



## Delhi Public School, Howrah

PERIODIC TEST - III (2024-2025)

CLASS-XII

Care must be taken not to write anything on the question paper. All the questions must be attempted in the correct sequence.

SUBJECT: CHEMISTRY (CODE-043)

TIME: 3 HOURS

F.M.: 70

### General Instructions:

Read the following instructions carefully.

- There are 33 questions in this question paper with internal choice.
- SECTION A consists of 16 multiple choice questions carrying 1 mark each.
- SECTION B consists of 5 short answer questions carrying 2 marks each.
- SECTION C consists of 7 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		MARKS
<b>The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.</b>		
1.	Atharv heated a mixture of primary amine and chloroform with ethanolic potassium hydroxide (KOH) to form isocyanides which has foul smell. What is the name of the reaction involved in the statement?  (a) Hoffmann bromide degradation reaction (b) Gabriel Phthalimide reaction (c) Hinsberg's Test (d) Carbylamine reaction	1
2.	Based on the position of -Br in the compound $\text{CH}_3\text{CH}=\text{CH}(\text{Br})(\text{CH}_3)_2$ , it can be classified as _____ halide. (a) Allyl (b) Aryl (c) Vinyl (d) Secondary	1
3.	$\text{KMnO}_4$ is not acidified by HCl instead of $\text{H}_2\text{SO}_4$ because (a) $\text{H}_2\text{SO}_4$ is stronger acid than HCl (b) HCl is oxidised to $\text{Cl}_2$ by $\text{KMnO}_4$ (c) $\text{H}_2\text{SO}_4$ is dibasic acid (d) rate of reaction is faster in presence of $\text{H}_2\text{SO}_4$	1
4.	Toluene reacts with a halogen in the presence of iron (III) chloride giving ortho and para halo compounds. The reaction is (a) Electrophilic elimination reaction (b) Electrophilic substitution reaction (c) Free radical addition reaction (d) Nucleophilic substitution reaction	1

5.	If concentration of reactant 'A' is increased 10 times and the rate of reaction becomes 100 times. What is the order with respect to 'A'? (a) 1 (b) 2 (c) 3 (d) 4	1
6.	Carboxylic acids are more acidic than phenol and alcohol because of (a) Formation of dimers (b) Resonance stabilization of their conjugate base (c) Highly acidic hydrogen (d) Intermolecular hydrogen bonding	1
7.	The core atom of which of the following biologically significant coordination molecules is cobalt? (a) Vitamin B12 (b) Haemoglobin (c) Chlorophyll (d) Carboxypeptidase-A	1
8.	Which of the following is/are example(s) of denaturation of protein? (a) Coagulation of egg white (b) Curding of milk (c) Clotting of blood (d) Both (a) and (b)	1
9.	When $\text{KMnO}_4$ solution is added to oxalic acid solution, the decolourisation is slow in the beginning but becomes instantaneous after some time because (a) $\text{CO}_2$ is formed as the product. (b) Reaction is exothermic. (c) $\text{MnO}_4^-$ catalyses the reaction. (d) $\text{Mn}^{2+}$ acts as auto catalyst	1
10.	Radioactive disintegration is an example of (a) first order reaction (b) zero order reaction (c) second order reaction (d) third order reaction	1
11.	The correct IUPAC name for $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{N}(\text{CH}_3) - \text{C}_2\text{H}_5$ is (a) N, N- diethyl propan-1-amine (b) N, N-dimethyl propan-1-amine (c) N-ethyl -N-methyl propan-1-amine (d) N-methyl-1- pentanamine	1
12.	Which of the reactions below can result in ketones? (a) Oxidation of primary alcohols (b) Oxidation of secondary alcohols (c) Dehydrogenation of tertiary alcohols (d) Dehydrogenation of primary alcohols	1
	<b>Q. no 13 to 16 are Assertion - Reasoning based questions.</b> <b>These consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:</b> (a) Both A and R are true and R is the correct explanation of A. (b) Both A and R are true and R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.	
13.	<b>Assertion (A):</b> In the series Sc to Zn the enthalpy of atomisation of Zinc is the lowest. <b>Reason (R):</b> Zinc has greater number of unpaired electrons.	1
14.	<b>Assertion (A):</b> Copper sulphate cannot be stored in zinc vessel. <b>Reason (R):</b> Zinc is less reactive than copper.	1

