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प्री-बोर्ड परीक्षा:2024-25

PRE-BOARD EXAMINATION: 2024-25

SUBJECT : CHEMISTRY (043) TIME : 3 HOURS
CLASS : XII MM : 70

सामान्यनिर्देश/GENERAL INSTRUCTIONS:

1. There are 33 questions in this question paper with internal choice.
2. Section A consists of 16 multiple -choice questions carrying 1 mark each.
3. Section B consists of 5 short answer questions carrying 2 marks each.
4. Section C consists of 7 short answer questions carrying 3 marks each.
5. Section D consists of 2 case - based questions carrying 4 marks each.
6. Section E consists of 3 long answer questions carrying 5 marks each.
7. All questions are compulsory.
8. Use of log tables and calculators is not allowed. Required log values are given below-

(log1.6=0.204, log 35=1.54, log54=1.73, log 63 =1.8, log 16=1.2, log7 =0.84, log2= 0.30)

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	Interstitial compounds are formed when small atoms are trapped inside the crystal lattice of metals. Which of the following is not the characteristic property of interstitial compounds?		
	(a)	They have higher melting points in comparison to pure metals.	
	(b)	They are very hard.	
	(c)	They retain metallic conductivity.	
	(d)	They are chemically very reactive.	
2	To avoid bends, as well as, the toxic effects of high concentrations of nitrogen in the blood, the tanks used by scuba divers are filled with air diluted with helium. The correct composition of Helium in these tanks is-		
	(a)	21.7%	(b) 20.7%
	(c)	15.7%	(d) 11.7%
3	Identify the correct order of relative acidic strength of the following compounds?		
	(a)	$BrCH_2COOH > ClCH_2COOH > FCH_2COOH$	
	(b)	$ClCH_2COOH > FCH_2COOH > BrCH_2COOH$	
	(c)	$FCH_2COOH > ClCH_2COOH > BrCH_2COOH$	
	(d)	$ClCH_2COOH > BrCH_2COOH > FCH_2COOH$	
4	Correct electronic configuration of central metal atom of the complex $[Mn(CN)_6]^{4-}$ is-		
	(a)	$t_{2g}^3 e_g^2$	(b) $t_{2g}^5 e_g^0$
	(c)	$t_{2g}^5 e_g^1$	(d) $t_{2g}^4 e_g^2$
5	Considered the following statements for Gabriel Phthalimide reaction and identify the true statements- (i) It is used to prepare aliphatic primary amines.		

