JEE MAIN 2023
Paper with Solution

CHEMISTRY | 29th Jan 2023 _ Shift-1

Umeed Rank Ki Ho Ya Selection Ki, JEET NISCHIT HAI!

Most Promising RANKS
Produced by MOTION Faculties

NEET / AIIMS

- AIR-1 to 10 — 25 Times
- AIR-11 to 50 — 83 Times
- AIR-51 to 100 — 81 Times

JEE MAIN+ADVANCED

- AIR-1 to 10 — 8 Times
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- AIR-51 to 100 — 36 Times

Nation's Best SELECTION
Percentage (%) Ratio

Student Qualified in NEET

(2022)
4837/5356 = 90.31%
(2021)
3276/3411 = 93.12%

Student Qualified in JEE ADVANCED

(2022)
1756/4818 = 36.45%
(2021)
1256/2994 = 41.95%

Student Qualified in JEE MAIN

(2022)
4818/6653 = 72.41%
(2021)
2994/4087 = 73.25%

NITIN VIIJAY (NV Sir)
Founder & CEO

SECTION - A

31. "A" obtained by Ostwald's method involving air oxidation of NH_3, upon further air oxidation produces "B". "B" on hydration forms an oxoacid of Nitrogen along with evolution of "A". The oxoacid also produces "A" and gives positive brown ring test.
Identify *A* and *B*, respectively.
(1) N_2O_3, NO_2 (2) NO_2, N_2O_4 (3) NO_2, N_2O_5 (4) NO, NO_2

Sol. 4

$$4\,NH_3+5O_2 \xrightarrow{\Delta} 4NO+6H_2O$$
(A)

$$2NO+O_2 \rightarrow 2NO_2$$
(B)

32. Correct statement about smog is:
(1) Classical smog also has high concentration of oxidizing agents
(2) Both NO_2 and SO_2 are present in classical smog
(3) NO_2 is present in classical smog
(4) Photochemical smog has high concentration of oxidizing agents

Sol. 4
Photochemical smog is oxidizing smog. Its high concentration of oxidizing agent like ozone and HNO_3

33. The standard electrode potential (M^{3+}/M^{2+}) for V, Cr, Mn & Co are $-0.26\,V$, $-0.41\,V$, $+1.57\,V$ and $+1.97\,V$, respectively. The metal ions which can liberate H_2 from a dilute acid are
(1) Mn^{2+} and Co^{2+} (2) Cr^{2+} and Co^{2+} (3) V^{2+} and Cr^{2+} (4) V^{2+} and Mn^{2+}

Sol. 3
V^{+2} and Cr^{+2}
The metal ion for which have less value of reduction potential can release H_2 on reaction with dilute acid.

34. The shortest wavelength of hydrogen atom in Lyman series is λ. The longest wavelength in Balmer series of $He^+$is
(1) $\frac{36\lambda}{5}$ (2) $\frac{9\lambda}{5}$ (3) $\frac{5}{9\lambda}$ (4) $\frac{5\lambda}{9}$

Sol. 2

For lymen seriese $\rightarrow \frac{1}{\lambda_{min}} = R \times 1\left(\frac{1}{1^2}-\frac{1}{\infty^2}\right)$

For balmer seriese $\rightarrow \frac{1}{\lambda_{max}} = R \times 4\left(\frac{1}{2^2}-\frac{1}{3^2}\right)$

$$\frac{\frac{1}{\lambda_{min}}}{\frac{1}{\lambda_{max}}} = \frac{\lambda_{max}}{\lambda_{min}} = \frac{\lambda_{max}}{\lambda} = \frac{9R}{5R}$$

$$\lambda_{max} = \frac{9\lambda}{5}$$

35. The bond dissociation energy is highest for
(1) F_2 (2) Br_2 (3) I_2 (4) Cl_2

Sol. 4

Order of B.D.E in halogen is

(E) Cl–Cl > Br-Br > F-F > I-I

36. The increasing order of pK_a for the following phenols is

(A) 2, 4-Dinitrophenol (B) 4-Nitrophenol

(C) 2, 4,5 – Trimethylphenol (D) Phenol

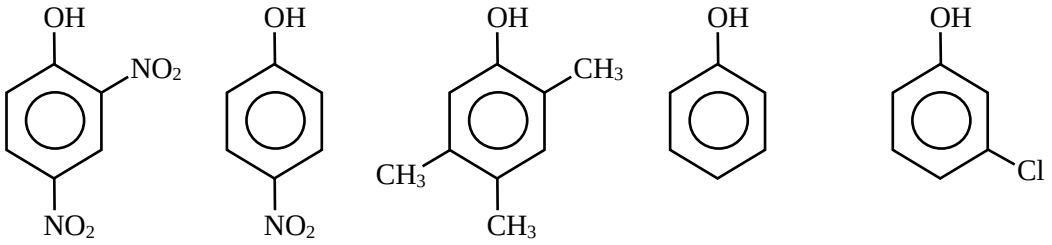
(E) 3-Chlorophenol

Choose the correct answer from the option given below:

(1) (A), (B), (E), (D), (C) (2) (C), (D), (E), (B), (A)

(3) (A), (E), (B), (D), (C) (4) (C), (E), (D), (B), (A)

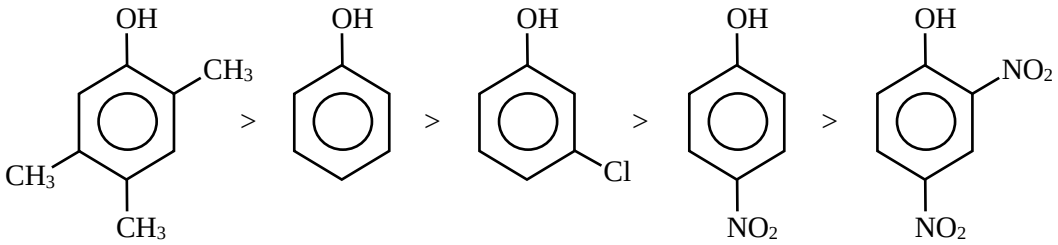
Sol. 1



(A) (B) (C) (D) (E)

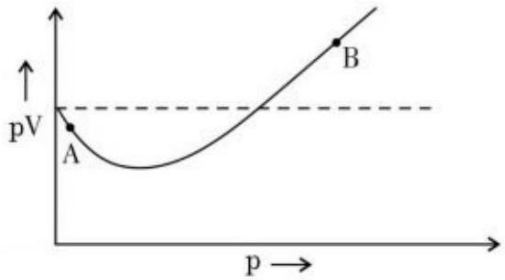
acedic strength $\propto K_a$

$$\propto \frac{1}{PK_a}$$



(C) (D) (E) (B) (A)

37. For 1 mol of gas, the plot of pV vs. p is shown below. p is the pressure and V is the volume of the gas



What is the value of compressibility factor at point ?

(1) $1+\frac{a}{RTV}$ (2) $1-\frac{a}{RTV}$ (3) $1+\frac{b}{V}$ (4) $1-\frac{b}{V}$

Sol. 2

At point A → low pressure, volume of gas very high

$\rightarrow V-b \approx V$

$$\left(p+\frac{a}{V^2}\right)\left(v-\underset{\text{neglect}}{b}\right)=RT$$

$$\left(p+\frac{a}{V^2}\right)v=RT$$

$$PV+\frac{a}{v}=RT$$

$$z+\frac{a}{RTV}=1$$

$$z=1-\frac{a}{RTV}$$

38. Match List I with List II.

List I		List II	
Antimicrobials		Names	
(A)	Narrow Spectrum Antibiotic	(I) Furacin	
(B)	Antiseptic	(II) Sulphur dioxide	
(C)	Disinfectants	(III) Penicillin G	
(D)	Broad spectrum antibiotic	(IV) Chloramphenicol	

Choose the correct answer from the options given below:

(1) (A) – II, (B) – I, (C) – IV, (D) – III (2) (A) –I, (B) – II, (C) – IV, (D) – III

(3) (A) – II, (B) – I, (C) – IV, (D) – II (4) (A) –III, (B) – I, (C) – II, (D) – IV

Sol. 4

Narrow Spectrum Antibiotic → Penicillin G (used in pathgens)

Antiseptic → Furacin

Disinfectants → Sulphur dioxide

Broad spectrum antibiotic → Chloramphenicol

39. During the borax bead test with $CuSO_4$, a blue green colour of the bead was observed in oxidising flame due to the formation of

(1) CuO (2) $Cu(BO_2)_2$ (3) Cu_3B_2 (4) Cu

Sol. 2

Blue green colour is due to formation of $Cu(BO_2)_2$

$$CuSO_4 \xrightarrow{\Delta} CuO+SO_3$$

$$CuO+B2O_3 \rightarrow Cu(BO_2)_2$$

40. Which of the following salt solution would coagulate the colloid solution formed when FeCl3 is added to NaOH solution, at the fastest rate?