15.	<b>Assertion (A):</b> Change in pH and heating leads to denaturation of proteins. <b>Reason (R):</b> Change in pH and heating cause loss of biological activity of proteins.	1
16.	<b>Assertion (A):</b> The presence of a catalyst increases the activation energy of a reaction. <b>Reason (R):</b> Catalysts provide an alternative reaction pathway with a lower activation energy.	1
<b>SECTION : B</b>		
<b>This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.</b>		
17.	People taking lot of salt experience puffiness or swelling of the body. Why? OR How can the direction of osmosis be reversed?	2
18.	Explain why $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ has magnetic moment value of 5.92 BM whereas $[\text{Fe}(\text{CN})_6]^{3-}$ has a value of only 1.74 BM.	2
19.	Why on dilution the $\Lambda_m$ of $\text{CH}_3\text{COOH}$ increases drastically while that of $\text{CH}_3\text{COONa}$ increases gradually?	2
20.	What happens when (a) n-butyl chloride is treated with alcoholic KOH? (b) bromobenzene is treated with Mg in the presence of dry ether?	2
21.	Give a chemical test to distinguish between Benzoic acid and Phenol.	2
<b>SECTION : C</b>		
<b>This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.</b>		
22.	(a) Which type of a metal can be used in cathodic protection of iron against rusting? (b) Write the name of the electrolyte used in fuel cell. (c) Write the cathode & anode reaction involved in using fuel cell.	3
23.	Account for the following: (a) $\text{La}^{3+}$ and $\text{Lu}^{3+}$ do not show any colour in solutions. (b) Chemistry of all the lanthanoids are quite similar.	3
24.	Formaldehyde does not undergo aldol condensation reaction. Why? What happens when Formaldehyde is treated with conc. KOH?	3
25.	Write chemical reactions to show that open structure of D-glucose contains the following (a) Straight chain (b) 5 alcohol groups (c) Aldehyde as carbonyl group	3
26.	Give the structures and IUPAC names of the products expected from the following reactions: (any two) (a) Catalytic reduction of butanal. (b) Hydration of propene in the presence of dilute sulphuric acid. (c) Reaction of propanone with methyl magnesium bromide followed by hydrolysis.	3
27.	(a) What is the IUPAC name of Chloroform? (b) Write a short note on any two-name reactions where Chloroform is used as a reagent.	3
28.	Calculate the cell EMF and $\Delta G^\circ$ for the cell reaction at $25^\circ\text{C}$ for the cell :  $\text{Zn(s)}   \text{Zn}^{2+}(0.0004\text{M})    \text{Cd}^{2+}(0.2\text{M})   \text{Cd(s)}$  $E^\circ$ values at $25^\circ\text{C}$ : $\text{Zn}^{2+}/\text{Zn} = -0.763\text{ V}$ $\text{Cd}^{2+}/\text{Cd} = -0.403\text{ V}$ ; $F = 96500\text{ C mol}^{-1}$ ; $R = 8.314\text{ J K}^{-1}\text{ mol}^{-1}$	3
<b>SECTION : D</b>		
<b>The following questions are case-based questions. Each question has an internal choice and carries 4 (2+1+1) marks each. Read the passage carefully and answer the questions that follow.</b>		
29.	The rate law for a chemical reaction relates the reaction rate with the concentrations or partial pressures of the reactants.	4

