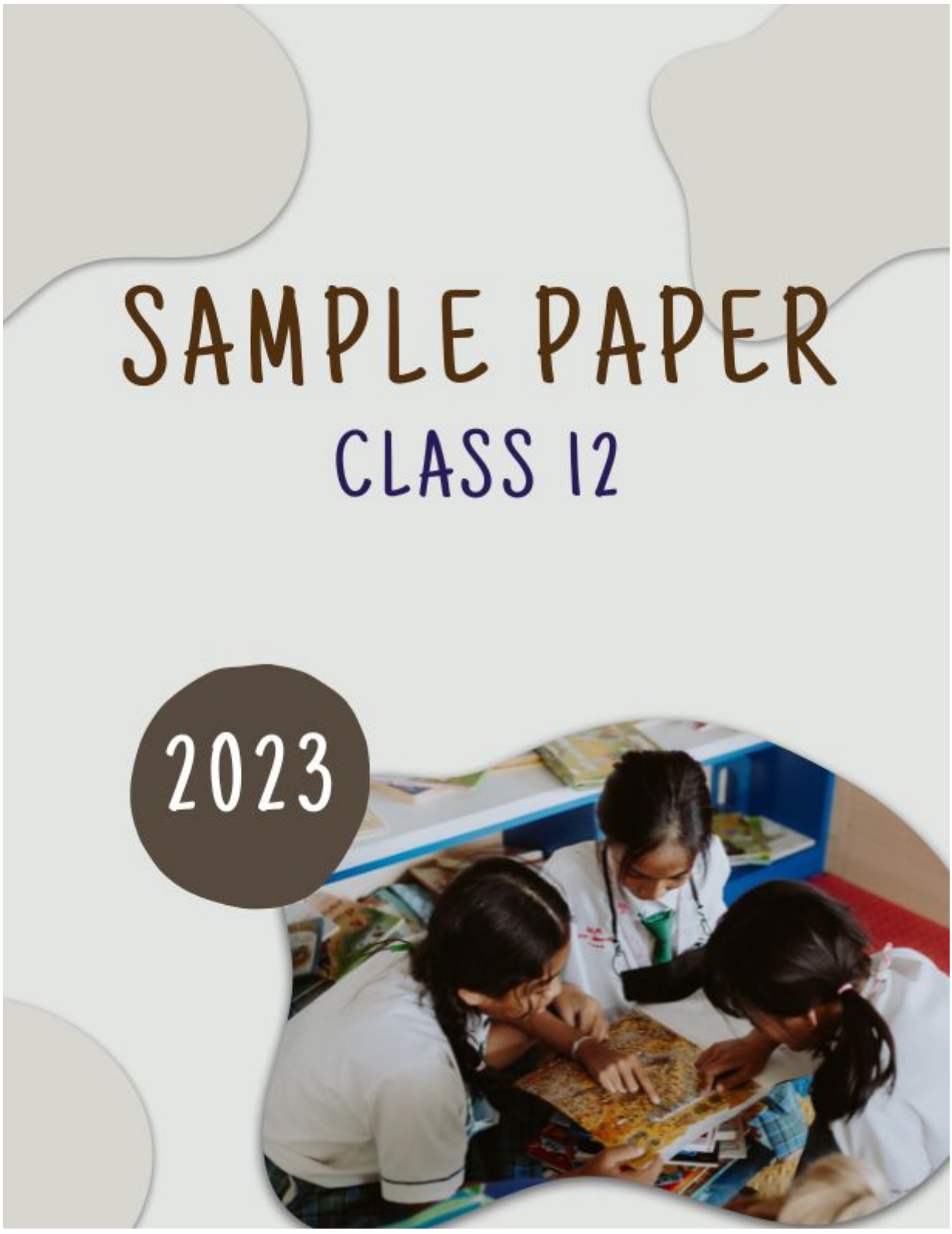
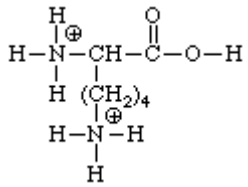
Class 12 Sample Paper 2023 Solution