(1) 10 mL of 0.1 mol dm^{-3} Na_2SO_4 (2) 10 mL of 0.2 mol dm^{-3} $AlCl_3$

(3) 10 mL of 0.1 mol dm^{-3} $Ca_3(PO_4)_2$ (4) 10 mL of 0.15 mol dm^{-3} $CaCl_2$

Sol. 2

$FeCl_3 + NaOH \rightarrow Fe(OH)_3/OH^-$

Negative colloidal particle

Positive ion required for coagulation of sol.

41. Number of cyclic tripeptides formed with 2 amino acids *A* and *B* is:

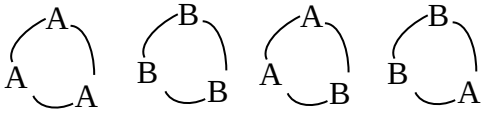
(1) 5 (2) 2 (3) 4 (4) 3

Sol. 3

To amine acid

$H_2N-CH(R_1)-COOH$ (A) $H_2N-CH(R_2)-COOH$ (B)

Tripeptide are formed →



42. The correct order of hydration enthalpies is

(A) K^+ (B) Rb^+ (C) Mg^{2+} (D) Cs^+

(E) Ca^{2+}

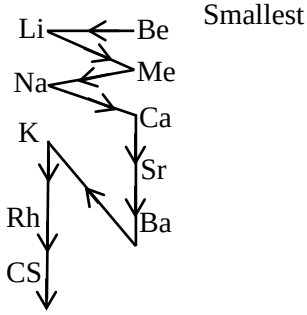
Choose the correct answer from the options given below:

(1) E > C > A > B > D (2) C > A > E > B > D

(2) C > E > A > D > B (4) C > E > A > B > D

Sol. 4

Order of hydration enthalpy is size order



$Mg^{2+} > Ca^{2+} > K^+ > Rb^+ > CS^+$

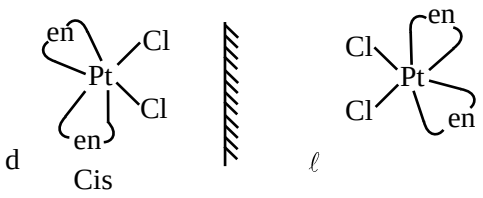
43. Chiral complex from the following is:

Here en = ethylene diamine

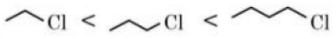
(1) cis $^-[PtCl_2(en)_2]^{2+}$ (2) trans $-[PtCl_2(en)_2]^{2+}$

(3) cis $-[PtCl_2(NH_3)_2]$ (4) trans $-[Co(NH_3)_4Cl_2]^+$

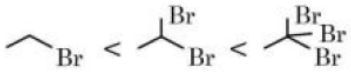
Sol. 1

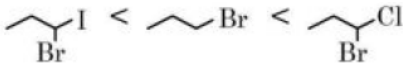


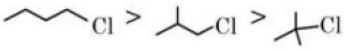
44. Identify the correct order for the given property for following compounds.

(A) Boiling Point: 

(B) Density: 

(C) Boiling Point: 

(D) Density: 

(E) Boiling Point: 

Choose the correct answer from the option given below:

(1) (B), (C) and (D) only
(2) (A), (C) and (D) only
(3) (A), (B) and (E) only
(4) (A), (C) and (E) only

Sol. 4

(i) B.P. $\propto$ Molecular mass

(ii) B.P. $\propto$ polarity↑

(iii) B.P. $\propto \frac{1}{\text{No.of Branches}}$

45. The magnetic behavior of Li_2O, Na_2O_2 and KO_2, respectively, are

(1) Paramagnetic, paramagnetic and diamagnetic
(2) diamagnetic, paramagnetic and diamagnetic
(3) paramagnetic, diamagnetic and paramagnetic
(4) diamagnetic, diamagnetic and paramagnetic

