# Answers to RCH–DS1/Set-2

**1.** (*a*) $\Delta G^\circ = -nE^\circ F = -2 \times 1.1\ V \times 96500\ C = -212.3\ kJ\ mol^{-1}$,

$E^\circ_{cell} = +\ 0.34 - (-0.76) = 1.10\ V$

**2.** (*b*) 'A' is $CH_3COOH$ (Ethanoic acid), 'B' is $HCOOCH_3$ (Methyl methanoate).

**3.** (*a*) H–H bond

**4.** (*c*) $CH_3—\overset{\overset{O}{\|}}{C}—CH_3 + 3I_2 + 4NaOH \longrightarrow CHI_3 + CH_3COONa + 3NaI + 2H_2O$

**5.** (*b*) $C_6H_5CH_2Cl$ $\because$ it forms benzyl carbocation stabilised by resonance

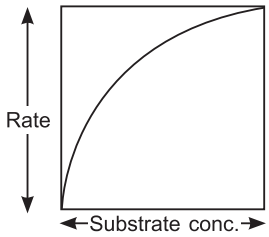
**6.** (*d*) $E^\circ_{Cu^{2+}/Cu} = +\ 0.34\ V$

$E^\circ_{Cr^{2+}/Cr} = -0.90\ V$

$E^\circ_{V^{2+}/V} = -1.18\ V$

$E^\circ_{Ni^{2+}/Ni} = -0.25\ V$

**7.** (*c*) Because rate of reaction increases in presence of enzyme but not linearly.




**8.** (*b*) $C_6H_5Br$, Gattermann reaction

**9.** (*d*) $2C_2H_5OH \xrightarrow[413K]{\text{Conc. } H_2SO_4} C_2H_5OC_2H_5 + H_2O$

**10.** (*a*) $(CH_3)_3CONa + C_2H_5I \longrightarrow (CH_3)_3COC_2H_5 + NaI$

**11.** (*b*) $0.0462\ year^{-1}$ $\because$ $k = \dfrac{0.693}{t_{1/2}} = \dfrac{0.693}{15} = 0.0462\ years^{-1}$

**12.** (*b*) 4 $\because$ $\mu_b = \sqrt{n(n+2)} = \sqrt{4 \times 6} = \sqrt{24} = 4.92$ BM.

**13.** (*b*) Both A and R are true but R is not the correct explanation of A.

**14.** (*c*) A is true but R is false.

**15.** (*d*) A is false but R is true.

**16.** (*b*) Both A and R are true but R is not the correct explanation of A.

**17.** (*a*) $k = Ae^{-Ea/RT}$ *or* $\ln k = \ln A - \dfrac{Ea}{RT}$ *or* $\log k = \log A - \dfrac{Ea}{2.303\,RT}$

(*b*) If $Ea = 0$, '$k$' does not depend upon temperature.

**18.** $CH_3—CH=\underset{\displaystyle CH_3}{\overset{|}{C}}—CH_3$ ('X') $\xrightarrow[(ii)\ Zn/H_2O]{(i)\ O_3}$ $CH_3—\overset{\displaystyle O}{\overset{\|}{C}}—H$ ('A') + $CH_3—\overset{\displaystyle O}{\overset{\|}{C}}—CH_3$ ('B')

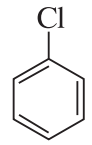
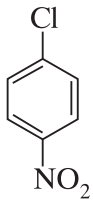
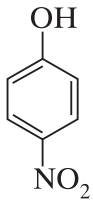
2-Methyl but-2-ene — Ethanal — Propanone

Both 'A' and 'B' give yellow ppt. of Iodoform. 'A' forms silver mirror with Tollen's reagent but 'B' does not react.