Practice Questions – Marking Scheme
SESSION: 2022-23
Class: XII
Subject: CHEMISTRY (043)

Q.No	Question	Marks
	SECTION A Q1 to 18 each correct answer 1 mark	
Q.1	C. propan-2-ol	1
Q.2	C. elimination	1
Q.3	A. $Cu + 2\ H_2SO_4 \dashrightarrow CuSO_4 + SO_2 + 2\ H_2O$	1
Q.4	D. The temperature of the reactants in experiment 4 could have been different than for the other experiments.	1
Q.5	B. i and ii only	1
Q.6	D. Reaction X involves complex molecules, while reaction Y involves simple molecules or atomic species.	1
Q.7	A. -2	1
Q.8	C. only B and C	1
Q.9	D. [No extra information is needed. A can be calculated with the information available]	1
Q.10	D. D	1
Q.11	B. ethene	1
Q.12	B. i and ii only	1
Q.13	A. The almost identical radii of the atoms.	1
Q.14	D. all- i, ii, iii and iv	1
Q.15	B. Both A and R are true but R is not the correct explanation of A.	1
Q.16	B. Both A and R are true but R is not the correct explanation of A.	1
Q.17	C. A is true but R is false.	1
Q.18	D. Both A and R are false.	1
	SECTION B	
Q.19	Calculating the rate constant: Rate = $k[CH_3CH_2Cl]$ since it is a first order reaction. [0.5 mark] 1.6×10^{-8} M/s = k x 0.01 M $\therefore k = 1.6 \times 10^{-6}\ s^{-1}$ [0.5 marks] Calculating rate of reaction if the initial concentration of ethyl chloride is 0.07 M: Rate = $k[CH_3CH_2Cl]$	2

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	Rate = $1.6 \times 10^{-6} \times 0.07$ M/s $\therefore$ Rate = 1.12×10^{-7} M/s [1 mark]	
Q.20	- Fresh pineapple contain enzymes which breaks down protein molecules in liquid that would turn into jelly, making them smaller, so they can't tangle up, which stops the jelly setting [1] - In canned pineapple, due to a change in temperature, the protease enzyme becomes inactivated, and hence it won't break protein molecules of the liquid, allowing them to tangle. [1]	2
OR	(i) - It is basic [0.5] - Side chain of lysine contains an amine functional group, so it produces a basic solution because the extra amine group is not neutralized by the acid group. [0.5] (ii) 1 marks 	2
Q.21	(a) 0.5 marks for each of the following: - SN_2 mechanism - The configuration of the product is opposite to that of the reactant. (b) 0.5 marks each for the following: (i) The rate of reaction will be reduced by half. (ii) The rate of reaction will be reduced by half.	2
OR	(a) Both, compound P and compound Q have a chiral centre. (b) (i) 0.5 marks each for any one example such as: - melting point - boiling point - refractive index (ii) direction of rotation of plane of polarized light [0.5 marks]	2
Q.22	(i) - $[PtCl_2(NH_3)_2]$ has a square planar structure.	2

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	- All the ligands in it are in the same plane, so they can have cis and trans configuration. [0.5] - $[CoCl_4]^{2-}$ has a tetrahedral structure with the same kind of ligand. - All the four ligands are adjacent and equidistant to one another in it and the relative positions of donor atoms of ligands attached to the central atom are same with respect to each other. Thus, isomers are not found for $[CoCl_4]^{2-}$ [0.5] (ii) X= $[Cu(H_2O)_4(OH)_2]$; Y= $[Cu(NH_3)_4(H_2O)_2]^{2+}$	
Q.23	(i) E^o will become more positive [1] (ii) more feasible -with an increase in concentration, the) E^o will become more positive that means it will have more likely (energetically favourable) for the reduction of copper ions to copper. [1]	2
Q.24	Calculating k from t ½: $t ½ = 0.693 / k$ $\therefore k = 0.693 / 1.15 \times 10^4$ s $k = 6.06 \times 10^{-5}$ s^{-1} [1 mark] $k = (2.303 \times \log R_0/R) / t$ $t= (2.303 \times \log R_0/(R_0-0.99R_0))/k$ $t= (2.303 \times \log 10^2)/k$ $t = 4.606/k = 4.606/(6.06 \times 10^{-5})$ t = 76006.6 s = 1266.77 minutes = 21.11 hours [1 mark]	2
Q.25	0.5 mark each for the following: - Remove the water as it is formed. - Remove the ester as it is formed. OR - Reduce the concentration of the products formed. (ii) 2/3 moles of ethyl ethanoate and 1/3 moles of ethanoic acid [1]	2
	SECTION C	