	(ii) It is S_N reaction of haloalkanes. (iii) Aniline can not be prepared by this reaction. (iv) Phthalimide has two replaceable hydrogen atoms on nitrogen.				
	(a)	(i), (ii), (iii)		(b) (i),(iii), (iv)	
	(c)	(ii), (iii), (iv)		(d) (i), (ii), (iii), (iv)	
6	Which among the following is is not type of RNA?				
	(a)	Ribosomal RNA		(b) Transport RNA	
	(c)	Messenger RNA		(d) None of the above	
7	Identify the incorrect match with respect to the following water-soluble Vitamins-				
		Vitamin	**Name**	**Deficiency Disease**	
	(a)	Vitamin B_6	Pyridoxine	Pernicious anaemia	
	(b)	Vitamin B_2	Riboflavin	Cheilosis	
	(c)	Vitamin C	Ascorbic acid	Scurvy	
	(d)	Vitamin B_1	Thiamine	Beri-beri	
8	The emf of the cell: Ni / Ni^{2+} (1.0 M) // Au^{3+} (1.0 M) / Au is- (E° = -0.25 V for Ni^{2+}/Ni; E° = 1.4 V for Au^{3+}/Au)				
	(a)	1.15 V		(b) -1.15 V	
	(c)	1.65 V		(d) 2.0 V	
9	Consider the following compounds- **1-Iodobutane, 1-Bromobutane, 1-Chlorobutane, 1-Fluorobutane** The correct increasing order of reactivity towards S_N reaction of the compounds is-				
	(a)	1-Fluorobutane < 1-Chlorobutane < 1-Iodobutane < 1-Bromobutane			
	(b)	1-Fluorobutane < 1-Chlorobutane < 1-Bromobutane < 1-Iodobutane			
	(c)	1-Fluorobutane < 1-Iodobutane < 1-Bromobutane < 1-Chlorobutane			
	(d)	1-Iodobutane < 1-Bromobutane < 1-Chlorobutane < 1-Fluorobutane			
10	For the reaction A+B → C+D, the rate of reaction quadruples when the concentration of A doubles, whereas on making the concentration of B two times, the rate doubles up. What is overall order of the reaction?				
	(a)	1		(b) 2	
	(c)	2.5		(d) 3	
11	IUPAC name of CH_3-CH_2-CH(OH)-CH=CH-COOH is				
	(a)	6-Carboxy-hex-4-en-3-ol		(b) 4-hydroxy-hex-2-encarboxylicacid	
	(c)	3-Hydroxy-hex-4-enoicacid		(d) 4-Hydroxy-hex-2-enoicacid	
12	Rohan wants to prepare salicylic acid from Phenol. Which among the following name reaction can be used by Rohan for this synthesis-				
	(a)	Kolbe's reaction		(b) Coupling reaction	
	(c)	Williamson synthesis		(d) Reimer-Tiemann reaction	
Question number 13-16 are of assertion–reason type questions. 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.					
13	**Assertion**: Glycine is simplest amino acid.				
	Reason: All natural alpha amino acids are optically inactive except glycine.				
14	**Assertion:** The lower members of aldehydes and ketones such as methanal, ethanal and propanone are miscible with water. **Reason:** The lower members of aldehydes and ketones form hydrogen bond with water.				
15	**Assertion**: [Ni $(CO)_4$] has square planer geometry and is diamagnetic in nature.				

	Reason: CO is a neutral ligand which forms synergic bonding with the metal.	
16	**Assertion**: A solution of acetone and chloroform has lower vapour pressure than that of pure components. **Reason:** Acetone and chloroform forms intramolecular hydrogen bond in the solution.	
SECTION B **This section contains 5 questions with internal choice in one question. These questions are very short answer type and carry 2 marks each.**		
17	(i)	Suggest a suitable chemical test to distinguish Aniline and N-Methylaniline.
	(ii)	Arrange the following in decreasing order of their basic strength: $C_6H_5NH_2$, $C_2H_5NH_2$, $(C_2H_5)_2NH$, NH_3
18		An aqueous solution of 2% non-volatile solute exerts a pressure of 1.004 bar at the normal boiling point of the solvent. What is the molar mass of the solute? (Vapour pressure of water at its boiling point = 1.013 bar)
19	(i)	How acidified permanganate ion reacts with oxalate ion? write balanced equation.
	(ii)	Compare the chemistry of actinoids with that of the lanthanoids with special reference to: (a) electronic configuration (b) oxidation state
20		Write the reactions of Williamson synthesis of 2-ethoxy-3-methylpentane starting from ethanol and 3-methylpentan-2-ol.
		OR
		Write mechanism of reaction of methoxyethane with HI to give ethanol and iodomethane.
21	(i)	Aryl halides do not undergo nucleophilic substitution reactions under ordinary conditions, why?
	(ii)	AgCN and KCN gives different products on reaction with alkyl halides, why?
SECTION C **This section contains 7 questions with internal choice in one question. These questions are short answer type and carry 3 marks each.**		
22	(i)	Give equations of the following reactions:
	(a)	Treating phenol with chloroform in presence of aqueous NaOH followed by hydrolysis.
	(b)	Treating phenol with acidified sodium dichromate
	(ii)	How will you convert Butanal from Butanol?
23	(i)	Molality is preferred over molarity during determination of colligative properties such as elevation of boiling point and depression of freezing point, why?
	(ii)	Calculate the mass of an organic compound $C_6H_8O_6$ to be dissolved in 75 g of acetic acid to lower its melting point by 1.5°C. Kf = 3.9 K kg mol^{-1} .
24	(i)	Identify the reaction order from each of the following rate constants. (i) k = 2.3×10^{-5} L mol^{-1} s^{-1} (ii) k = 3×10^{-4} mol $L^{-1}s^{-1}$
	(ii)	For the reaction: $2A + B \rightarrow A_2B$; the rate = $k[A][B]^2$ with k = 2.0×10^{-6} mol^{-2} L^2 s^{-1}. Calculate the initial rate of the reaction when [A] = 0.1 mol L^{-1}, [B] = 0.2 mol L^{-1}. Calculate the rate of reaction after [A] is reduced to 0.06 mol L^{-1}.
25		Write reaction occurring at cathode, anode and overall cell reaction of the cell used in the Apollo space programme of India. Write its two advantages and one disadvantage.
26	(i)	Although amino group is o– and p– directing in aromatic electrophilic substitution reactions, aniline on nitration gives a substantial amount of m-nitroaniline, why?
	(ii)	Give the structures of A, B, C & D in the following reactions: $C_6H_5NO_2 \xrightarrow{Fe/HCl} \mathbf{A} \xrightarrow{NaNO2+HCl/273K} \mathbf{B} \xrightarrow{H2O/H+} \mathbf{C} \xrightarrow{Conc.HNO3} D$

