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Senior School Certificate Examination

March 2019

Marking Scheme – CHEMISTRY (SUBJECT CODE: 043)

(PAPER CODE – 56-*4*-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. **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.

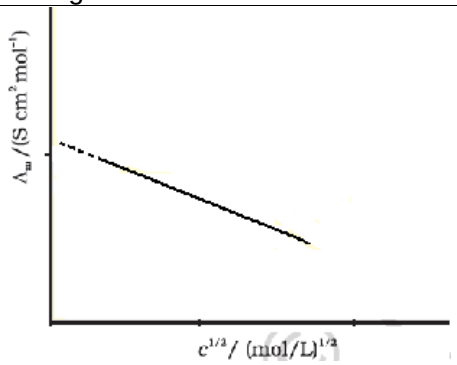
14. Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.

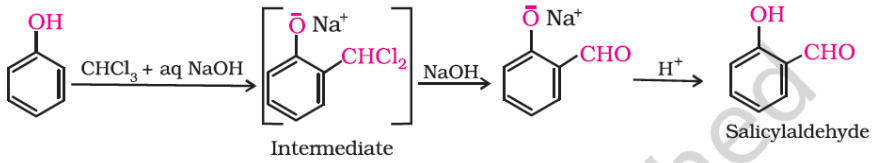
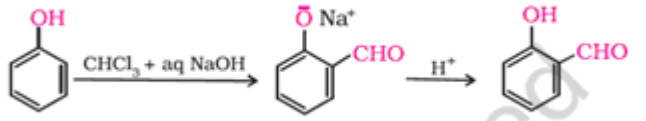
15. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges.

Marking scheme – 2019

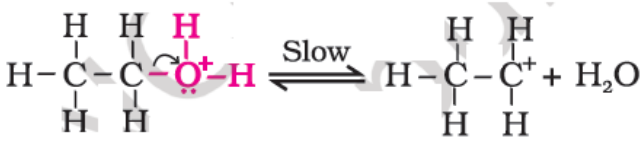
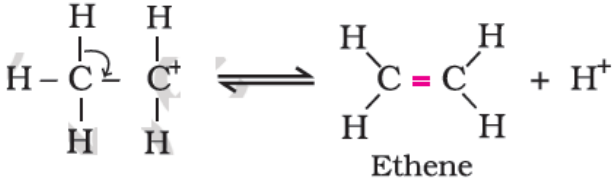
CHEMISTRY (043)/ CLASS XII DELHI 2019

56/4/1

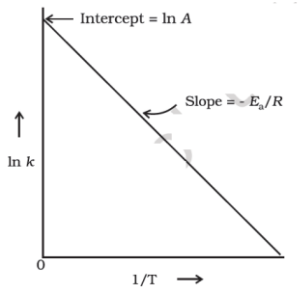
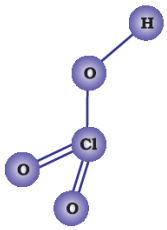
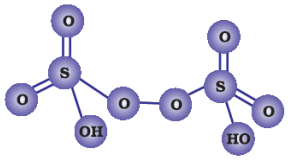
Q. No.	VALUE POINTS	MARKS
1	Schottky defect / Vacancy defect	1
2	$[Cr(H_2O)_5Cl]Cl_2 . H_2O$ / $[Cr(H_2O)_5Cl]Cl_2$	1
	OR	
	Double salt dissociates in simple ions completely when dissolved in water while Complex salt does not .	1
3	Substances which at low concentrations behave as normal strong electrolytes, but at higher concentrations exhibit colloidal behavior due to the formation of aggregates / Micelles. Example : Soap solutions / any other suitable example	½ + ½
4	Due to higher stability of 3^0 / tertiary carbocation	1
5	$R-\overset{\overset{O}{\|\|}}{C}-NH_2 + Br_2 + 4NaOH \longrightarrow R-NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$	1
	OR	
	Propanamine has intermolecular hydrogen bonding whereas N,N-dimethylmethanamine has no intermolecular hydrogen bonding.	1
6	(a) Solubility of gases (O_2) increases with decrease in temperature / Solubilty of gases (O_2) is inversely proportional to temperature / Decrease in temperature decreases K_H and increases solubility of gases (O_2). (b) Due to the lower partial pressure of oxygen / Due to low concentrations of oxygen in the blood.	1 1
	OR	
	Maximum boiling azeotrope Hydrogen bonding between acetone and chloroform / Stronger solute – solvent interaction / Negative deviation from Raoult's law.	1 1
7	 *Λm increases with increase in dilution / $\Lambda m = \kappa V$ / with increase in volume Λm increases.*	1 1
8	Nitrate ion / NO_3^- $[Fe(H_2O)_5(NO)]^{2+}$	1 1
	OR	
	$MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$ / $2KMnO_4 + 16HCl \rightarrow 2KCl + 2MnCl_2 + 8H_2O + 5Cl_2$ / $4HCl + O_2 \xrightarrow{CuCl_2} Cl_2 + 2H_2O$	1