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Q.26	(a) - less reactive [0.5 marks] - The aldehyde group is an electron withdrawing group and destabilises the intermediate carbocation formed in electrophilic substitution reactions. [0.5 mark] (b) - meta position [0.5 marks] - Of the three positions meta, ortho and para, the meta position is the least deactivated.[0.5] (c) 2-methyl-butan-2-ol [0.5] - 2-methyl-butan-2-ol is a tertiary compound which can not be formed using reduction of carbonyl group. [0.5]	3
Q.27	(i) Oxidation state = +2; Coordination number =6 [1] (ii) All of them [1] (iii) Octahedral [1]	3
Q.28	According to Henry's law, the partial pressure of the gas in vapour phase (p) is proportional to the mole fraction of the gas (x) in the solution and is expressed as: $p = K_H x$ [1 mark] K_H, the Henry's constant, generally increases with increasing temperature. This means that the solubility of gases in liquids decreases with an increase in temperature. [1 mark] K_H for oxygen dissolving in warm water is thus more than that of cold water. Thus, there will be more oxygen dissolved in cold water than in warm water.[1 mark]	3
Q.29	(a) increase in the temperature and disappearance of smell from the solution. (b) Reaction between ethylamine and hydrochloric acid gives a salt called ethyl ammonium salt, which is non-volatile and has no smell. (c) When a strong base is added to ethyl ammonium salt, protons are removed from the salt. This reforms the free amine.	3
Q.30	The cyanohydrin formed by reaction of CN^- with acetaldehyde will be the major product. [1] 1 mark each for the following:	3

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	- Due to greater steric hindrance of the ethyl groups in diethyl ketone, the nucleophilic substitution reaction of CN^- with acetaldehyde is favoured over that with diethyl ketone. - The greater electron releasing effect of the ethyl groups in diethyl ketone reduces the electrophilicity of the carbonyl carbon atom more than the methyl group in acetaldehyde.	
OR	(a) [1 mark] (i) reduction of nitrobenzene to aniline with tin/HCl or Fe/HCl (ii) diazotisation of aniline to benzenediazonium chloride with sodium nitrite and hydrochloric acid at 0 to 5 °C (iii) hydrolysis of benzenediazonium chloride to phenol with water (b) [2 marks] (i) $2C_2H_5OH + 2Na \longrightarrow 2C_2H_5O^-Na^+ + H_2$  (ii) phenol is stronger than ethanol. This is because the negative charge on oxygen atom in phenoxide ion can be partly delocalised around the ring. - This reduces its tendency to attract H^+ ions. In other words, it reduced its strength as conjugate base. This makes it as a stronger conjugate acid than ethanol.	3
	SECTION D	
Q.31	(i) (a) Change in temperature - double helix is formed through hydrogen bonds. By changing temperature, the bonds are disturbed and the helix gets uncoiled. [0.5] (b) change in pH - by increasing pH, some of the bases within the double helix structure of DNA will be de-protonated. This means that less hydrogen bonds will be involved in holding the two strands of DNA together and eventually the two strands will break apart, thereby destroying the double helix structure. [1] - conversely, decreasing the pH, we can end up protonating the bases, which can also lead to the disturbance in hydrogen bonds of the double helix structure [0.5]	4

