

PRE-BOARD EXAMINATION (2025-26)

CLASS - XII

Time: 3 hours

SUBJECT : CHEMISTRY (043)

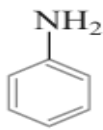
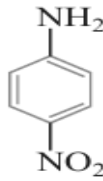
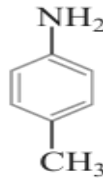
MM-70

GENERAL INSTRUCTIONS:

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.

Q. NO.	QUESTION	MARKS
	SECTION A Questions no.1 to 16 are Multiple Choice type Questions, Carrying 1 mark each.	
1.	In the reaction, $A \rightarrow B$ the rate of reaction increases two times on increasing the concentration of A four times, the order of reaction is (A) 2 (B) 0 (C) $\frac{1}{2}$ (D) 3	1
2.	Which substance is used to determine the hardness of water using a simple titration? (A) Mg(EDTA) (B) Fe(EDTA) (C) $\text{Na}_2(\text{EDTA})$ (D) Co(EDTA)	1
3.	Which of the following compounds will give brisk effervescence of CO_2 on treatment with NaHCO_3 ? (A) Phenol (B) Acetic acid (C) both (D) None of these	1
4.	The half-life of a first order reaction is 69.35 sec. The value of rate constant of the reaction is (A) 1.0 s^{-1} (B) 0.1 s^{-1} (C) 0.01 s^{-1} (D) 0.001 s^{-1}	1

5.	Which of the following can be used for the preparation of 1-chloropropane? (A) Propene and HCl in the presence of peroxide (B) Propene and HCl in the absence of peroxide (C) Propene and Cl ₂ followed by treatment with aqueous KOH (D) Propan-1-ol and SOCl ₂ /pyridine	1
6.	Actinoids exhibit greater number of oxidation states than lanthanoids. The main reason being (A) more energy difference between 5f and 6d than between 4f and 5f orbitals (B) 4f orbitals are more diffused than the 5f orbitals (C) lesser energy difference between 5f and 6d than between 4f and 5d orbitals (D) more reactive nature of the actinoids than the lanthanoids.	1
7.	Which of the following reactions will not result in the formation of carbon-carbon bond? (A) Friedel-Crafts acylation (B) Wurtz reaction (C) Cannizzaro reaction (D) Reimer-Tiemann reaction	1
8.	Which of the following alcohols is not polyhydric? (A) Propylene glycol (B) Ethylene glycol (C) Cyclohexanol (D) Benzene-1,2-diol	1
9.	Which of the following oxidation state is common for all lanthanoids? (A) +2 (B) +3 (C) +4 (D) +5	1
10	Which of the following reactions of glucose can be explained only by its cyclic structure? (A) Glucose forms pentaacetate. (B) Glucose reacts with hydroxylamine to form an oxime. (C) Pentaacetate of glucose does not react with hydroxylamine. (D) Glucose is oxidized by nitric acid to gluconic acid.	1
11.	<p>The correct increasing order of basic strength for the following compounds is _____.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>(I)</p> </div> <div style="text-align: center;">  <p>(II)</p> </div> <div style="text-align: center;">  <p>(III)</p> </div> </div> <p>(A) II < III < I (B) III < I < II (C) III < II < I (D) II < I < III</p>	1

12	<p>An organic compound 'A' on treatment with NH_3 gives 'B' which on heating gives 'C'. 'C' when treated with Br_2 in the presence of KOH produces ethylamine. Compound 'A' is</p> <p>(A) $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—COOH}$ (B) CH_3COOH</p> <p>(C) $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—CHO}$ (D) $\text{CH}_3\text{—CH}_2\text{—COOH}$</p>	1
	<p>For the Questions number 13 to 16, two statements are given—one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below:</p> <p>(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).</p> <p>(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).</p> <p>(C) Assertion (A) is true, but Reason (R) is false.</p> <p>(D) Assertion (A) is false, but Reason (R) is true.</p>	
13.	<p>Assertion (A): Current stops flowing when $E_{\text{cell}} = 0$.</p> <p>Reason (R): Equilibrium of the cell reaction is attained.</p>	1
14.	<p>Assertion (A): Order of the reaction can be zero or fractional.</p> <p>Reason (R): We cannot determine order from balanced chemical equation.</p>	1
15.	<p>Assertion(A): Linkage isomerism arises in coordination compounds containing ambidentate ligand.</p> <p>Reason (R): Ambidentate ligand has two different donor atoms.</p>	1
16.	<p>Assertion (A) : Sucrose is a non-reducing sugar.</p> <p>Reason (R) : In sucrose, the aldehydic group of glucose and ketonic group of fructose are not free.</p>	1
	<p style="text-align: center;">SECTION B</p> <p>This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.</p>	
17.	<p>(a) Define azeotropes.</p> <p>(b) What type of azeotrope is formed by negative deviation from Raoult's law? Give an example.</p> <p style="text-align: center;">OR</p> <p>The images below show the evaporation of the solvent on account of the presence of non-volatile solutes. In each of the three cases, the solvent taken is of the same type. The solvent is volatile and its quantity is the same in all three cases.</p>	1+1=2