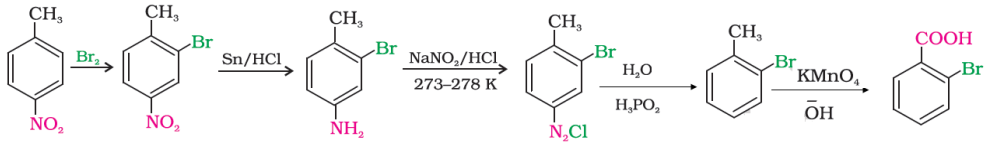
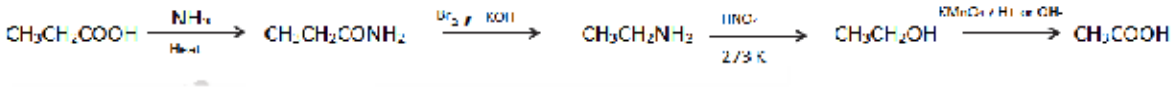
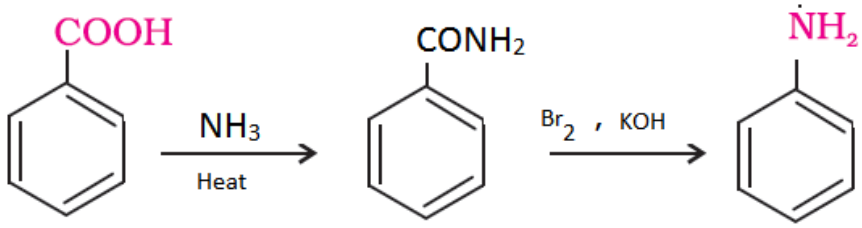
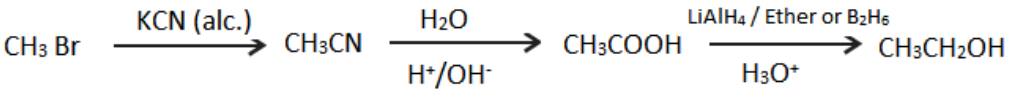
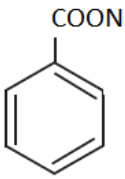
	$H_2 + Cl_2 \rightarrow 2HCl$ $H_2S + Cl_2 \rightarrow 2HCl + S$ $C_{10}H_{16} + 8Cl_2 \rightarrow 16HCl + 10C$ (OR ANY OTHER CORRECT REACTION.)	1
9	(a) Cr^{2+} , due to lower standard reduction potential (E^0) / Higher standard oxidation potential. (b) Mn^{2+} , Due to highest negative standard reduction potential.	½ +½ ½ +½
10	(a) On treating phenol with chloroform in the presence of sodium hydroxide, a –CHO group is introduced at *ortho* position of benzene ring.  Intermediate Salicylaldehyde OR  Salicylaldehyde (b) An alkyl halide is allowed to react with sodium alkoxide to form ether. R–X + R'–ONa -------→ R–O–R' + Na X (or any other specified equation) (Note: Full marks to be awarded if only equation is given)	½ ½ ½ ½
11	(a) $NH_2(CH_2)_6NH_2$ and $HOOC(CH_2)_4COOH$ (b) $CH_2 = CH - CH = CH_2$ and  	1 1
12	(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
13	$d = \frac{z.M}{a^3.N_A}$ for bcc z=2 $= \frac{2 \times 52 \text{ g mol}^{-1}}{(300 \times 10^{-10}\text{cm})^3 \times (6.022 \times 10^{23}\text{mol}^{-1})}$ $= 6.39 \text{ g cm}^{-3}$ (Half mark to be deducted for incorrect or no units) (Or any other correct method)	½ ½ 1 1
14	$\pi = CRT$ $4.98 = (30/180/1) \times RT$	½ ½

