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Senior School Certificate Examination

March 2019

Marking Scheme – CHEMISTRY (SUBJECT CODE: 043)

(PAPER CODE – 56-4-3)

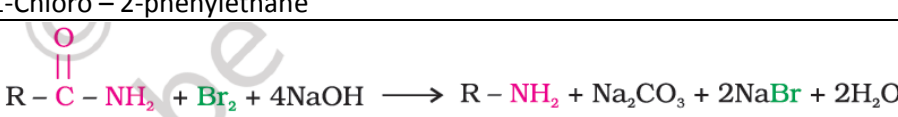
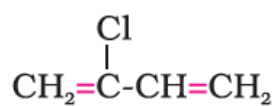
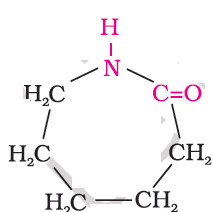
General Instructions: -

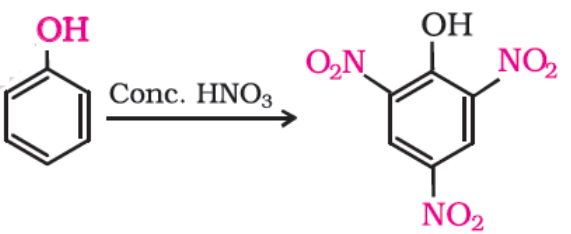
1. You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully. **Evaluation is a 10-12 days mission for all of us. Hence, it is necessary that you put in your best efforts in this process.**
2. 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 marks be awarded to them.**
3. 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. 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.
4. 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.
5. If a question does not have any parts, marks must be awarded in the left hand margin and encircled.
6. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.
7. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
8. A full scale of marks **0-70** has to be used. Please do not hesitate to award full marks if the answer deserves it.
9. Every examiner has to necessarily do evaluation work for full working hours i.e. 8 hours every day and evaluate 25 answer books per day.
10. 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 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.
 - 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.

11. While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as (X) and awarded zero (0) Marks.
12. Any unassessed 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.
13. The Examiners should acquaint themselves with the guidelines given in the Guidelines for spot Evaluation before starting the actual evaluation.
14. 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.
15. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges.

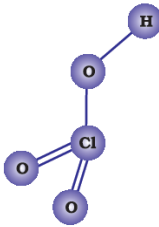
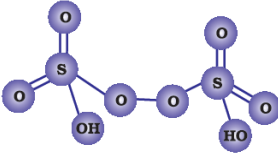
Marking scheme – 2019
CHEMISTRY (043)/ CLASS XII DELHI 2019