24.	<p>(a) Arrange the following compounds in increasing order of their property as indicated:</p> <p>(i) Acetaldehyde, Acetone, Di-tert-butyl ketone, Methyl tert-butyl ketone (Reactivity towards HCN)</p> <p>(ii) $\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{COOH}$, $\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{COOH}$, $(\text{CH}_3)_2\text{CHCOOH}$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ (Acid strength)</p> <p>(b) Give a simple chemical test to distinguish between Propanal and Propanone.</p>	2+1=3
25.	<p>Primary alkyl halide $\text{C}_4\text{H}_9\text{Br}$ (A) reacted with alcoholic KOH to give compound (B). Compound (B) is reacted with HBr to give (C) which is an isomer of (A). When (A) is reacted with sodium metal, it gives compound (D), C_8H_{18} which is different from the compound formed when n-butyl bromide is reacted with sodium. Write the equations for all the reactions.</p>	1+1+1=3
26.	<p>(a) What type of linkage is present in nucleic acid.</p> <p>(b) Why must vitamin C be supplied regularly in diet?</p>	1+2=3
27.	<p>Give explanation for each of the following:</p> <p>(i) Cyclohexanone forms cyanohydrin in good yield but 2,2,6-trimethylcyclohexanone does not.</p> <p>(ii) There are two —NH_2 groups in semicarbazide, only one is involved in the formation of semicarbazone.</p> <p>(iii) Acetaldehyde, Acetone, Di-tert-butyl ketone, Methyl tert-butyl ketone (reactivity towards HCN).</p> <p style="text-align: center;">OR</p> <p>How do you convert the following?</p> <p>(i) Propanone to Propene</p> <p>(ii) Benzoic acid to Benzaldehyde</p> <p>(iii) Ethanol to 3-Hydroxybutanal</p>	1+1+1=3
28.	<p>i) What is lanthanoid contraction? What are the consequences of lanthanoid contraction?</p> <p>ii) Highest fluoride of Mn is MnF_4 whereas the highest oxide is Mn_2O_7. why?</p>	2+1=3

	<p style="text-align: center;">SECTION D</p> <p>The following questions are case-based questions. Each question has an internal choice in 2 marks questions and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.</p>	
29.	<p>Temperature has a marked effect on the rate of reaction. For most of the reactions, the rate of reaction becomes nearly double for every 10 degrees rise in temperature. The effect of temperature is usually expressed in terms of temperature coefficient. The quantitative dependence of reaction rate on temperature was first explained by Swante Arrhenius. Arrhenius proposed a simple equation known as Arrhenius equation $k = Ae^{-E_a/RT}$. This equation provides a relationship between the rate constant (k) of a reaction and the temperature of the system. A is the Arrhenius factor or pre-exponential factor, E_a is the activation energy and R is the gas constant.</p> <p>According to Boltzmann and Maxwell, the distribution of kinetic energy may be described by plotting the fraction of molecules with a given kinetic energy. The Maxwell-Boltzmann Distribution is important in chemical reactions because it helps to explain the rate of reaction. The speed of particles affects the rate of collision between particles, which in turn affects the rate of reaction and also shows the distribution of energy amongst the particles of an ideal gas.</p> <p>Answer the following questions:</p> <p>(i) Define ‘activation energy’ of a reaction.</p> <p>(ii) What is the expression for the fraction of molecules having energy greater than activation energy?</p> <p style="text-align: center;">OR</p> <p>How does a catalyst affect the rate of a reaction? Explain with respect to the Arrhenius equation.</p> <p>(iii) Can a reaction have zero activation energy? Justify</p>	<p style="text-align: right;">1</p> <p style="text-align: right;">1</p> <p style="text-align: right;">2</p>
30.	<p>Pure aliphatic and alkyl amines can be prepared by Gabriel phthalimide reaction. In this reaction, phthalimide is treated with ethanolic KOH solution followed by heating with a suitable alkyl or aralkyl halide to give N-substituted phthalimides. These upon hydrolysis with dil HCl under pressure give primary amines.</p> <p>Primary amines can also be prepared from amides by treatment with Br_2 and KOH by a reaction known as Hoffmann bromamide degradation method. Like ammonia, amines behave as Lewis bases because of the presence of a lone pair of electrons. The basicity</p>	