	4.98= 0.166 RT …….. (i) 1.52 = CRT ……(ii) Divide eq. (ii) by (i) 0.305= C/0.166 C = 0.0506 mol l^{-1} (Or any other correct method)	½ ½ ½ ½
15	$E^0_{cell} = E_{cathode} - E_{anode}$ = - 0.403 –(-0.763) = 0.360 V $\Delta_r G^0 = - nFE^0_{cell}$ = -2x 96500 x 0.360 = - 69480 J mol-1 or -69.480 kJ mol^{-1} log $K_c = nE^0_{cell} / 0.059$ = 2 x 0.360 / 0.059 log Kc= 12.20	½ ½ ½ ½ ½ ½
	OR	
	6 x 96500 C deposit 1 mole Cr = 52 g 24000 C will deposit 52 x 24000 / 6 x 96500 = 2.155 g 52 g of Cr deposited by 6 x 96500 C 1.5 g Cr deposited by 6 x 96500 x 1.5 / 52= 16701.9 C Q=I × t t = Q/I = 16701.9 C / 12.5 A= 1336 s (Or any other correct method)	½ ½ ½ ½ ½ ½
16	(a) Mutual coagulation / coagulation / cancellation of charges (b) Due to coagulating property of $FeCl_3$ for blood to form clots. (c) Due to saturation / log x/m = K $p^{1/n}$ When 1/*n*= 0, *x/m* = constant, the adsorption is independent of pressure.	1 1 1
17	(a) To prevent one of the sulphide ore from coming to the froth. (b) For refining of Ni / To form volatile complex with Ni which decomposes on further heating/ $Ni + 4CO \xrightarrow{Heat} Ni(CO)_4$ $Ni(CO)_4 \xrightarrow{Heat} Ni + 4CO$ (c) To separate (remove) impurities by forming soluble sodium aluminate / $Al_2O_3(s) + 2NaOH(aq) + 3H_2O(l) \rightarrow 2Na[Al(OH)_4](aq)$	1 1 1
	OR	
	1) $Al_2O_3(s) + 2NaOH(aq) + 3H_2O(l) \rightarrow 2Na[Al(OH)_4](aq)$ 2) $2Na[Al(OH)_4](aq) + CO_2(g) \rightarrow Al_2O_3.xH_2O(s) + 2NaHCO_3(aq)$ 3) $.Al_2O_3.xH_2O(s) \xrightarrow{} Al_2O_3(s) + xH_2O(g)$ 4) $2Al_2O_3 + 3C \rightarrow 4Al + 3CO_2$ or 4) Cathode: $Al^{3+}(melt) + 3e^- \rightarrow Al(l)$ Anode: $C(s) + O^{2-} \rightarrow CO(g) + 2e^-$ (Balancing may be ignored)	1 ½ ½ 1
18	Fusion of chromite ore ($FeCr_2O_4$) with sodium or potassium carbonate in free access of air to form sodium chromate $4 FeCr_2O_4 + 8 Na_2CO_3 + 7 O_2 \rightarrow 8 Na_2CrO_4 + 2 Fe_2O_3 + 8 CO_2$ On acidification of Sodium chromate with sulphuric acid to form sodium dichromate $2Na_2CrO_4 + 2 H^+ \rightarrow Na_2Cr_2O_7 + 2 Na^+ + H_2O$ (Full marks may be awarded for writing correct equations only. Balancing may be ignored) $Cr_2O_7^{2-} + 14 H^+ + 6 Fe^{2+} \rightarrow 2 Cr^{3+} + 6 Fe^{3+} + 7 H_2O$	1 1 1
	OR	

	(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)** $Cr_2O_7^{2-} + 14\ H^+ + 3\ Sn^{2+} \rightarrow 2\ Cr^{3+} + 3\ Sn^{4+} + 7\ H_2O$ (Balancing may be ignored)	1 1 1
19	(i) sp^3d^2 , paramagnetic (ii) dsp^2 , diamagnetic	1 + ½ 1 + ½
20	(a) $-NO_2$ 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	
	Dry acetone (a) $CH_3CH_2CH_2CH_2\text{-}Cl + NaI$ ----------→ $CH_3CH_2CH_2CH_2\text{-}I + NaCl$ **(b)** 2-Bromo-2-methylbutane is more reactive as it gives more substituted alkene on elimination / Gives more stable product according to Saytzeff Rule. **(c)** 4-Bromo-4-methylpent-2- ene**.**	1 1 1
21	(a) $CH_3\ C\ (CH_3)=CH\ CH_3 \xrightarrow{H_2O,\ H^+} CH_3\ C(CH_3)(OH)CH_2CH_3$ / $CH_2=C(CH_3)CH_2CH_3 \xrightarrow{H_2O,\ H^+} CH_3\ C(CH_3)(OH)CH_2CH_3$ (b) Mechanism *Step 1:*  *Step 2:*  *Step 3:*  Ethene	1 1 ½ ½
22	(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)	1

