SAMPLE 1 PERIODIC TEST SET 3 CHEMISTRY

UNIT- I, II & III (SOLUTIONS, ELECTROCHEMISTRY & CHEMICAL KINETICS)

SUBJECT: CHEMISTRY **TIME: 90 MIN.**

CLASS: XII **MAX. MARKS: 40**

Note: There are **19** questions in this question paper.

1. Q. No. 1-5 consist of multiple-choice questions carrying 1 mark each.
2. Q. No. 6-9 consist of Assertion and Reason questions carrying 1 mark each.
3. Q. No. 10-13 consist of very short answer questions carrying 2 marks each.
4. Q. No. 14-16 consists of short answer questions carrying 3 marks each.
5. Q. No. 17 consists of case- based questions carrying 4 (1+1+1+1) marks.
6. Q. No. 18-19 consists of long answer questions carrying 5 marks each.

S.No.	Questions	Marks
1.	What happens when a solute crystal is added to a supersaturated solution? (a) It becomes a colloidal solution (b) The solute dissolves in the solution (c) The solution desaturates (d) The solute precipitates out of the solution	1
2.	_____ _ obeys Raoult's law in all stages of concentration. (a) Ideal Solution (b) Non-Ideal solution (c) Real Solution (d) None of the mentioned	1
3.	The molar conductivity of CH_3COOH at infinite dilution is 390 Scm^2/mol. Using the graph and given information, the molar conductivity of CH_3COOK will be: (a) 100 Scm^2/mol (b) 115 Scm^2/mol (c) 150 $Scm^2/$ mol (d) 125 Scm^2/mol	1
4.	Which of the following is given to a fuel cell's cathode? (a) Hydrogen (b) Nitrogen (c) Oxygen (d) Chlorine	1
5.	For the reaction, A +B → Product, rate is doubled when the concentration of B is doubled, and rate increases by a factor of 8 when the concentration of both the reactants (A and B) are doubled, Rate law for the reaction can be written as: (a) rate = $k[A][B]^2$ (b) rate = $k[A]^2[B]^2$ (c) rate = k[A][B] (d) rate = $k[A]^2[B]$	1
	In the following questions one mark each (Q. No. 6 - 9) a statement of **Assertion (A)** followed by a statement of **Reason (R)** is given. Choose the correct answer out of the following choices. (i) A and R both are correct statements and R is the correct explanation for A.	

	(ii) A and R both are correct statements and R is not correct explanation for A. (iii) A is correct statement but R is wrong statement. (iv) A is wrong statement but R is correct statement.	
6.	**Assertion (A):** If one component of a solution obeys Raoult's law over a certain range of composition, the other component will not obey Henry's law in that range. **Reason (R):** Raoult's law is a special case of Henry's law.	1
7.	**Assertion (A):** Molarity of a solution in liquid state changes with temperature. **Reason (R):** The volume of a solution changes with change in temperature.	1
8.	**Assertion:** On increasing dilution, the specific conductance keeps on increasing. **Reason:** On increasing dilution, degree of ionisation of weak electrolyte increases and molality of ions also increases.	1
9.	**Assertion:** The order and molecularity of a reaction are always the same. **Reason:** Order is determined experimentally whereas molecularity by a balanced elementary reaction.	1
10.	What is meant by positive deviations from Raoult's law? Give an example. What is the sign of ΔH_{mix} for positive deviation?	2
11.	When 1.5 g of a non-volatile solute was dissolved in 90 g of benzene, the boiling point of benzene raised from 353.23 K to 353.93 K. Calculate the molar mass of the solute. (K_b for benzene = 2.52 K kg mol^{-1})	2
12.	Corrosion is an electrochemical phenomenon. The oxygen in moist air reacts as follows: $O_2(g) + 2H_2O(l) + 4e^- \rightarrow 4OH^-(aq)$. Write down the possible reactions for corrosion of zinc occurring at the anode, cathode, and overall reaction to form a white layer of zinc hydroxide.	2
13.	A first-order reaction takes 69.3 min for 50% completion. What is the time needed for 80% of the reaction to get completed? (Given: log 5 =0.6990, log 8 = 0.9030, log 2 = 0.3010)	2
14.	(a) State Henry's law and explain why are the tanks used by scuba divers filled with air diluted with helium (11.7% helium, 56.2% nitrogen, and 32.1% oxygen). (b) Assume that argon exerts a partial pressure of 6 bar. Calculate the solubility of argon gas in water. (Given Henry's law constant for argon dissolved in water, K_H = 40 kbar)	3
15.	Resistance of a conductivity cell filled with 0.1 mol L^{-1} KCl solution is 100 ohms. If the resistance of the same cell when filled with 0.02 mol L^{-1} KCl solution is 520 ohms, calculate the conductivity and molar conductivity of 0.02 mol L^{-1} KCl solution. The conductivity of 0.1 mol L^{-1}KCl solution is 1.29×10^{-2} ohm $^{-1}$ cm^{-1}.	3
16.	(a) What is the overall order of the two reactions having rate expression, Rate = $k[A]^{1/2}[B]^{3/2}$ and Rate = $k[A]^{3/2}[B]^{-1}$ respectively. (b) (b) The following data were obtained during the first order thermal decomposition of SO_2Cl_2 at a constant volume: $SO_2Cl_2(g) \rightarrow SO_2(g) + Cl_2(g)$	3