56/4/3

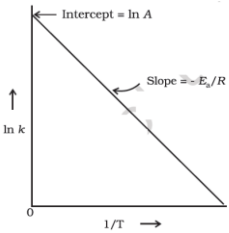
Q. No.	VALUE POINTS	MARKS	
1	Conductor	1	
2	Brownian movement / Similar charge on Colloidal particles (dispersed phase)	1	
3	$[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O} / [\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2$	1	
	OR		
3	Double salt dissociates in simple ions completely when dissolved in water while Complex salt does not .	1	
4	1-Chloro – 2-phenylethane	1	
5	 $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2 + \text{Br}_2 + 4\text{NaOH} \longrightarrow \text{R}-\text{NH}_2 + \text{Na}_2\text{CO}_3 + 2\text{NaBr} + 2\text{H}_2\text{O}$	1	
	OR		
5	Propanamine has intermolecular hydrogen bonding whereas N,N-dimethyl methanamine has no intermolecular hydrogen bonding.	1	
6	Nitrate ion / NO_3^- $[\text{Fe}(\text{H}_2\text{O})_5(\text{NO})]^{2+}$	1 1	
	OR		
6	$\text{MnO}_2 + 4\text{HCl} \rightarrow \text{MnCl}_2 + \text{Cl}_2 + 2\text{H}_2\text{O} /$ $2\text{KMnO}_4 + 16\text{HCl} \rightarrow 2\text{KCl} + 2\text{MnCl}_2 + 8\text{H}_2\text{O} + 5\text{Cl}_2 /$ CuCl_2 $4\text{HCl} + \text{O}_2 \xrightarrow{\text{CuCl}_2} \text{Cl}_2 + 2\text{H}_2\text{O}$ $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$ $\text{H}_2\text{S} + \text{Cl}_2 \rightarrow 2\text{HCl} + \text{S}$ $\text{C}_{10}\text{H}_{16} + 8\text{Cl}_2 \rightarrow 16\text{HCl} + 10\text{C}$ <p>(OR ANY OTHER CORRECT REACTION. Marks not to be deducted for not balancing.)</p>	1 1	
7	X ; Due to higher negative reduction potential.	1+1	
8	(a) Solubility of gases (O_2) increases with decrease in temperature / Solubility of gases (O_2) is inversely proportional to temperature / Decrease in temperature decreases K_H and increases solubility of gases (O_2).	1	
	(b) Due to the lower partial pressure of oxygen / Due to low concentrations of oxygen in the blood.	1	
	OR		
8	Maximum boiling azeotrope Hydrogen bonding between acetone and chloroform / Stronger solute – solvent interaction / Negative deviation from Raoult's law.	1 1	
9	(a) Chloroprene / 2-Methyl-buta- 1,3-diene 	(b) Caprolactum 	$\frac{1}{2} \times 4$

10	(a) Addition polymer; formed by addition of monomers / unsaturated monomeric units (b) Condensation polymer; formed by condensation of bifunctional monomers with elimination of water molecules	½+ ½ ½+ ½
11	(a) Cr ²⁺ , due to lower standard reduction potential (E ⁰) / Higher standard oxidation potential. (b) Mn ²⁺ , Due to highest negative standard reduction potential.	½ +½ ½ +½
12	(a)  (b) $\text{C}_2\text{H}_5\text{Cl} + \text{NaOC}_2\text{H}_5 \longrightarrow \text{C}_2\text{H}_5\text{OC}_2\text{H}_5 + \text{NaCl}$	1 1
13	$\pi = CRT$ $4.98 = (30/180/1) \times RT$ $4.98 = 0.166 RT \dots\dots\dots (i)$ $1.52 = CRT \dots\dots\dots (ii)$ Divide eq. (ii) by (i) $0.305 = C/0.166$ $C = 0.0506 \text{ mol l}^{-1}$	½ ½ ½ ½ ½ ½
(Or any other correct method)		
14	$d = \frac{z.M}{a^3.N_A}$ for bcc z=2 $= \frac{2 \times 52 \text{ g mol}^{-1}}{(300 \times 10^{-10} \text{ cm})^3 \times (6.022 \times 10^{23} \text{ mol}^{-1})}$ $= 6.39 \text{ g cm}^{-3}$	½ ½ 1 1
(Half mark to be deducted for incorrect or no units) (Or any other correct method)		
15	a) Sol -When a solid is dispersed in liquid. Example : Paint or any other correct example. b) Aerosol - When a solid / liquid is dispersed in gas. Example : Smoke or any other correct example c) Hydrosol - When a solid is dispersed in water . Example : Starch sol or any other correct example	½ + ½ ½ + ½ ½ + ½
16	$E_{\text{cell}}^0 = E_{\text{cathode}} - E_{\text{anode}}$ $= -0.403 - (-0.763) = 0.360 \text{ V}$ $\Delta_r G^0 = -nFE_{\text{cell}}^0$ $= -2 \times 96500 \times 0.360$ $= -69480 \text{ J mol}^{-1} \text{ or } -69.480 \text{ kJ mol}^{-1}$ $\log K_c = nE_{\text{cell}}^0 / 0.059$ $= 2 \times 0.360 / 0.059$ $\log K_c = 12.20$	½ ½ ½ ½ ½
OR		
16	$6 \times 96500 \text{ C deposit 1 mole Cr} = 52 \text{ g}$ $24000 \text{ C will deposit } 52 \times 24000 / 6 \times 96500 = 2.155 \text{ g}$ $52 \text{ g of Cr deposited by } 6 \times 96500 \text{ C}$	½ ½ ½