Sol. 4

Li_2O	O^{--}	Diamagnetic
Na_2O_2	O_2^{--}	Diamagnetic
KO_2	O_2^{-}	paramagnetic

46. The reaction representing the Mond process for metal refining is_____

(1) $ZnO + C \xrightarrow{\Delta} Zn + CO$

(2) $Zr + 2I_2 \xrightarrow{\Delta} ZrI_4$

(3) $2\ K[Au(CN)_2] + Zn \xrightarrow{\Delta} K_2[Zn(CN)_4] + 2Au$

(4) $Ni + 4CO \xrightarrow{\Delta} Ni(CO)_4$

Sol. 4

$$Ni + 4CO \xrightarrow{50^oC} Ni(CO)_4 \text{ (vap.)}$$

Impure

$\downarrow 250^oC$

$Ni + 4CO$ pure

47. Which of the given compounds can enhance the efficiency of hydrogen storage tank?

(1) Di-isobutylaluminium hydride (2) $NaNi_5$

(3) Li/P_4 (4) SiH_4

Sol. 2

Ni can adsorb 800 times more hydrogen then its own volume

48. Match List I with List II.

List I		List II
Reaction		Reagents
(A)	Hoffmann Degradation	(I) Conc.KOH, Δ
(B)	Clemenson reduction	(II) $CHCl_3$, $NaOH/H3O^{\oplus}$
(C)	Cannizaro reaction	(III) Br_2, NaOH
(D)	Reimer-Tiemann Reaction	(IV) Zn – Hg/HCl

Choose the correct answer from the options given below:

(1) (A) –III, (B) –IV, (C) – I, (D) – II (2) (A) - II, (B) –I, (C) - III, (D) – IV

(3) (A) –III, (B) –IV, (C) – II, (D) – I (4) (A) –II, (B) – IV, (C) – I, (D) – III

Sol. 1

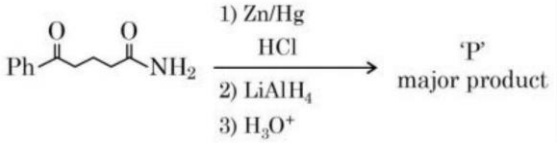
Hoffmann degradation → Br_2, NaOH

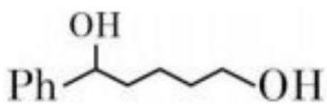
Clemenson reduction → Zn-Hg/HCl

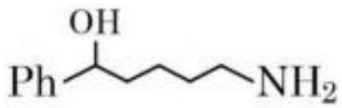
Cannizaro reaction → Conc. KOH, Δ

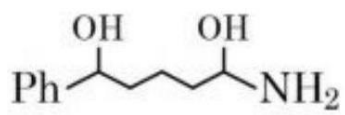
Reimer-Tiemann reaction → $CuCl_3$, $NaOH/H_3O^{\oplus}$

49. The major product 'P' for the following sequence of reactions is:



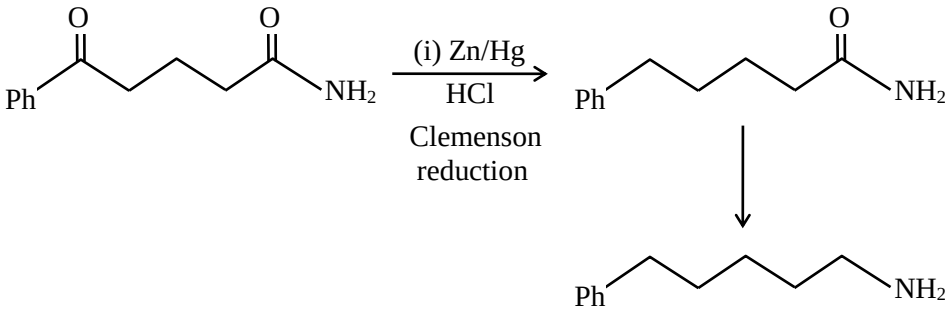
(1) 

(2) 

(3) 

(4) 

Sol. 4



50. Compound that will give positive Lassaigne's test for both nitrogen and halogen is:
(1) $NH_2OH.HCl$ (2) $CH_3NH_2.HCl$ (3) NH_4Cl (4) $N_2H_4.HCl$

Sol. 2
Lassaigne test for both N and X is given by the compound which have C, N as well X atom in compound.

51. Millimoles of calcium hydroxide required to produce 100 mL of the aqueous solution of pH 12 is $x \times 10^{-1}$. The value of x is_____(Nearest integer).
Assume complete dissociation.

