Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Senior Secondary School Examination, 2023
SUBJECT: CHEMISTRY (043)(56/5/1)

General Instructions: -

1	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
2	**"Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, Evaluation done and several other aspects. Its' leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in News Paper/Website etc may invite action under various rules of the Board and IPC."**
3	Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and due marks be awarded to them. In class-XII, while evaluating two competency-based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, due marks should be awarded.**
4	The Marking scheme carries only suggested value points for the answers These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
5	The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. If there is any variation, the same should be zero after delibration and discussion. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
6	Evaluators will mark(√) wherever answer is correct. For wrong answer CROSS 'X" be marked. Evaluators will not put right (✓)while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**
7	If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.
8	If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.

9	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note **"Extra Question"**.
10	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11	A full scale of marks 70 has to be used. Please do not hesitate to award full marks if the answer deserves it.
12	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines).This is in view of the reduced syllabus and number of questions in question paper.
13	Ensure that you do not make the following common types of errors committed by the Examiner in the past:- ● Leaving answer or part thereof unassessed in an answer book. ● Giving more marks for an answer than assigned to it. ● Wrong totaling of marks awarded on an answer. ● Wrong transfer of marks from the inside pages of the answer book to the title page. ● Wrong question wise totaling on the title page. ● Wrong totaling of marks of the two columns on the title page. ● Wrong grand total. ● Marks in words and figures not tallying/not same. ● Wrong transfer of marks from the answer book to online award list. ● Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.) ● Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
14	While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0)Marks.
15	Any un assessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.
16	The Examiners should acquaint themselves with the guidelines given in the "**Guidelines for spot Evaluation**" before starting the actual evaluation.
17	Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.
18	The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.

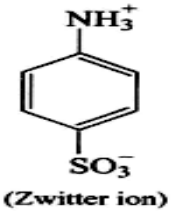
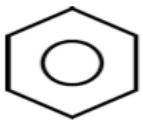
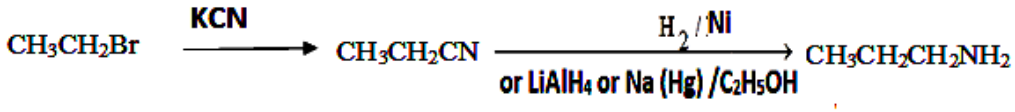
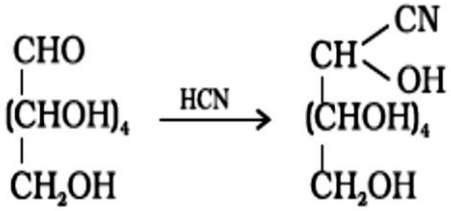
MARKING SCHEME

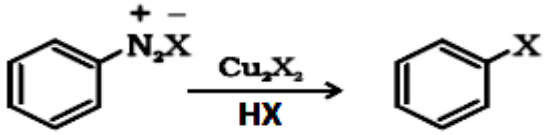
Senior Secondary School Examination, 2023

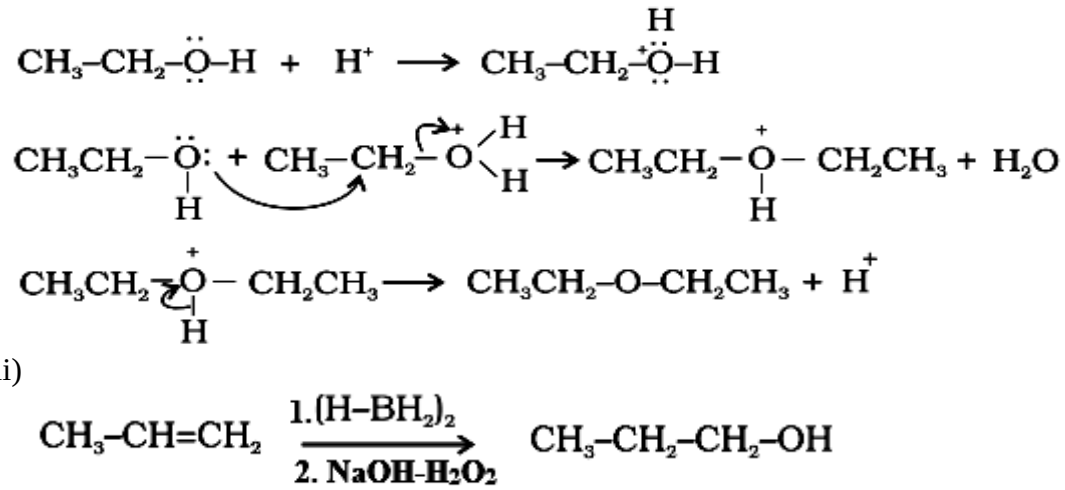
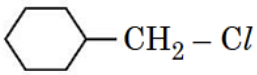
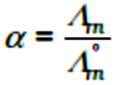
CHEMISTRY (Subject Code–043)

