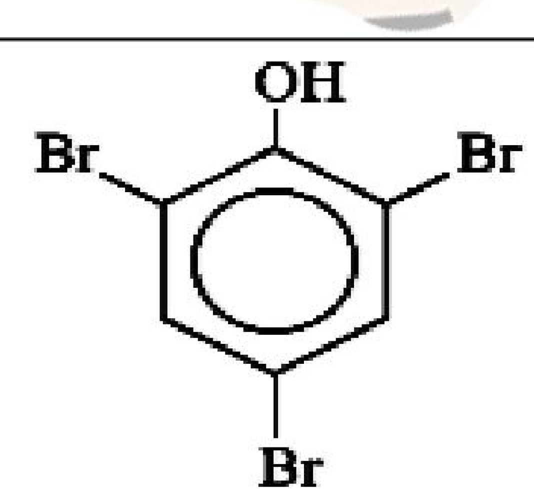
Marking scheme – 2021

CHEMISTRY (043) / CLASS XII

56 (B)

Q. No	Expected Answer / Value Points	Marks
	SECTION-A	
1. (i)	(B)	1
(ii)	(D) **OR** (B)	1
(iii)	(C)	1
(iv)	(C)	1
2. (i)	(D)	1
(ii)	(B) **OR** (A)	1
(iii)	(D)	1
(iv)	(A)	1
3.	(C)	1
4.	(A) **OR** (A)	1
5.	(B) **OR** (B)	1
6.	(B)	1
7.	(A) **OR** (C)	1
8.	(B)	1
9.	(D)	1
10.	(C)	1
11.	(C) **OR** (B)	1
12.	(A)	1
13.	(B)	1
14.	(C) **OR** (A)	1
15.	(D)	1
16.	(A)	1
	SECTION-B	
17.(a) 17.(b)	(i)  (ii) CH_3CH_2CHO **OR** (i) $CH_3CH_2OH \xrightarrow{PCl_5} CH_3CH_2Cl \xrightarrow{KCN} CH_3CH_2CN$ (ii) $C_6H_5OH \xrightarrow{\text{Zn dust}} C_6H_6 \xrightarrow{CH_3COCl/\ \text{Anhy. } AlCl_3} C_6H_5COCH_3$ (Or by any other suitable method)	1 1 1 1
18.	**Ideal Solution**: Each component obeys Raoult's law at all temperature and concentration, have similar structure and polarity, form them. ΔVmixing = 0 and $\Delta H_{mixing} = 0$ **Non-Ideal solution**: They do not obey Raoult's law. They show positive or negative deviation. Liquids, which are structurally different or have different polarity, form them. $\Delta V_{mixing} \neq 0$ and $\Delta H_{mixing} \neq 0$.	1 1
19. (a)	(i) d^2sp^3, Octahedral, diamagnetic, hexacyanidoferrate(II) ion / hexacyanoferrate(II) ion	½ X 4

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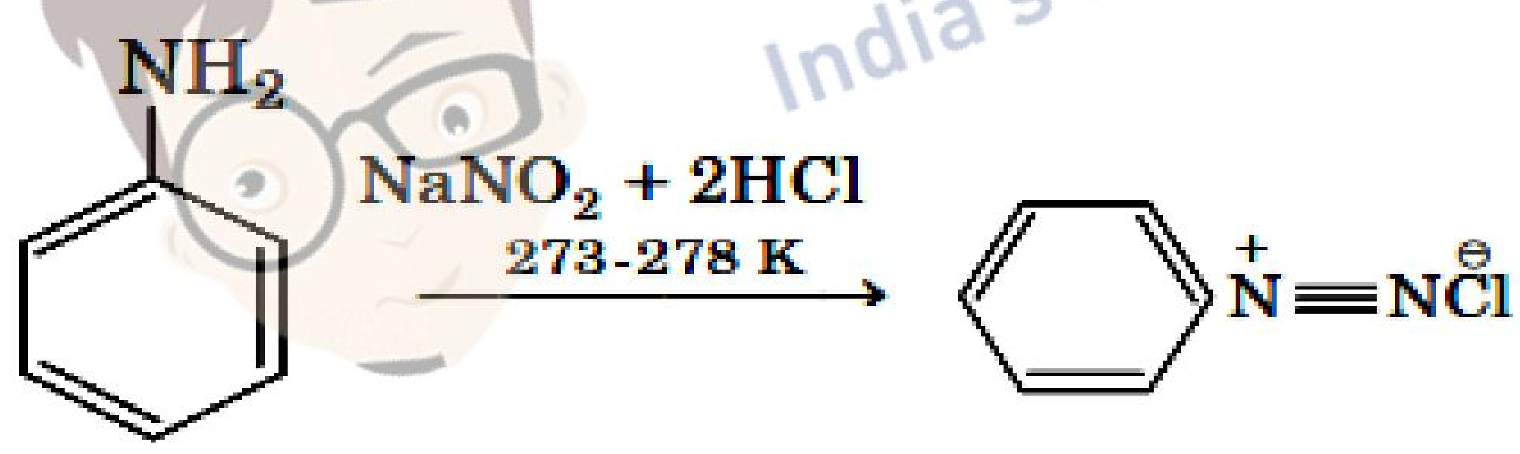
	OR	