***Or***

(*a*) 'A' is $CH_2ClCOOH$ 'B' is $HOCH_2COOH$

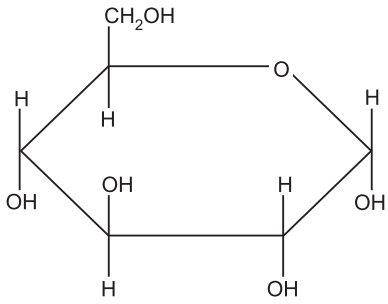
(*b*) $C_6H_5COCl$ (A) and $C_6H_5—\overset{\displaystyle O}{\overset{\|}{C}}—H$ (B)

**19.** (*i*)  + $HNO_3$ (Conc.) $\xrightarrow[\text{heat}]{\text{conc. } H_2SO_4}$  + NaOH $\xrightarrow[468\ K]{\Delta}$ 

Chlorobenzene — *p*-nitro chlorobenzene — *p*-nitrophenol

(*ii*) $C_2H_5OH \xrightarrow{PCl_5} C_2H_5Cl + KCN \longrightarrow C_2H_5C\equiv N \xrightarrow{H_2O/H^+} C_2H_5COOH$

Ethanol — Chloro ethane — Propanenitrile — Propanoic acid

**20.** (*a*) 

α-D(+) Glucopyranose

(*b*) Sucrose is dextrorotatory but after hydrolysis gives *d*(+) glucose (+52.5°) and *l*(–) fructose (–92.4°), the mixture is levorotatory, this process is called inversion of sugar.

**21.** $\pi_1 = \pi_2 \Rightarrow C_1 = C_2$ [$C_1$ and $C_2$ are molarity of glucose and unknown solute respectively.]

$$0.05 = \frac{12}{M_B} \times \frac{1000}{1000} \Rightarrow M_B = \frac{12}{0.05} = 240 \text{ g mol}^{-1}$$

**22.** (*a*) (*i*) Haemoglobin, a complex of iron acts as oxygen carrier.

(*ii*) Gold is extracting from $[Au(CN)_2]^-$ by reduction with zinc.

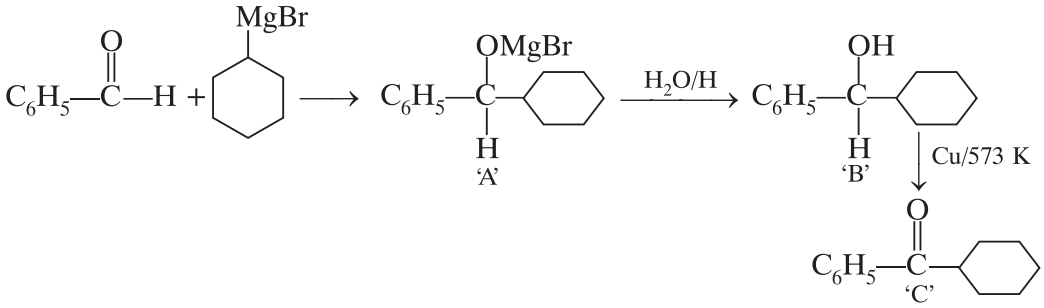
(*b*) Triammine triaqua cobalt(III) chloride. It will show *fac-mer* isomerism.

**23.** (*a*) It states "To deposite 1 mole of substance integral multiple of Faraday of charge should be passed".

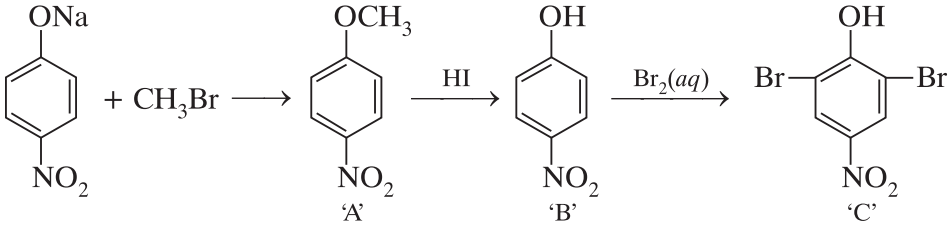
(*b*) The cell will become electrolytic cell.

(*c*) $E^\circ_{cell}$ is positive and $\Delta G$ is –ve for spontaneous redox reaction.