	<p>1.5 g Cr deposited by $6 \times 96500 \times 1.5 / 52 = 16701.9 \text{ C}$ $Q = I \times t$ $t = Q/I = 16701.9 \text{ C} / 12.5 \text{ A} = 1336 \text{ s}$</p> <p style="text-align: right;">(Or any other correct method)</p>	<p>$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$</p>
17	<p>(i) $sp^3 d^2$, paramagnetic (ii) dsp^2, diamagnetic</p>	<p>$1 + \frac{1}{2}$ $1 + \frac{1}{2}$</p>
18	<p>Fusion of chromite ore ($FeCr_2O_4$) with sodium or potassium carbonate in free access of air. $4 FeCr_2O_4 + 8 Na_2CO_3 + 7 O_2 \rightarrow 8 Na_2CrO_4 + 2 Fe_2O_3 + 8 CO_2$</p> <p>On acidification of Sodium chromate with sulphuric acid : $2Na_2CrO_4 + 2 H^+ \rightarrow Na_2Cr_2O_7 + 2 Na^+ + H_2O$</p> <p>$Cr_2O_7^{2-} + 14 H^+ + 6 Fe^{2+} \rightarrow 2 Cr^{3+} + 6 Fe^{3+} + 7 H_2O$</p>	<p>1 1 1</p>
OR		
18	<p>(a) $2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$ (b) $10I^- + 2MnO_4^- + 16H^+ \rightarrow 2Mn^{2+} + 8H_2O + 5 I_2$ (c) $Cr_2O_7^{2-} + 14 H^+ + 3 Sn^{2+} \rightarrow 2 Cr^{3+} + 3 Sn^{4+} + 7 H_2O$</p>	<p>1 1 1</p>
19	<p>(a) To separate two sulphide ores. (b) For refining of Ni / To form volatile complex with Ni which decomposes on further heating/ $Ni + 4CO \xrightarrow{\text{Heat}} Ni(CO)_4$ $Ni(CO)_4 \xrightarrow{\text{Heat}} Ni + 4CO$ (c) To separate (remove) impurities by forming soluble sodium aluminate / $Al_2O_3(s) + 2NaOH(aq) + 3H_2O(l) \rightarrow 2Na[Al(OH)_4](aq)$</p>	<p>1 1 1</p>
OR		
19	<p>1) $Al_2O_3(s) + 2NaOH(aq) + 3H_2O(l) \rightarrow 2Na[Al(OH)_4](aq)$ 2) $2Na[Al(OH)_4](aq) + CO_2(g) \rightarrow Al_2O_3 \cdot xH_2O(s) + 2NaHCO_3(aq)$ 3) $Al_2O_3 \cdot xH_2O(s) \rightarrow Al_2O_3(s) + xH_2O(g)$ 4) $2Al_2O_3 + 3C \rightarrow 4Al + 3CO_2$ or 4) Cathode: $Al^{3+}(\text{melt}) + 3e^- \rightarrow Al(l)$ Anode: $C(s) + O^{2-} \rightarrow CO(g) + 2e^-$</p> <p style="text-align: right;">(Balancing may be ignored)</p>	<p>1 $\frac{1}{2}$ $\frac{1}{2}$ 1</p>
20	<p>(a) Chemical compounds used for the treatment of stress / mental diseases / relieve anxiety/ induce a sense of well-being / to cure depression. Example: Iproniazid / phenelzine or any other correct example. (b) Sucralose / Aspartame / Alitame or any other correct example. (c) Due to more branching bacteria (microbes) can not degrade it./ Highly branched.</p>	<p>$\frac{1}{2} + \frac{1}{2}$ 1 1</p>
21	<p>(a) Biologically active / three dimensional structured protein is native protein whereas biologically inactive / not having three dimensional structure / lost 2^0 and 3^0 structures is denatured protein. (b) Lactose (c) Vitamin K / Phylloquinone.</p>	<p>1 1 1</p>
22	<p>(a) (i) CH_3NH_2 with Hinsberg's Reagent (Benzene Sulphonyl Chloride) forms a precipitate which is soluble in base. $(CH_3)_2NH$ with Hinsberg's Reagent (Benzene Sulphonyl Chloride) forms a precipitate which is insoluble in base. (Or any other suitable chemical test) (ii) Add benzene diazonium chloride to both the compounds, aniline forms yellow dye while ethanamine does not. (Or any other suitable chemical test)</p> <p>(b) Due to salt formation between Aniline and anhydrous $AlCl_3$. / Aniline behave as lewis base and anhydrous $AlCl_3$ behaves as lewis acid. / Nitrogen of aniline acquires positive charge</p>	<p>1 1</p>