	<p>For a general reaction,</p> $aA + bB \rightarrow C$ <p>with no intermediate steps in its reaction mechanism, meaning that it is an elementary reaction.</p> <p>The rate law is given by, <math>r = k [A]^x [B]^y</math> where [A] and [B] express the concentrations of A and B in moles per litre. Exponents x and y vary for each reaction and are determined experimentally. The value of k varies with conditions that affect reaction rate, such as temperature, pressure, surface area, etc. The sum of these exponents is known as overall reaction order. A zero order reaction has constant rate that is independent of the concentration of the reactants. A first order reaction depends on the concentration of only one reactant. A reaction is said to be of second order when the overall order is two. Once we have determined the order of the reaction, we can go back and plug one set of our initial values and solve for k.</p> <p>Answer the following questions:</p> <p>(a) A first order reaction takes 77.78 minutes for 50% completion. Calculate the time required for 30% completion of the reaction. (<math>\log 10 = 1</math>, <math>\log 7 = 0.8450</math>)</p> <p>(b) Calculate the overall order of the reaction which has the following rate expression:  <math display="block">\text{Rate} = k[A]^{1/2}[B]^{3/2}</math></p> <p>(c) What is the effect of temperature on rate of the reaction?</p> <p style="text-align: center;"><b>OR</b></p> <p>(c) What is meant by the rate of reaction?</p>	
30.	<p>Amines are organic bases having the general formula <math>RR'_2N</math>, where R is a hydrocarbon group, 'R' may be H or a hydrocarbon group. As with ammonia, the reaction of amines with water is</p> $RNH_2 + H_2O \rightarrow RNH_3^+ + OH^-$ <p>Like all bases, amines form salts when allowed to react with acids.</p> $CH_3NH_2 + HCl \rightarrow CH_3NH_3^+ + Cl^-$ <p>These salts are usually colourless, odourless solids. Aromatic amines are used mainly in the manufacture of dyes. Aniline, the simplest aromatic amine itself is a toxic compound; a number of other aromatic amines such as 2-naphthylamine and benzidine are potent carcinogens.</p> <p>(a) Write a short note on: Hinsberg test of amines.</p> <p>(b) Draw the structure of sulphanilic acid along with its zwitter ionic structure.</p> <p>(c) Arrange the following in the increasing order of <math>pK_b</math> value  <math>C_6H_5NH_2</math>, <math>C_2H_5NH_2</math>, <math>CH_3NH_2</math>, <math>NH_3</math></p> <p style="text-align: center;"><b>OR</b></p> <p>(c) In cold conditions, aniline is diazotised to form a compound, which is treated with phenol to form a coloured product. Write the necessary chemical equation for the 2<sup>nd</sup> reaction.</p>	4
	<p><b>SECTION : E</b></p> <p><b>The following questions are long answer type and carry 5 marks each. All questions have an internal choice.</b></p>	
31.	<p>Among elements of 3d transition series, write the element</p> <p>(a) Which is not regarded as transition element.</p> <p>(b) Which shows maximum number of oxidation states.</p> <p>(c) Which forms stable divalent (<math>M^{2+}</math>) ion.</p> <p>(d) Which shows only +3 state.</p> <p>(e) Has the least atomisation enthalpy.</p> <p style="text-align: center;"><b>OR</b></p> <p>Explain giving a suitable reason for each of the following</p> <p>(a) Metal –metal bonding is more frequent for the 4d &amp; 5d series of transition metals than that for the 3d series.</p>	5

	(b) $\text{Cu}^+$ salts are colourless while $\text{Cu}^{2+}$ salts are coloured. (c) $\text{Mn}^{2+}$ exhibits maximum paramagnetism.	
32.	<p>(a) Write the IUPAC name of</p> <p style="text-align: center;"><math>[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2]^-</math></p> <p>Which type of ligands are present in this complex?</p> <p>(b) When a coordination compound <math>\text{CrCl}_3 \cdot 6\text{H}_2\text{O}</math> is mixed with <math>\text{AgNO}_3</math>, 2 moles of <math>\text{AgCl}</math> are precipitated per mole of the compound. Write the structural formula of the complex showing ionisation.</p> <p style="text-align: center;">OR</p> <p>(a) Find the primary and secondary valences of cobalt in <math>[\text{Co}(\text{NH}_3)_6]\text{Cl}_3</math>.</p> <p>(b) Give a chemical test to distinguish the following pair</p> <p style="text-align: center;"><math>[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{SO}_4</math> and <math>[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Cl}</math></p> <p>What is the relation between the complexes?</p>	5
33.	<p>Give reasons for the following: -</p> <p>(a) Ortho nitro phenol is more acidic than Ortho-methoxyphenol.</p> <p>(b) 2,4,6-trinitrophenol gives sodium bicarbonate test.</p> <p>(c) Alcohol reacts with sodium metal whereas ether do not.</p> <p style="text-align: center;">OR</p> <p>(a) Alcohols act as Bronsted bases also.</p> <p>(b) Phenoxide ion is more stable than phenol.</p> <p>(c) Phenol doesn't react with <math>\text{NaHCO}_3</math> whereas carboxylic acid reacts.</p>	5