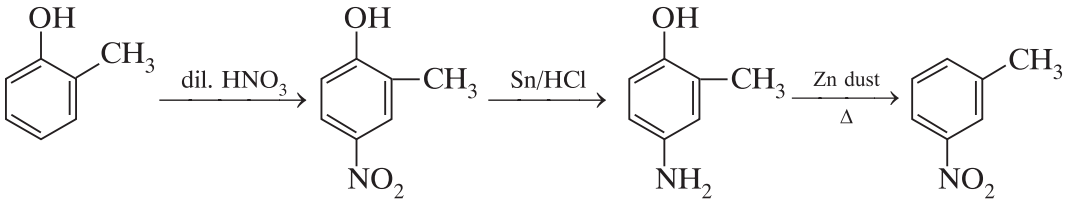
**24.** (*a*)



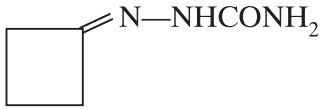

(*b*)



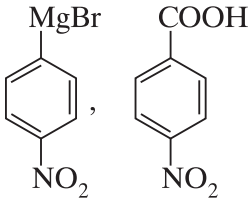

(*c*)




**25.** (*a*) 'A' is




(*b*)




(*c*) $C_6H_5CH{=}NH$, $C_6H_5CHO$ (Stephan's reaction)

**26.** (*a*) Order of reaction is determined experimentally, while molecularity is determined theoretically.

(*b*) $k = \dfrac{0.693}{t_{1/2}} = \dfrac{0.693}{24} = \dfrac{69.3}{24} \times 10^{-2} = 2.8875 \times 10^{-2}\ \text{min}^{-1}$

$$t_{25\%} = \frac{2.303}{k} \log \frac{[R]_0}{\frac{75}{100}[R]_0} = \frac{2.303}{0.693} \times 24 \text{ (log 4 – log 3)} = \frac{24(0.6021 - 0.4771}{0.3010}$$

$$t_{25\%} = \frac{24 \times 0.1250}{0.3010} = 9.966 \text{ min}$$

**27.** (*a*) **Rate constant** is equal to rate of reaction when molar conc. of reactants is unity. **Rate of reaction** is change in conc. of reactants or products per unit time.

(*b*) (*i*) Molecules must possess Ea or more than Ea.

(*ii*) They must collide in proper orientation.

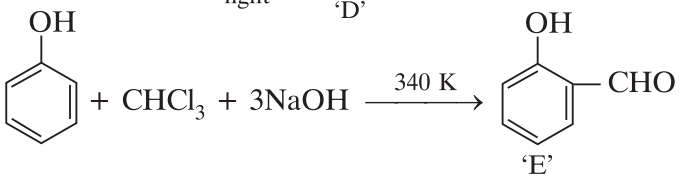
(*c*) Rate constant is directly proportional to collision frequency.

**28.** 'A' is $CHCl_3$

$$\underset{}{C_6H_5NH_2} + \underset{\text{'A'}}{CHCl_3} + \underset{\text{(alc.)}}{3KOH} \longrightarrow \underset{\text{'B'}}{C_6H_5N{\equiv}C} + 3KCl + 3H_2O$$

$$\underset{\text{'B'}}{C_6H_5N{\equiv}C} \xrightarrow[\text{(reduction)}]{LiAlH_4} \underset{\text{'C'}}{C_6H_5NHCH_3}$$

$$2CHCl_3 + O_2 \xrightarrow[\text{light}]{\text{Sun}} \underset{\text{'D'}}{2COCl_2} + 2HCl$$




'E'

**29.** (*a*) It is because number of ions per unit volume decreases.

(*b*) $\alpha = \frac{\Lambda_m}{\Lambda_m^\circ} = \frac{141}{150} = 0.94$, $\alpha = 0.94 \times 100 = 94\%$

(*c*) In HCl, $\Lambda_m$ will have higher value $\because$ $H^+$ mobility is higher than $K^+$ due to lesser atomic mass.

***Or***

(*c*) Conductance $\kappa$ (Kappa) will decrease with decrease in conc. in $CH_3COOH$ also.

**Similarity:** $\Lambda_m$ will increase with dilution in case of $CH_3COOH$ also.

**Difference:** The increase in $\Lambda_m^\circ$ will be drastic in $CH_3COOH$ than that of KCl.

**30.** (*a*) It is because $CN^-$ is strong field ligand, $\Delta_0$ is high.

(*b*) It is due to presence of unpaired electron, it undergoes *d-d* transitions by absorbing light from visible region and radiates violet colour in $Ti^{3+}$ and blue colour in $Cu^{2+}$.

(*c*) (*i*) $\Delta_t = \frac{4}{9}\Delta_0 = \frac{4}{9} \times 27000 \text{ cm}^{-1} = 12000 \text{ cm}^{-1}$

(*ii*) $Ti^{4+}$ does not have unpaired electron, can't undergo *d-d* transitions.