19. (b)	(i) The energy used to split d-orbitals into two sets t_{2g} and e_g. (ii) If $\Delta_0 > P$: Pairing of electrons occurs and If $\Delta_0 < P$: No pairing of electrons	1 ½ , ½
20.	For a first order reaction, the time required for 99% completion is $t_1 = \frac{2.303}{k} \log \frac{100}{100-99}$ $= \frac{2.303}{k} \log 100$ $= 2 \times \frac{2.303}{k}$ -----------------------------(i) $t_2 = \frac{2.303}{k} \log \frac{100}{100-90}$ $= \frac{2.303}{k} \log 10$ $= \frac{2.303}{k}$ ------------------------(ii) Comparing (i) and (ii), $t_1 = 2t_2$.	½ ½ 1
21. (a)	(i) Due to incomplete filling of d- orbitals. (ii) Due to the presence of unpaired electrons.	1 1
	OR	
21. (b)	Due to the participation of 3d and 4s orbitals electron for bonding. +2, due to stable half filled $3d^5$ configuration.	1 ½, ½
22.	(i) H_2, Pd / $LiAlH_4$ / $NaBH_4$ (or any other correct reagent) (ii) Zn dust	1 1
23.	(i) Due to resonance. (ii) Due to sp^2 hybridised carbon atom. (or any other correct reason)	1 1
24.	**(i)** $R-\overset{O}{\overset{\parallel}{C}}-NH_2 + Br_2 + 4NaOH \longrightarrow R-NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$ (ii) 	1 1
25.	$d = \frac{Z\ X\ M}{N_A\ X\ a^3}$ $7.5\ g\ cm^{-3} = \frac{Z\ X\ 72\ g\ mol^{-1}}{(4\ X\ 10^{-8}))^3 cm^3\ \ X\ 6.022\ X 10^{23}\ mol^{-1}}$ $z = \frac{7.5\ X\ \ 6.022\ X10^{23}\ \ X\ 64\ X\ 10^{-24}}{72}$ = 4 Unit cell is of fcc type.	½ ½ ½ ½
	SECTION-C	
26 (a).	(i) C_6H_5MgBr is formed. (ii) o-Chlorotoluene and p-Chlorotoluene (or structures) (iii) CH_3NC	1 1 1