[Paper Code: 56/5/1]

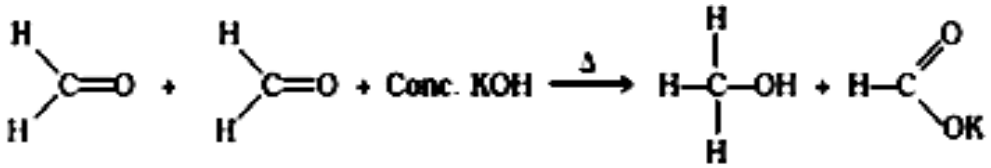
Q. No.	EXPECTED ANSWER / VALUE POINTS	Marks
	SECTION A	
1.	(b)	1
2.	(c)	1
3.	(b)	1
4.	(b)	1
5.	(d)	1
6.	(b)	1
7.	(b)	1
8.	(a)	1
9.	(d)	1
10.	(a)	1
11.	(b)	1
12.	(c)	1
13.	(c)	1
14.	(b)	1
15.	(c)	1
16.	(a) / (b)	1
17.	(b)	1
18.	(d)	1
	SECTION- B	
19.	(a) (i) E^0_{cell} = + ve & ΔG^o= -ve (ii) It states that the mass of a substance deposited / liberated at the electrodes is directly proportional to the charge/quantity of electricity passed through the electrolyte.	½, ½ 1
	OR	
	(b) $E_{cell} = E^\circ_{cell} - \frac{0{\cdot}059}{2} \log \frac{[Fe^{2+}(aq)]}{[H^+(aq.)]^2}$ $= 0{\cdot}44 - \frac{0{\cdot}059}{2} \log \frac{(0{\cdot}01)}{(1)^2}$	½ 1

	$= 0{\cdot}44 - \frac{0{\cdot}059}{2} \log 10^{-2}$ $= 0{\cdot}499$ V	½
20.	• k increases. • **Reason**: k is proportional to the rate of the reaction / temperature of the reaction. • E_a unchanged / No effect. • **Reason**: E_a only depends on the nature of reactants / depends on the difference between the energy of activated complex and reactants.	½ ½ ½ ½
21.	(a) NH_4^+ , Due to the unavailability of lone pair of electrons / cannot act as a Lewis base. (b) Pentaamminenitrito-O-cobalt (III)chloride	½ ½ 1
22.	B.P. of o-isomer is higher as it has higher dipole moment or polarity / stronger intermolecular interactions. M.P. of p-isomer is higher as it is symmetric and fits better in the crystal lattice.	1 1
23.	(a) Because phenoxide ion is more stable due to resonance. (or any other correct explanation) (b) Add neutral $FeCl_3$ to both the compounds, phenol gives violet colour whereas cyclohexanol does not. (or any other suitable chemical test)	1 1
24.	(a) (i)  (Zwitter ion) (ii) Protecting /deactivating -NH_2 group by acetylation or acylation.	1 1
	OR	
	(b) (i)  (ii)  	1 1
25.	 Confirms the presence of aldehydic / carbonyl group.	1 1