Experiment	Time/s–1	Total pressure/atm
1	0	0.4

	<table><tr><td>2</td><td>100</td><td>0.7</td></tr></table> Calculate the rate constant. (Given: log 4 = 0.6021, log 2 = 0.3010)	
17.	**Case study-based question:** Chemical kinetics: The branch of physical chemistry that is concerned with understanding the rates of chemical reactions. It is to be contrasted with thermodynamics which deals with the direction in which a process occurs but in itself tells nothing about its rate. Thermodynamics is time's arrow while chemical kinetics is time's clock. Chemical kinetics relates to many aspects of cosmology, geology, biology, engineering and even psychology and thus has far-reaching implications. The principles of chemical kinetics applied to purely physical processes as well as to chemical reactions. The rate of a chemical reaction is defined in terms of the rates with which the products are formed and the reactants (the reacting substances) are consumed. For chemical systems, it is usual to deal with the concentrations of substances, which is defined as the amount of substances per unit volume. The rate can then be defined as the concentration of a substance that is consumed or produced in unit time. Sometimes it is more convenient to express rates as number of molecules formed are consumed in unit time. Answer the following questions: Q1. Chemical kinetics is the study to find out: (a) The feasibility of a chemical reaction (b) Speed of a reaction (c) Extent to which a reaction will proceed (d) All of the above Q2. The rate of a reaction: (a) Increases as the reaction proceeds (b) Decreases as the reaction proceeds (c) May increase or decrease as the reaction proceeds (d) Remains the same as the reaction proceeds Q3. A reaction is first order with respect to reactant A. What will be the initial rate, if concentration of reactant is reduced by half? (a) Halved (b) doubled (c) tripled (d) not changed Q4. In the first order reaction, the concentration of the reactant is reduced to 1/4th in 60 minutes. What will be its half-life? (a) 120 min (b) 40 min (c) 30 min (d) 25 min	4
18.	(a) Define the following terms: (i) Molarity (ii) Molal elevation constant (Kb) (b) A solution containing 15 g urea (molar mass = 60 g mol^{-1}) per litre of solution in water has the same osmotic pressure (isotonic) as a solution of glucose (molar mass = 180 g mol^{-1}) in water. Calculate the mass of glucose present in one litre of its solution. OR (a) What type of deviation is shown by a mixture of ethanol and acetone? Give reason. (b) A solution of glucose (molar mass = 108 g mol^{-1}) in water is labelled as 10% (by mass). What would be the molality and molarity of the solution? (Density of solution = 1.2 g mL^{-1})	(5)

19.	(a) Why does the cell voltage of a mercury cell remain constant during its 10 lifetimes? (b) Write the reaction occurring at the anode and cathode and the products of electrolysis of aq KCl. (c) What is the pH of the HCl solution when the hydrogen gas electrode shows a potential of -0.59 V at standard temperature and pressure? OR (a) Molar conductivity of substance A is 5.9×10^{3} S/m and B is 1×10^{-16} S/m. Which of the two is most likely to be copper metal and why? (b) What is the quantity of electricity in Coulombs required to produce 4.8 g of Mg from molten $MgCl_2$? How much Ca be produced if the same amount of electricity was passed through molten $CaCl_2$? (Atomic mass of Mg = 24 u, atomic mass of Ca = 40 u). (c) What is the standard free energy change for the following reaction at room temperature? Is the reaction spontaneous? $Sn(s) + 2Cu^{2+}(aq) \rightarrow Sn^{2+}(aq) + 2Cu^{+}(s)$	(5)