Sol. 5
pH=12, pOH=2 $[OH^-]=10^{-2}$ N

Molarity of $Ca(OH)_2$= $\frac{N}{2}=\frac{10^{-2}}{2}$ = 0.005 N

$0.005 = \frac{\text{mili moles}}{100}$

$= \frac{5}{1000}=\frac{\text{mili moles}}{100}$

$= 5\times10^{-1}$ milimoles

52. Water decomposes at 2300 K

$$H_2O(g) \rightarrow H_2(g) + \frac{1}{2}O_2(g)$$

The percent of water decomposing at 2300 K and 1 bar is_____(Nearest integer).
Equilibrium constant for the reaction is 2×10^{-3} at 2300 K.

Sol. 2
$H_2O(g) \rightarrow H_2(g) + 1/2O_2$
$1-\alpha \quad \alpha \quad \alpha/2$

$k_p = \frac{\alpha(\alpha/2)^{1/2}}{1-\alpha} = 2\times10^{-3}$

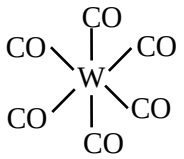
$2\times10^{-3} = \frac{\alpha^{3/2}}{\sqrt{2}(1-\alpha)}$ $\alpha \ll 1$

$2^{3/2}\times(10^{-2})^{3/2}=\alpha^{3/2}$
$\alpha=2\times10^{-2}$

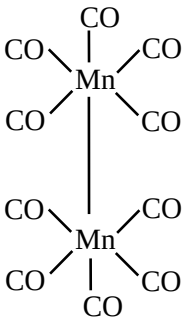
53. The sum of bridging carbonyls in $W(CO)_6$ and $Mn_2(CO)_{10}$ is_____

Sol. 0

$W(CO)_6 \rightarrow 0$ Bridge CO



$Mn_2(CO)_{10} \rightarrow 0$



54. Solid Lead nitrate is dissolved in 1 litre of water. The solution was found to boil at 100.15^0C. When 0.2 mol of NaCl is added to the resulting solution, it was observed that the solution froze at -0.8^0C. The solubility product of $PbCl_2$ formed is_____$\times 10^{-6}$ at 298 K. (Nearest integer)

(Given : K_b=0.5 K kgmol^{-1} and K_f = 1.8 K kg mol^{-1}. Assume molality to be equal to molarity in all cases.)

Sol. 13

Let a mole $Pb(NO_3)_2$ be added

$$Pb(NO_3)_2 \rightarrow Pb^{2+} + 2NO_3^-$$

a a 2a

$$\Delta T_b = 0.15 = 0.5[3a] \Rightarrow a = 0.1$$

$$Pb^{2+}_{(aq)} + 2Cl^-_{(aq)} \rightarrow PbCl_2(s)$$

t = 0	0.1	0.2
$t = \infty$	(0.1 – x)	(0.2 – 2x)

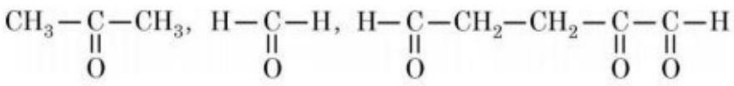
In final solution

$$\Delta T_f = 0.8 = 1.8\left[\frac{0.3+3x+0.2+0.2}{1}\right]$$

$$\Rightarrow x = \frac{2.3}{27}$$

$$\Rightarrow K_{sp} = \left(0.1-\frac{2.3}{27}\right)\left(0.2-\frac{4.6}{27}\right)^2 = 13\times10^{-6}$$

55. 17mg of a hydrocarbon (M.F. $C_{10}H_{16}$) takes up 8.40 mL of the H_2 gas measured at 0°C and 760 mm of Hg. Ozonolysis of the same hydrocarbon yields



The number of double bond/s present in the hydrocarbon is_____

Sol. 3

$$\text{Moles of hydrocarbon} = \frac{17\times10^{-3}}{136} = 1.25\times10^{-4}$$

$$nH_2 = 1\times\frac{8.4}{1000} = n\times0.0821\times273$$

$$\Rightarrow\ n = 3.75\times10^{-4}$$

Hydrogen molecule used for 1 molecule of hydrogen is 3

$$= \frac{3.75\times10^{-4}}{1.25\times10^{-4}} = 3$$

56. Consider the following reaction approaching equilibrium at 27°C and 1 atm pressure

$$A + B \underset{k_r=10^2}{\overset{k_f=10^3}{\rightleftharpoons}} C + D$$

The standard Gibb's energy change $(\Delta_r G^{\theta})$ at 27°C is (–)_____KJ mol^{-1}

(Nearest integer).