	OR	
26 (b).	**(i)** $CH_3\ CH_2Cl \xrightarrow{\text{Na, dry ether}} CH_3\ CH_2\ CH_2\ CH_3$ **(ii)** $CH_3CH(Br)CH_3 \xrightarrow{\text{KOH (alco.)}} CH_3\text{-}CH = CH_2 \xrightarrow{\text{HBr, peroxide}} CH_3\text{-}\ CH_2\ CH_2Br$ **(iii)** $CH_3\ CH_2Cl \xrightarrow{\text{1. KCN}} CH_3\ CH_2\ COOH$	1 1 1

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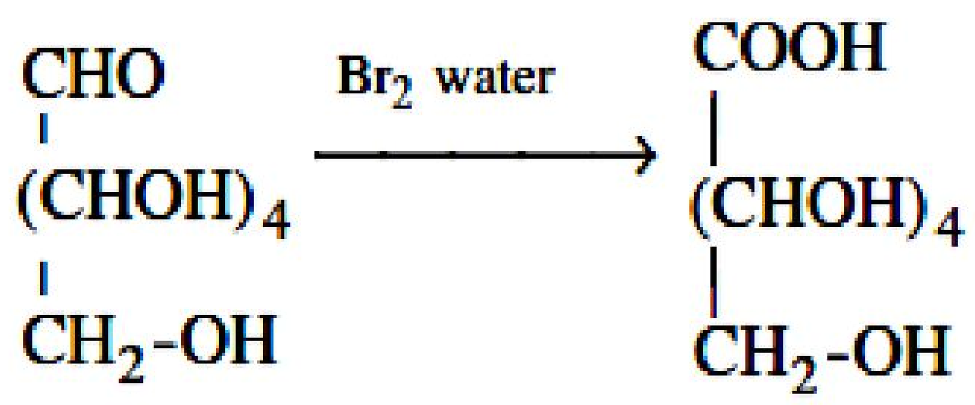
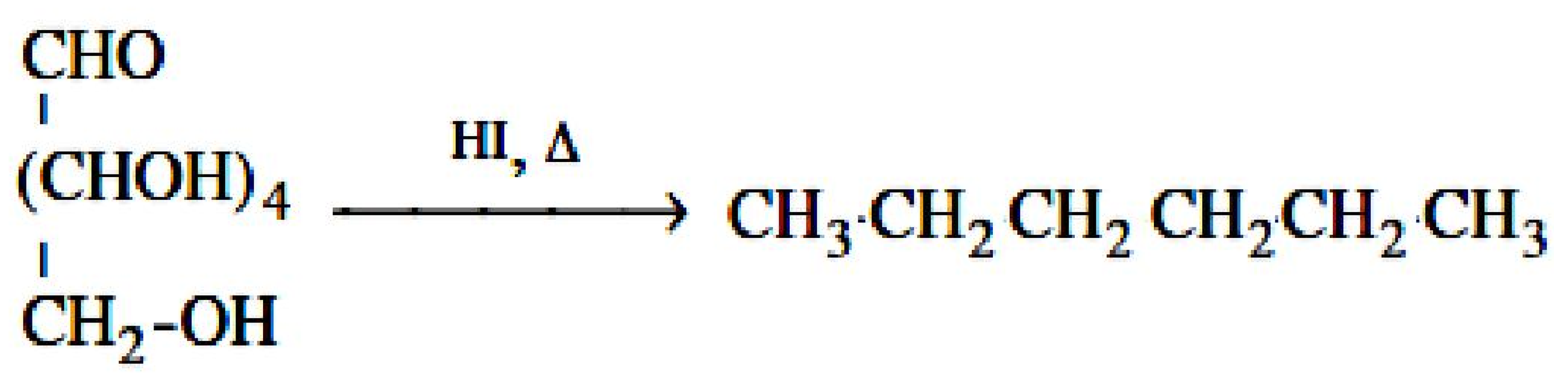
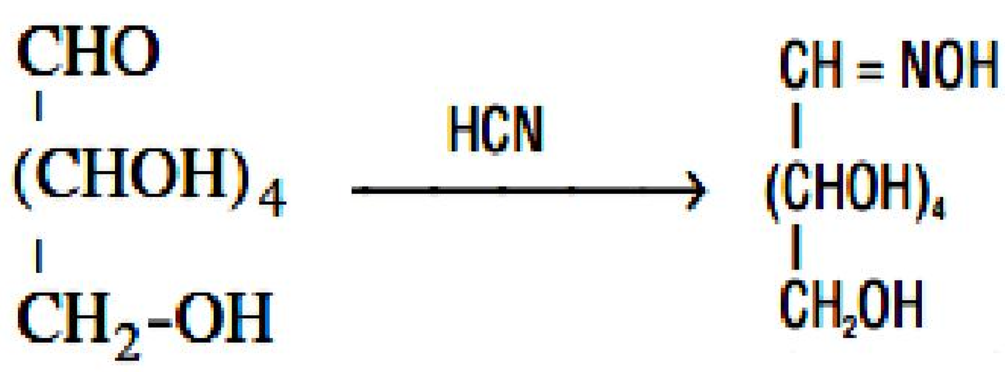
	2. H_3O^+	
27.	(i) Due to high enthalpy of atomization and low enthalpy of hydration. (ii) Due to the presence of one unpaired electron in Ti^{3+} whereas no unpaired electron in Sc^{3+}. (iii) Due to their ability to show variable oxidation state.	1 1 1
28 (a).	(i) Isomers that differ in the configuration as C-1. (ii) Linkage joining two amino acids through -CONH- bond. (iii) Loss of biological activity in proteins when subjected to change in pH, temperature, etc. **OR** (i)  (ii)  (iii) 	1 1 1 1 1 1
29.	$\frac{Po-P}{Po} = X2$ $\frac{17.536-P}{17.536} = \frac{w2}{M2} x \frac{M1}{w1}$ $\frac{17.536-P}{17.536} = \frac{20}{180} X \frac{18}{500}$ $\frac{17.536-P}{17.536} = 0.004$ 17.536 – P = 0.07 P = 17.536 – 0.07 = 17.466 mm Hg (Deduct ½ mark for no or incorrect unit).	1 1 1
30.	$k = \frac{2.303}{30 \text{ min}} \log \frac{100}{100-60}$ $= \frac{2.303}{30 \text{ min}} \log \frac{10}{4}$ $= 0.95 \text{ min}^{-1}$ $t_{1/2} = \frac{0.693}{k} = \frac{0.693}{0.95} = 0.73 \text{ min}$	1 1 1