	(ii)Add benzene diazoniumchloride to both the compounds, aniline forms yellow dye while ethanamine does not. (Or any other suitable chemical test) (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 which acts as a strong deactivating group.	1 1
23	(a) Glucose does not give Schiff's test / does not form the hydrogensulphite addition product / Pentaacetate of glucose does not react with hydroxylamine/ Glucose is found to exist in two anomeric forms. (b) Amylose is a long unbranched chain with α-glucose units / Glycosidic linkage between C-1 & C-4 Amylopectin is a branched chain polymer of α-D-glucose Units / Chain is formed by C1–C4 glycosidic linkage whereas branching occurs by C1–C6 glycosidic linkage. Note: As per the language of question paper **"Amylase"** a protein / enzyme, a polymer of α – amino acid. (c) Due to presence of both, acidic (-COOH) and basic ($-NH_2$) groups / It reacts with both, acids and bases / Exists as Zwitter ion / Correct structure of zwitter ion.	1 1 1
24	(a) Antiseptics are chemicals which either kill or prevent the growth of micro-organisms applied to the living tissues such as wounds, cuts. Examples- Soframicine. (b) Drugs which relieve pain without causing addiction.Examples- Aspirin. (c) Cationic detergents are quarternary ammonium salts of amines with acetates, chlorides or bromides as anions/ Cationic part possess a long hydrocarbon chain and a positive charge on Nitrogen atom / Cationic part is involved in cleansing action. Example: Cetyltrimethyl ammonium bromide (Or any other correct example.)	½ + ½ ½ + ½ ½ + ½
25	(a) (i) Zero order (ii) – k (b) $\log \frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1 T_2}\right]$ $\log 4 = \left(\frac{E_a}{2.303 \times 8.314\ JK^{-1}mol^{-1}}\right)\left[\frac{313 - 293}{313 \times 293}\right]$ $0.602 = E_a \times 20 / 19.147 \times 91709$ E_a = 52862 J mol^{-1} = 52.862 kJ mol^{-1} (Deduct ½ mark if incorrect or no unit is given)	1 1 1 1 1
	OR	

	(a)  (b) k = (2.303/t) log $[R]_0$ / [R] = (2.303 / 30 min) log 100/80 = 0.0074 min^{-1} or 0.007 min^{-1} t ½ = 0.693 /k = 0.693 / 0.0074 = 93.6 min or 99 min OR $t_{1/2}$ = (2.303 × 0.3010 × 30) / (2.303 × 0.0969) = 93.16 min / 93.18 min	1 1 1 ½ ½ ½ ½
26	(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 $[PCl_4]^+[PCl_6]^-$	1 +1 1 1 1
26	OR	
	(a) (i) $PbS(s) + 4O_3(g) \rightarrow PbSO_4(s) + 4O_2(g)$ (ii) $XeF_6 + NaF \rightarrow Na^+ [XeF_7]^-$ (b) (i) $PH_3 < AsH_3 < NH_3 < SbH_3 < BiH_3$ / $NH_3 > PH_3 < AsH_3 < SbH_3 < BiH_3$; NH_3 molecules associated with intermolecular H-bonding while other hydrides are associated with Van der Waals forces which depends on size. (ii) HF < HCl < HBr < HI ; Down the group bond dissociation enthalpy decreases / Size increases. (iii) $H_2O < H_2S < H_2Se < H_2Te < H_2Po$, Down the group bond dissociation enthalpy decreases / Size increases.	1 1 ½ + ½ ½ + ½ ½ + ½

27	(a) (i)  (ii)  (Or any other correct method) (b) A : 2-Methylbut-2-ene / $CH_3CH=C(CH_3)_2$ B: Ethanal/ Acetaldehyde /CH_3CHO C: Propanone/ Acetone /CH_3COCH_3	1 1 1 1 1
	OR	
	(a) (i)  (ii)  (Or any other correct method) (b) (i) $CH_3CH_2CH_3$ (ii) $(CH_3)_3C\ CH_2OH$ + $(CH_3)_3C\ COONa$ (iii)  	1 1 1 1