	<p>of aliphatic amines in aqueous solution depends upon the +I effect of alkyl group as well as the extent of hydrogen bonding with water molecules and the steric effect of the alkyl group. However, aromatic amines are weaker bases than aliphatic amines.</p> <p>Primary amines with three or more carbon atoms are liquid and still higher ones are solid. Aniline and other aryl amines are usually colourless but get coloured on storage due to atmospheric oxidation.</p> <p>Answer the following questions:</p> <p>i) How can you distinguish between $\text{CH}_3\text{CH}_2\text{NH}_2$ and $(\text{CH}_3\text{CH}_2)_2\text{NH}$ by Hinsberg test?</p> <p>ii) Which one has more pK_b value; aliphatic amines or ammonia?</p> <p style="text-align: center;">OR</p> <p>Write structure and IUPAC names of the amide which gives propanamine by Hoffmann bromamide reaction.</p> <p>iii) (a) Gabriel phthalimide reaction cannot be used to prepare aniline. Why? (b) Why does aniline not give Friedel-Crafts reaction?</p>	<p>1</p> <p>1</p> <p>1+1= 2</p>
	<p>SECTION E</p> <p>The following questions are long answer types and carry 5 marks each. All questions have an internal choice.</p>	
31	<p>a) Determine the osmotic pressure of a solution prepared by dissolving 25 mg of K_2SO_4 in 2 litre of water at 25°C, assuming that it is completely dissociated.</p> <p>b) blood cells are isotonic with 0.9% sodium chloride solution. What happening if we placed blood cells in a solution containing (i) 1.2% NaCl solution (ii) 0.4% NaCl solution.</p> <p style="text-align: center;">OR</p> <p>a) Define the following terms: (i) Anoxia (ii) Osmotic pressure (iii) Colligative properties</p> <p>b) Calculate the mass of NaCl (molar mass = 58.5 g mol^{-1}) to be dissolved in 37.2 g of water to lower the freezing point by 2°C, assuming that NaCl undergoes complete dissociation.</p>	<p>3+2 =5</p> <p>3+2=5</p>

32	<p>a) Give evidence that $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Cl}$ are ionisation isomers.</p> <p>b) Explain on the basis of valence bond theory that $[\text{Ni}(\text{CN})_4]^{2-}$ ion with square planar structure is diamagnetic and the $[\text{NiCl}_4]^{2-}$ ion with tetrahedral geometry is paramagnetic.</p> <p style="text-align: center;">OR</p> <p>$\text{CoSO}_4\text{Cl} \cdot 5\text{NH}_3$ exists in two isomeric forms 'A' and 'B'. Isomer 'A' reacts with AgNO_3 to give white precipitate, but does not react with BaCl_2. Isomer 'B' gives white precipitate with BaCl_2 but does not react with AgNO_3.</p> <p>Answer the following questions:</p> <p>(i) Identify 'A' and 'B' and write their structural formulae.</p> <p>(ii) Name the type of isomerism involved.</p> <p>(iii) Give the IUPAC name of 'A' and 'B'.</p>	<p>2+3</p> <p>2+1+2 =5</p>
33	<p>(a) Give equations of the following reactions:</p> <p>(i) Phenol is treated with conc. HNO_3.</p> <p>(ii) Propene is treated with B_2H_6 followed by $\text{H}_2\text{O}_2/\text{OH}^-$.</p> <p>(iii) Sodium t-butoxide is treated with CH_3Cl.</p> <p>(b) How will you distinguish between butan-1-ol and butan-2-ol?</p> <p>(c) Arrange the following in increasing order of acidity: Phenol, ethanol, water</p> <p style="text-align: center;">OR</p> <p>a) Write the equations involved in the following reactions:</p> <p>(i) Reimer–Tiemann reaction (ii) Kolbe's reaction</p> <p>b) Write the mechanism of the following reaction:</p> $2\text{CH}_3\text{-CH}_2\text{-OH} \xrightarrow[\text{413 K}]{\text{conc. H}_2\text{SO}_4} \text{CH}_3\text{-CH}_2\text{-O-CH}_2\text{-CH}_3$ <p>c) How you distinguish between Ethanol and phenol</p>	<p>3+1+1 =5</p> <p>2+2+1= 5</p>

*****END OF THE PAPER *****