	SECTION-C	
26.	(a) Rate of reaction $= -\frac{1}{2}\frac{\Delta[N_2O_5]}{\Delta t}$	½
	$= \frac{1}{2} \times 1{\cdot}4 \times 10^{-3} = 0{\cdot}7 \times 10^{-3}\ M\ s^{-1}$ or $7 \times 10^{-4}\ M\ s^{-1}$ (Unit may be ignored)	½
	(b) $t = \frac{2{\cdot}303}{k} \log \frac{[R]_0}{[R]}$	½
	$t_{99\%} = \frac{2{\cdot}303}{k} \log \frac{100}{1} = \frac{2{\cdot}303}{k} \log 100$	½
	$t_{90\%} = \frac{2{\cdot}303}{k} \log \frac{100}{10} = \frac{2{\cdot}303}{k} \log 10$	½
	$t_{99\%} / t_{90\%} = \frac{\log\ 100}{\log\ 10} = 2$	½
27.	(a) $t_{2g}^5\ e_g^0$	1
	(b) $[Ni(CO)_4]$ has sp^3 hybridisation	½
	$[Ni(CN)_4]^{2-}$ has dsp^2 hybridisation	½
	In both, all electrons are paired. (or explain using V.B. theory).	1
28.	(a)  X = Cl, Br, CN	1
	(b) Combination of inductive effect and solvation effect / Due to greater H-bonding with water molecules, $(CH_3)_2NH$ shows more hydration or solvation effect.	1+1
29.	(a) Absence of free – CHO group. (b) Due to the presence of both acidic (-COOH) and basic ($-NH_2$) groups in the same molecule / formation of Zwitter ion. (c) They are excreted in urine / cannot be stored in body. (d) Because the H-bonds are formed between specific pairs of bases / pairing between A & T and between C & G.	1 x 3
30.	(a)	
	(i) Partial double bond character due to resonance in phenol and no resonance in methanol / sp^2 hybridisation in phenol and sp^3 hybridisation in methanol.	1
	(ii) n-Butane < Ethoxyethane < Butanal < Butanol	1
	(iii) $C_6H_5OCH_3 + HX \longrightarrow C_6H_5OH + CH_3X$	1
	OR	

	(b) (i)  (ii) 	½ 1 ½ 1
	SECTION- D	
31.	(a) Because of the formation of planar carbocation / sp^2 hybridized carbocation. (b) Due to the +I effect / electron-releasing nature of the ethyl group in ethanol. (c) (i) CH_3CH_2I (ii) 	1 1 1 1
	OR	
	(c) (i) 1- Bromopentane < 2-Bromopentane < 2-Bromo-2-methylbutane. (ii) 1-Bromo-3-methylbutane < 2-Bromo-3-methylbutane < 2-Bromo-2-methylbutane.	 1 1
32.	(a) the number of ions per unit volume decreases on dilution. (b)  α = 141/150 = 0.94 (c) • More • Mobility of H^+ more than K^+. (Data given in the paper does not support the answer to the above question, award full mark if attempted)	1 1 1+1
	OR	
	(c) • **Similarity**: $\wedge_m$ increases with dilution for both electrolytes. • **Difference**: For KCl the $\wedge_m$ increases gradually whereas for CH_3COOH, $\wedge_m$ increases steeply on dilution / In case of CH_3COOH, $\wedge_m^o$ cannot be obtained by extrapolation of $\wedge_m$ to zero concentration whereas for KCl it can be obtained / graphical explanation.	 1,1

