta H^\circ = 28.40 \text{ kJ}$, $\Delta H^\circ = 28.40 \text{ kJ}$, and the equilibrium constant is 1.8×10^{-7} at 298K	2+2+1 3+2
32.	Any five questions- I. What is quantization of energy?	1x5

	II. What is the value of e/m for the particles in cathode rays? Why electron is called as universal fundamental particle? III. Why do we use the terms average mass unit. What is the mass of one atom of C-12 in grams? IV. The threshold frequency ν_0 for a metal is $7.0 \times 10^{14} \text{ s}^{-1}$. Calculate the kinetic energy of an electron emitted when radiation of frequency $\nu = 1.0 \times 10^{15} \text{ s}^{-1}$ hits the metal. V. State law of multiple proportions VI. The wavelength of the green light from a traffic signal is 522nm. What is the frequency and wave number of this radiation? VII. Why are there so many lines in the hydrogen spectrum? Although there is only one electron in its spectrum?	
33.	I. Calculate the pH of a buffer solution containing 0.01M CH_3COOH and 0.05M CH_3COONa. Dissociation constant of CH_3COOH is 1.8×10^{-5} at 25°C. [$\log 2 = 0.3010$, $\log 5 = 0.6990$, $\log 1.8 = 0.2553$] II. What is common ion effect? Illustrate your answer with an example? III. When 3.06 gram of solid NH_4HS is introduced into a two-liter evacuated flask at 27°C, 30% of the solid decomposes into gaseous ammonia and hydrogen sulphide. i) Calculate K_c and K_p for the reaction at 27°C. ii) What would happen to the equilibrium when more solid NH_4HS is introduced into the flask? OR I. The degree of ionization of a 0.1 M bromoacetic acid solution is 0.132. Calculate the pH of the solution and the pK_a of bromoacetic acid. [$\log 1.7 = 0.2405$] II. Calculate the pH of a buffer solution containing 0.2 mole of NH_4Cl and 0.1 mole of NH_4OH per liter? K_b for $\text{NH}_4\text{OH} = 1.85 \times 10^{-5}$, $\log 18 = 0.2672$, $\log 2 = 0.3010$ III. A gas is in equilibrium with water at a certain temperature and pressure. What will happen if- i) Temperature is increased ii) Pressure is increased.	5