***Or***

(*c*) $[Co(CN)_6]^{3-} < [Co(NH_3)_6]^{3+} < [Co(H_2O)_6]^{2+}$

$\because$ $CN^- > NH_3 > H_2O$ is order of strength of ligands and $\Delta_0$, order of wavelength will be opposite $\because$ $\Delta_0 = \frac{hc}{\lambda}$.

**31.** (*a*) Promethium (61) is man-made lanthanoid.

(*b*) $Al(CH_3)_3 + TiCl_4$ is Ziegler Natta catalyst.

(*c*) It is because platinum shows variable oxidation state, has large surface area.

(*d*) Scandium, it is due to large atomic size, least effective nuclear charge.

(*e*) It is because $Mn^{2+}$ ($3d^5$) is more stable than $Mn^{3+}$($3d^4$).

(*f*) It is because atomic size of Zn is bigger than copper.

(*g*) It is because CO ligands are capable of a $\pi$-acceptor character in addition to $\sigma$ bonding.

**32.** (*a*) It is equal to elevation in boiling point when molality of solution is equal to one in case of non-electrolyte.

(*b*) It is done so as to remove bitterness. The process is osmosis, bitter fluid comes out in hypertonic saline water.

(*c*) $\pi V = i \frac{W_2}{M_2} \times R \times T \Rightarrow \pi \times 2 = \frac{2.5 \times 10^{-2}}{174} \times 0.0821 \times 300 \times 3$ [$\because i = 3$]

$$\pi = \frac{2.5 \times 10^{-2} \times 24.63 \times 3}{2 \times 174} = 5.308 \times 10^{-3} \text{ atm.}$$

***Or***

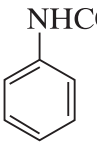
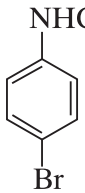
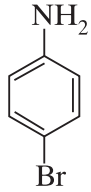
(*a*) Cryoscopic constant is equal to depression in freezing point of 1 molal solution of non-electrolyte.

(*b*) It is based on reverse osmosis.

(*c*) $(\Delta T_f)$ calculated $= m \times K_f = 0.561 \times 1.86 = 1.04346$

$(\Delta T_f)$ observed $= 2.93$, $i = \frac{(\Delta T_f)\text{obs}}{(\Delta T_f)\text{cal}} = \frac{2.93}{1.04346} = 2.808$

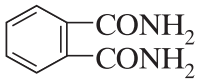
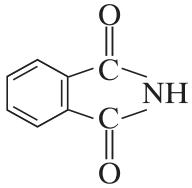
**33.** (*i*) A is $CH_3C{\equiv}N$ 'B' is $CH_3CH_2NH_2$ 'C' is $CH_3CH_2OH$

(*ii*) A is  'B' is  'C' is 

(*iii*) $C_6H_5NH_2 < C_6H_5NHCH_3 < C_6H_5N(CH_3)_2$

(*iv*) It is because R—— in amides is electron withdrawing reduces electron density on 'N' as compared to amines in which R— is electron releasing.

***Or***

(*i*) 'A' is  'B' is 

Phthalamide Phthalimide

(*ii*) 'A' is $C_6H_5CONH_2$ 'B' is $C_6H_5NH_2$

(*iii*) $CH_3CH_2CH_2NH_2 + HNO_2 \longrightarrow CH_3CH_2CH_2OH + N_2 + H_2O$

'X' 'Y'

$CH_3-\underset{\underset{NH_2}{|}}{CH}-NH_3 + HNO_2 \longrightarrow CH_3-\underset{\underset{OH}{|}}{CH}-CH_3 + N_2 + H_2O$

'X' 'Y'

$CH_3-CH_2-CH_2-NH_2 + C_6H_5SO_2Cl \longrightarrow C_6H_5SO_2NHCH_2CH_2CH_3$

'X' 'Z' $\xrightarrow{KOH}$ Soluble

$CH_3-\underset{\underset{NH_2}{|}}{CH}-CH_3 + C_6H_5SO_2Cl \longrightarrow C_6H_5SO_2NH-\underset{\underset{CH_3}{|}}{CH}-CH_3$

'X' 'Z' $\xrightarrow{KOH}$ Soluble

'X', 'Y', 'Z' each have two possible structures.