	SECTION-D	
31. (a)	(i) (I): Due to small size of nitrogen lone pair of electrons is easily available for donation. (II): Because O is less electronegative than F. (III): Due to small size, high electronegativity, absence of d-orbital. (ii) (I):	1 1 1 1

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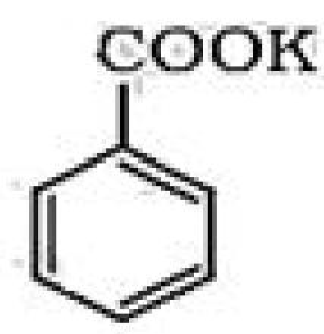
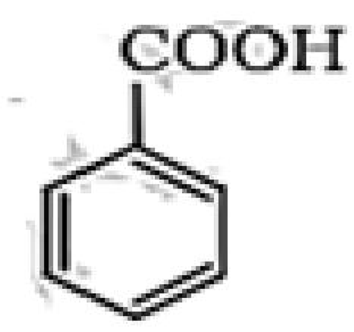
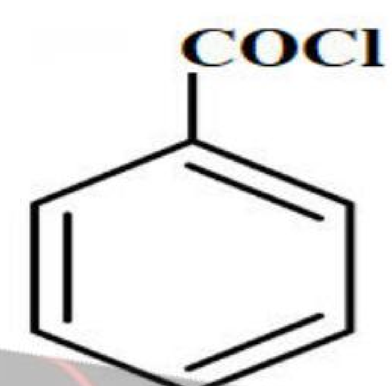
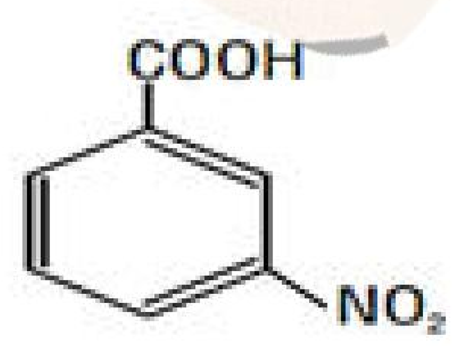
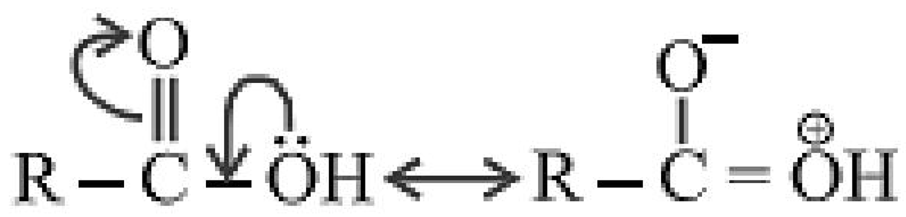
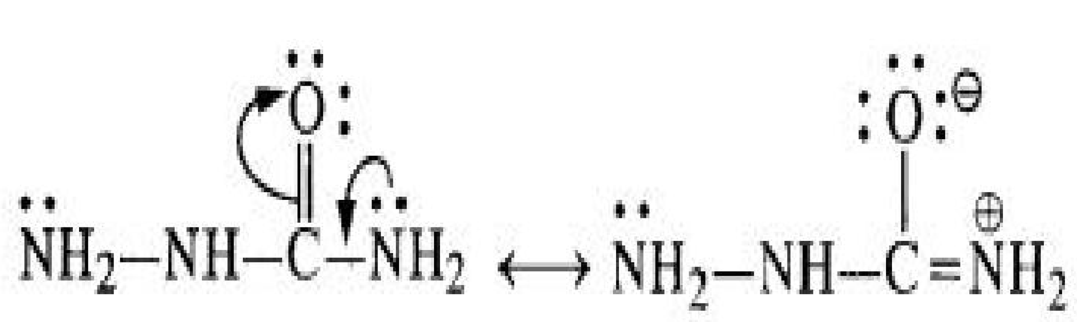
31. (b)	$2NaOH + Cl_2 \rightarrow NaCl + NaOCl + H_2O$ (cold and dilute) (II): $Cu + 2\ H_2SO_4(conc.) \rightarrow CuSO_4 + SO_2 + 2H_2O$ **OR** (i) (I): HI > HBr > HCl > HF (II): $BiH_3 < SbH_3 < AsH_3 < PH_3 < NH_3$ (III): $H_2O < H_2S < H_2Se < H_2Te$ (ii) (I) : Due to absorption of radiations in visible region which results in the excitation of outer electrons to higher energy level. (II): Because they easily accept one electron to acquire stable configuration.	1 1 1 1 1 1
32 (a).	(i) (I) A: CH_3CHO / Ethanal B:$CH_3CH(OH)CH_2CHO$ / 3-Hydroxybutanal C: $CH_3CH = CHCHO$ / But-2-enal (II) A:  / Potassium benzoate B:  / Benzoic acid C:  / Benzoyl chloride (ii): (I) On heating acetone with NaOH and I_2, it will give *yellow ppt.* of iodoform whereas propanal does not. (II) On adding $NaHCO_3$, benzoic acid will give the brisk effervescence whereas phenol does not. (Or any other suitable chemical test)	½ x 3 ½ x 3