27		The first order rate constant for the decomposition of ethyl iodide by the reaction $C_2H_5I(g) \rightarrow C_2H_4(g) + HI(g)$ at 600K is $1.60 \times 10^{-5}\ s^{-1}$. Its energy of activation is 209 kJ/mol. Calculate the log of rate constant (log k_2) of the reaction at 700K. ($R = 8.314\ Jmol^{-1}K^{-1}$)
		OR
		For the first order decomposition of azoisopropane to hexane and nitrogen at 543 K, the following data are obtained.

t (sec)	P (mm of Hg)
0	35.0
360	54.0
720	63.0

Calculate the rate constant.

28		Suman is student of class XII and she wants to prepare the following compounds from propene- (a) 1-Iodopropane (b) Butanoic acid (c) 2-Methoxypropane Write the suitable chemical equations for the above conversions.
		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.
29		Living systems are made up of various complex biomolecules like carbohydrates, proteins, nucleic acids, lipids, etc. Proteins and carbohydrates are essential constituents of our food. These biomolecules interact with each other and constitute the molecular logic of life processes. In addition, some simple molecules like vitamins and mineral salts also play an important role in the functions of organisms. Chemically, the carbohydrates may be defined as optically active polyhydroxy aldehydes or ketones or the compounds which produce such units on hydrolysis. Carbohydrates are classified on the basis of their behaviour on hydrolysis. They have been broadly divided into following three groups. The carbohydrates may also be classified as either reducing or non-reducing sugars. Glucose is an aldohexose and is also known as dextrose. Structure of glucose is given on the basis of its several chemical properties such as reaction with HI, HCN, NH_2-OH, Br_2 Water, HNO_3 etc. It exists in cyclic as well as in open chain structure. Monosaccharides combine through glycosidic linkage to form oligo saccharides and poly saccharides. Starch and cellulose are the commonly found polysaccharides of plant kingdom. Proteins are the most abundant biomolecules of the living system. All proteins are polymers of a-amino acids. Amino acids are classified as acidic, basic or neutral depending upon the relative number of amino and carboxyl groups in their molecule. When the number of such amino acids is more than ten, then the products are called polypeptides. A polypeptide with more than hundred amino acid residues, having molecular mass higher than 10,000u is called a protein. Proteins can be classified into two types on the basis of their molecular shape. Structure and shape of proteins can be studied at four different levels, i.e., primary, secondary, tertiary and quaternary, each level being more complex than the previous one.
	i	Classify the following as globular or fibrous protein- Myosin, Insulin **OR** How essential and non-essential amino acids are different from each other?
	ii	Why sucrose is called as invert sugar?

	iii	Write reaction of glucose with- (a) HI (B) Br_2 water

30 The d-block of the periodic table contains the elements of the groups 3-12 in which the d orbitals are progressively filled in each of the four long periods. Some of the properties of first series d-block elements are given in the following table. Observe the table carefully and answer the questions given below-