	which acts as a strong deactivating group.	1
23	(a) Due to inter molecular H-bonding in Butan-1-ol (b) (i) $\text{CH}_3\text{-CH}_2\text{-}\ddot{\text{O}}\text{-H} + \text{H}^+ \longrightarrow \text{CH}_3\text{-CH}_2\text{-}\overset{\text{H}}{\overset{+}{\text{O}}}\text{-H}$ (ii) $\text{CH}_3\text{CH}_2\text{-}\ddot{\text{O}}\text{:} + \text{CH}_3\text{-CH}_2\text{-}\overset{\text{H}}{\overset{+}{\text{O}}}\text{-H} \longrightarrow \text{CH}_3\text{CH}_2\text{-}\overset{\text{H}}{\overset{+}{\text{O}}}\text{-CH}_2\text{CH}_3 + \text{H}_2\text{O}$ (iii) $\text{CH}_3\text{CH}_2\text{-}\overset{\text{H}}{\overset{+}{\text{O}}}\text{-CH}_2\text{CH}_3 \longrightarrow \text{CH}_3\text{CH}_2\text{-}\ddot{\text{O}}\text{-CH}_2\text{CH}_3 + \text{H}^+$	1 1 $\frac{1}{2}$ 1 $\frac{1}{2}$
24	(a) $-\text{NO}_2$ is an electron withdrawing group / It stabilises carbanion through resonance./ Diagrammatic representation (b) Due to symmetry / It fits better in crystal lattice. (c) Due to formation of gaseous byproducts / The two gaseous products are escapable.	1 1 1
OR		
24	Dry acetone (a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{-Cl} + \text{NaI} \longrightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{-I} + \text{NaCl}$ (b) 2-Bromo-2-methylbutane is more reactive as it gives more substituted alkene on elimination / Gives more stable product according to Saytzeff Rule/ 3° carbocation is more stable. (c) 4-Bromo-4-methylpent-2-ene.	1 1 1
25	(a) (i)  (ii)  (b) (i) Above 1000 K, Sulphur exist as S_2 molecule which has two unpaired electrons. (ii) It is due to low enthalpy of dissociation of F-F bond and high hydration enthalpy of F^- ion. (iii) Exists as $[\text{PCl}_4]^+ [\text{PCl}_6]^-$	1 + 1 1 1 1
OR		
25	(a) (i) $\text{PbS(s)} + 4\text{O}_3\text{(g)} \rightarrow \text{PbSO}_4\text{(s)} + 4\text{O}_2\text{(g)}$ (ii) $\text{XeF}_6 + \text{NaF} \rightarrow \text{Na}^+ [\text{XeF}_7]^-$ (b) (i) $\text{PH}_3 < \text{AsH}_3 < \text{NH}_3 < \text{SbH}_3 < \text{BiH}_3$ / $\text{NH}_3 > \text{PH}_3 < \text{AsH}_3 < \text{SbH}_3 < \text{BiH}_3$; NH_3 molecules associated with intermolecular H-bonding while other hydrides are associated with Van der Waals forces which depends on size.	1 1 $\frac{1}{2} + \frac{1}{2}$