32 (b).	(i): (I):  (II):  (III): CH_3CHO (ii) (I): Lone pairs of electrons on oxygen involved in resonance stabilization of -COOH group /Due to resonance lone pair on -OH of -COOH group decreases the electrophilicity of carbon atom to greater extent /  (II) Because the other $-NH_2$ group is involved in resonance *with -CO- group* / 	1 X 3 1 1

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33 (a).	(i) $E_{cell} = E^0_{cell} - \frac{0.059}{2}\log\frac{[Mg^{2+}]}{[Cu^{2+}]}$ $E_{cell} = 2.70 - \frac{0.059}{2}\log\frac{[10^{-3}]}{[10^{-4}]}$ $E_{cell} = 2.70 - \frac{0.059}{2}\log 10$ $E_{cell} = 2.70 - 0.0295$ $E_{cell} = 2.67$ V (Deduct ½ mark, if no or incorrect unit) $\Delta G = -nFE_{cell}$ = -2 x 96500 C mol^{-1} x 2.67 V = -515310 J mol^{-1} or -515. 310 kJ mol^{-1}	1 1 1 1 1 1
	OR	
33 (b).	(i) $\Delta G^\circ = -nFE^\circ_{cell}$ = -1 x 96500 C mol^{-1} x 0.03 V = -2895 J mol^{-1} or -2.895 kJ mol^{-1} $E^\theta_{(cell)} = \frac{0.059\ V}{n}\log K_C$ $\log K_c = \frac{1 \times 0.03\ V}{0.059}$ $\log K_c = 0.51$ (ii) Limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the anion and cation of the electrolyte. (iii) Calculation of molar conductivity at infinite dilution ('Λ_m°') for weak electrolytes / Calculation of degree of dissociation [α] and degree of dissociation constant (K).	½ 1 ½ 1 1 1

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