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	(ii) (a) covalent bonds - Covalent bonds are stronger, and form between two non-metals sharing electrons. If a carbon and oxygen, or two carbons, or a carbon and nitrogen held the helix together, it would be very strong, but require a lot more energy to form and separate for replication or repairs. [1] b) London dispersion force - molecules with only this force are usually nonpolar, without any electronegative atoms to induce a dipole. This force would probably be too weak to hold the helix together. [1]	
Q.32	i) 9.8 g of H_2SO_4 is 0.1 mole. 1 mole of H_2SO_4 reacts with 2 moles of NaOH. [1 mark] 0.2 moles of NaOH reacts with 0.1 moles of H_2SO_4. Molarity of NaOH = 0.2 × 1000/240 = 0.83 M/litre [1 mark] ii) Moles = amount of NaOH/Molar mass Amount of NaOH = Molar mass × moles Number of NaOH = 40 × 0.2 = 8 grams [1 mark] iii) 0.5 M of 1 litre NaOH solution will have 0.5 moles of NaOH. Therefore 20 grams of NaOH needs to be present. Therefore, 12 g of NaOH needs to be added [1 mark]	4
	SECTION E	
Q.33	(i) Reactions: - At graphite electrode: $2MnO_2 + H_2O + 2e^- \rightarrow Mn_2O_3 + OH^-$ - At zinc electrode: $Zn \rightarrow Zn^{2+} + 2e^-$ (ii) Overall cell potential = +0.74 - (-0.76) V = +1.5 V (iii) Carbon(graphite); because electrons flow from zinc to carbon (iv) cell diagram representing the direction in which reaction occurs in this cell: $Zn(s)\ l\ Zn^{2+}(aq.)\ ll\ 2MnO_2\ (s) + H_2O(l)\ l\ Mn_2O_3\ (S) + OH^-\ (aq.)$	5
OR	i) In experimental Set up I, the blue colour of $CuSO_4$ solution will fade away. It is because $CuSO_4$ solution will turn into H_2SO_4 solution. Oxidation of water leaves behind H^+ and reduction of Cu^{2+}ion leaves SO_4^{2-}ion in the solution. $2H^+ + SO_4^{2-} \text{---} > H_2SO_4$ (1+1)	5

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	ii) $Cu_{(s)}$ ---> $Cu^{2+}_{(aq)}$+ $2e^-$ [1] iii)Oxygen (O_2) ($2OH^-$ ---> O_2+ $2H^+$+$4e^-$) [1] iv) Set up II depict the refining of Cu metal. [1] In this setup, an impure copper rod is made anode, where oxidation takes place, At anode- $Cu_{(s)}$---> $Cu^{2+}_{(aq)}$ + $2e^-$ and a pure thin wire of copper is made cathode. At cathode- $Cu^{2+}_{(aq)}$+ $2e^-$ ---> Cu(s) [1]	
Q.34	(i) Due to the presence of hydrogen bonding in alcohol, it has higher boiling point. No such bonding is present in alkanes. [1] (ii) As the number of carbon atoms increases: - the influence of '-OH group' becomes less and less dominant as hydrogen bond has short range order [1] - the van der Walls force of attraction and covalent bond dominates for a compound with higher number of carbon atoms [1] (iii) Yes, they could intersect [1] (iv) The melting point of alcohols will also be higher than their corresponding alkanes, this is again due to the presence of hydrogen bonding [1] (v) The boiling point of amines will be higher than their corresponding alkanes but lower than their corresponding alcohols. SO, the line graph for amines would come between that of alcohol and alkane [1]	5
Q.35	i) The element with atomic number 24, Cr, has outer shell electronic configuration $4s^1$ $3d^5$. [1 mark] This is a consequence of the fact that half-filled sets of 3*d* orbitals are relatively more stable and the energy gap between 3*d* and 4*s* orbitals is small. [1 mark]	5

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	ii) Hg has completely filled d orbitals ($3d^{10}$) in its ground state as well as in its oxidised state, hence it is not regarded as a transition element. [1 mark] iii) Mn^{2+} has $3d^5$ configuration, which is more stable than $3d^6$ configuration of Fe^{2+}. This makes removing an electron from Mn^{2+} more difficult than from Fe^{2+}. [1 mark] Since Cr^+ has $3d^5$ configuration, it is more stable than Mn^+ and so Cr will have higher second ionisation enthalpy as compared to Mn.[1 mark]	

…….**End of the Paper**……

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