	(ii) $\text{HF} < \text{HCl} < \text{HBr} < \text{HI}$; Down the group bond dissociation enthalpy decreases / Size increases.	$\frac{1}{2} + \frac{1}{2}$
	(iii) $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te} < \text{H}_2\text{Po}$, Down the group bond dissociation enthalpy decreases / Size increases.	$\frac{1}{2} + \frac{1}{2}$
26	<p>(a) (i)</p> <p>(ii)</p> $\text{CH}_3\text{CH}_2\text{COOH} \xrightarrow[\text{Heat}]{\text{NH}_3} \text{CH}_3\text{CH}_2\text{CONH}_2 \xrightarrow[\text{KOH}]{\text{Br}_2} \text{CH}_3\text{CH}_2\text{NH}_2 \xrightarrow[273 \text{ K}]{\text{HNO}_2} \text{CH}_3\text{CH}_2\text{OH} \xrightarrow[\text{OH}^-]{\text{KMnO}_4 / \text{H}^+} \text{CH}_3\text{COOH}$ <p>(Or any other correct method)</p> <p>(b) A : 2-Methylbut-2-ene / $\text{CH}_3\text{CH}=\text{C}(\text{CH}_3)_2$ B: Ethanal/ Acetaldehyde / CH_3CHO C: Propanone/ Acetone / CH_3COCH_3</p>	1 1 1 1
	OR	
26	<p>(a) (i)</p> <p>(ii)</p> $\text{CH}_3\text{Br} \xrightarrow{\text{KCN (alc.)}} \text{CH}_3\text{CN} \xrightarrow[\text{H}^+/\text{OH}^-]{\text{H}_2\text{O}} \text{CH}_3\text{COOH} \xrightarrow[\text{H}_3\text{O}^+]{\text{LiAlH}_4 / \text{Ether or B}_2\text{H}_6} \text{CH}_3\text{CH}_2\text{OH}$ <p>(Or any other correct method)</p> <p>(b) (i) $\text{CH}_3\text{CH}_2\text{CH}_3$ (ii) $(\text{CH}_3)_3\text{CCH}_2\text{OH} + (\text{CH}_3)_3\text{CCOONa}$ (iii)</p>	1 1 1 1
27	<p>(a) (i) Zero order (ii) $-k$</p> <p>(b)</p>	1 1 1

	$\log \frac{k_2}{k_1} = \frac{E_a}{2.303R} \left[\frac{T_2 - T_1}{T_1 T_2} \right]$	1
	$\log 4 = \left(\frac{E_a}{2.303 \times 8.314 \text{ JK}^{-1} \text{ mol}^{-1}} \right) \left[\frac{313 - 293}{313 \times 293} \right]$	1
	$0.602 = E_a \times 20 / 19.147 \times 91709$	
	$E_a = 52862 \text{ J mol}^{-1} = 52.862 \text{ kJ mol}^{-1}$	
	OR	
27	<p>(a)</p> 	1
	<p>(b) $k = (2.303/t) \log [R]_0 / [R]$ $= (2.303 / 30 \text{ min}) \log 100/80$ $= 0.0074 \text{ min}^{-1}$ or 0.007 min^{-1} $t_{1/2} = 0.693 / k$ $= 0.693 / 0.0074 = 93.6 \text{ min}$ or 99 min</p>	1
	OR	
	$t_{1/2} = (2.303 \times 0.3010 \times 30) / (2.303 \times 0.0969)$ $= 93.16 \text{ min} / 93.18 \text{ min}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$