(Given: R = 8.3 J K^{-1} mol^{-1} and ln 10 = 2.3)

Sol. 6

$$K_{eq} = \frac{K_f}{K_b} = \frac{10^3}{10^2} = 10$$

$\Delta G^o = -RT \ln K_{eq}$

$= -8.3\times300 \ln 10$

$= -8.3\times300 \times2.3$

$= -5.72\times10^{+3}$ J

= 5.72 KJ

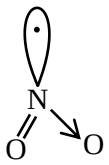
57. The number of molecules or ions from the following, which do not have odd number of electrons are_____

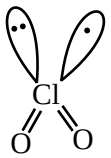
(A) NO_2 (B) ICl_4^- (C) BrF_3 (D) ClO_2

(E) NO_2^+ (F) NO

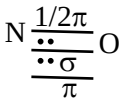
Sol. 3

odd e^-

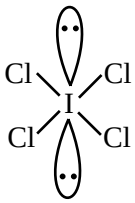


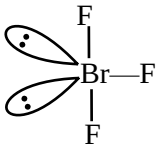


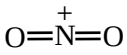
ICl_4^-, BrF_3 and NO_2^+ do not have odd number of electron.



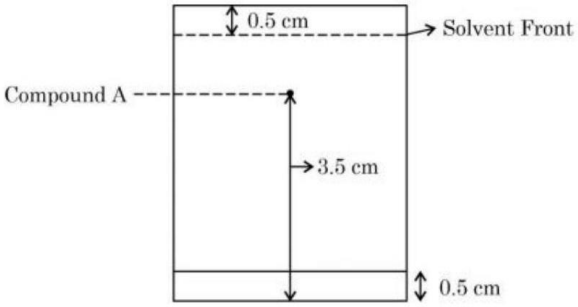
Odd e^- absent







58. Following chromatogram was developed by adsorption of compound 'A' on a 6 cm TLC glass plate. Retardation factor of the compound 'A' is_____$\times 10^{-1}$

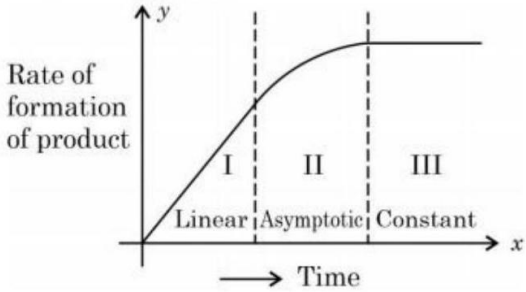


Sol. 6

$$R_f = \frac{\text{Distance moved by the substance from base line}}{\text{Distance moved by the solvent from base line}}$$

$$= \frac{3.0\text{ cm}}{5.0\text{ cm}} = 0.6 \text{ or } 6\times10^{-1}$$

59. For certain chemical reaction $X \rightarrow Y$, the rate of formation of product is plotted against the time as shown in the figure. The number of correct statement/s from the following is_____

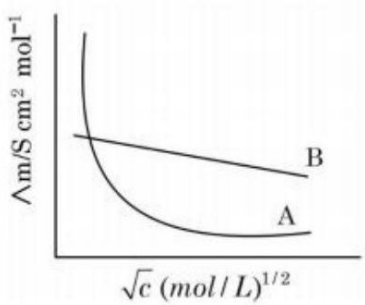


(A) Over all order of this reaction is one
(B) Order of this reaction can't be determined
(C) In region I and III, the reaction is of first and zero order respectively
(D) In region-II, the reaction is of first order
(E) In region-II, the order of reaction is in the range of 0.1 to 0.9.

Sol. 2

Only option (B) is correctr as order cannot be determined.

60. Following figure shows dependence of molar conductance of two electrolytes on concentration. Λ°_m is the limiting molar conductivity.



The number of incorrect statement(s) from the following is_____

(A) Λ°_m for electrolyte A is obtained by extrapolation

(B) For electrolyte B, Λm vs $\sqrt{c}$ graph is a straight line with intercept equal to Λ°_m

(C) At infinite dilution, the value of degree of dissociation approaches zero for electrolyte B.

(D) Λ°_m for any electrolyte A or B can be calculated using λ° for individual ions

Sol. 2

Statement (A) and Statement (C) are incorrect.

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Target: JEE/NEET 2024
Enthuse & प्रयास Batch
Class 11th to 12th Moving

Target: JEE/NEET 2024
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