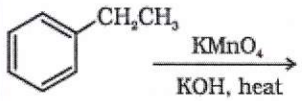
Element	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn
Atomic Number	21	22	23	24	25	26	27	28	29	30
Enthalpy of atomization KJ/mol	326	473	515	397	281	416	425	430	339	126
IE-1 KJ/mol	631	656	650	653	717	762	758	736	745	906
Metallic Radii (pm)	164	147	135	129	137	126	125	125	128	137
E^0M^{3+}/M^{2+} V	-	-0.37	-0.26	-0.41	+1.57	+0.77	+1.97	-	-	-
E^0M^{2+}/M V	-	-1.63	-1.18	-0.90	-1.18	-0.44	-0.28	-0.25	+0.34	-0.76

	i	Give reason for the exceptional lower enthalpy of atomization of Zn.
	ii	Why E^0Cu^{2+}/Cu is positive whereas it is negative for other elements of the series?
	iii	On the basis of E^0M^{3+}/M^{2+}, compare stability of Fe^{3+}, Mn^{3+} and Cr^{3+} ions giving suitable reason. **OR** Explain reason for the irregular trend of metallic radii and first ionization enthalpy in the series moving from Sc to Zn.

SECTION E

The following questions are long answer type and carry 5 marks each. All questions have an internal choice

31	i	Write products of electrolysis of concentrated sulphuric acid using inert electrode.
	ii	If a current of 0.5 ampere flows through a metallic wire for 2 hours, then how many electrons would flow through the wire? (Charge on electron= 1.6×10^{-19}C)
	iii	Resistance of a conductivity cell filled with 0.1 mol L^{-1} KCl solution is 100 Ω. If the resistance of the same cell when filled with 0.02 mol L^{-1} KCl solution is 520 Ω, 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 S/m.
		OR
	i	Write the factors on which the conductivity of electrolytic (ionic) solutions depends.
	ii	Construct the cell and calculate its emf in which the following reaction takes place: $Ni(s) + 2Ag^+ (0.002\ M) \rightarrow Ni^{2+} (0.160\ M) + 2Ag(s)$ $E^0_{Ag^+/Ag} = 0.80$ V, $E^0_{Ni^{2+}/Ni} = -0.25$ V
32	i	Complete the following reactions-
	(a)	$R\text{-}CH{=}CH\text{-}CHO + NH_2\text{-}\overset{\overset{O}{\|}}{C}\text{-}NH\text{-}NH_2 \xrightarrow{H^+}$

	(b)	
	ii	Arrange the following compounds in their increasing order of reactivity towards nucleophilic addition reaction- Acetaldehyde, Acetone, Di-tert-butyl ketone, Methyl tert-butyl ketone
	iii	You are given with acetophenone and benzophenone in two different test tubes. Give suitable chemical test to distinguish these compounds.
	iv	Write product and name of reaction involved, when methanal heated with concentrated NaOH.
		OR
	i	An organic compound (A) (molecular formula $C_8 H_{16} O_2$) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives but-1-ene. Identify A, B & C. Write equations for the reactions involved.
	ii	Write product and name of reaction involved, when ethanoic acid heated with concentrated Br_2 in presence of red phosphorous. .
	iii	Write suitable chemical test to distinguish benzaldehyde and propanal.
33	i	A solution of $[Ni(H_2O)_6]^{2+}$ is green but a solution of $[Ni(CN)_4]^{2-}$ is colourless. Explain.
	ii	Write IUPAC name and coordination number of the following complex- **$[Co\ (NH_3)_2Cl\ (NO_2)\ (C_2O_4)]^-$**
	iii	Using VBT justify that $[Cr(NH_3)_6]^{3+}$ is paramagnetic while $[Ni(CN)_4]^{2-}$ is diamagnetic.
		OR
	i	Using IUPAC norms write the formula of the following complex- **Potassium tri(oxalato)chromate(III)**
	ii	What type of stereoisomerism will be shown by above complex? Draw the structure of all possible stereoisomers.
	iii	What do you mean by ambidentate ligand? Give one example of such ligand.
	iv	Both Complex $CoCl_3 .4NH_3$ (Green) and Complex $CoCl_3 .4NH_3$ (Violet) on reaction with excess of $AgNO_3$ gives one mole of AgCl. What is the possible reason for different colour of both the complexes.