	SECTION-E	
33.	(a) (i) Dissociation of NaCl/more number of particles in NaCl solution / Value of 'i' for NaCl is greater than that of glucose.	1
	(ii) $\frac{p^o - p}{p^o} = x_2$ $= \frac{n_2}{n_2 + n_1}$ $(n_1 = w_A / M_A = 78/M_A)$ $p = 0{\cdot}9\ p^o$	½
	$\frac{p^o - 0{\cdot}9\ p^o}{p^o} = \frac{w/50}{w/50 + 1}$ $\left[n_1 = \frac{78}{78} = 1 \right]$ $0{\cdot}1\left(\frac{w}{50} + 1\right) = \frac{w}{50}$	1
	$w = 5{\cdot}55g$ (or 5g if dilute solution is considered) (Full marks may be awarded if the student substitutes M_A for molar mass of benzene as the molar mass of benzene is not given in the question).	½
	(iii) $\Delta T_b = i K_b m$	½
	$i = 3$	½
	$\Delta T_b = 3 \times 0{\cdot}512 \times \frac{10}{95} \times \frac{1000}{200}$	½
	$\Delta T_b = 0{\cdot}81$ K or °C	½
	OR	
	(b) (i) Ethanoic acid molecules associate to form dimer so the number of particles are nearly reduced to half.	1
	(ii) $\boldsymbol{\pi = i\ CRT}$	½
	$\boldsymbol{i = 3}$	½
	$\boldsymbol{\pi = 3 \times \frac{2{\cdot}32 \times 10^{-2}}{174 \times 2} \times 0{\cdot}082 \times 298}$	½
	$= 4{\cdot}88 \times 10^{-3}$ atm	½
	(iii)	
	$\boldsymbol{\Delta T_b = K_f \frac{w_2}{M_2} \times \frac{1000}{w_1}}$	½
	$\boldsymbol{0{\cdot}512 = 5{\cdot}12 \times \frac{25{\cdot}6}{M_2} \times \frac{1000}{1000}}$	½
	$\boldsymbol{M_2 = 256}$	½
	$\boldsymbol{S \times x = 256}$ $\boldsymbol{32 \times x = 256}$	
	$x = \frac{256}{32} = 8$ i.e. S_8	½

34.	(a) (i)  (or any other suitable reaction) (ii) Carboxylic acids have strong hydrogen bonding whereas aldehydes and ketones have weak dipole-dipole interactions. (iii) A = $CH_3-\overset{\overset{O}{\|}}{C}-CH_2-CH_2-CHO$ / 4-oxopentanal $CH_3-\overset{\overset{O}{\|}}{C}-CH_2CH_2CHO \xrightarrow[\text{heat}]{NaOH + I_2} CHI_3$ Yellow ppt $CH_3-\overset{\overset{O}{\|}}{C}-CH_2CH_2CHO \xrightarrow[\text{warm}]{[Ag(NH_3)_2]^+, OH^-} CH_3\overset{\overset{O}{\|}}{C}-CH_2-CH_2-COO^- + Ag\downarrow$	1 1 1 1
	OR	
	(b) (i) Add $NaHCO_3$ solution to both compounds, ethanoic acid will give the brisk effervescence of CO_2 while ethanal does not (or any other suitable chemical test). (Award full marks if the question is attempted because there is a misprint in the question paper). (ii) due to resonance stabilization of the conjugate base formed / the strong electron-withdrawing effect of the carbonyl group. (iii)(1) A = $CH_3COOC_2H_5$ / Ethyl ethanoate / Ethyl acetate, B = CH_3COOH / Ethanoic acid / Acetic acid, C = CH_3CH_2OH / Ethanol / Ethyl alcohol. (2) B, due to the more extensive association of carboxylic acid molecules through strong hydrogen bonding.	1 1 1 ½ ½ ½, ½
35.	(a) Actinoids show wide range of oxidation states / most of them are radioactive elements. (b) $3MnO_4^{2-} + 4H^+ \longrightarrow + \underline{2MnO_4^-} + \underline{MnO_2} + 2H_2O$ Oxidation state of Mn increases from +6 to + 7 (oxidation) and decreases from + 6 to + 4 (reduction) / Mn undergoes increase and decrease in oxidation state simultaneously. (c) Due to the presence of a greater number of unpaired electrons which leads to strong interatomic metal-metal bonding whereas Mn with a stable half-filled d^5 configuration has a weaker metallic bond.	1 1 1 1, 1

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