JEE MAIN 2023
Paper with Solution

CHEMISTRY | 25th Jan 2023 _ Shift-2

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
- AIR-11 to 50 — 32 Times
- 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. When the hydrogen ion concentration $[H^+]$ changes by a factor of 1000 , the value of pH of the solution

(1) increases by 2 units (2) increases by 1000 units

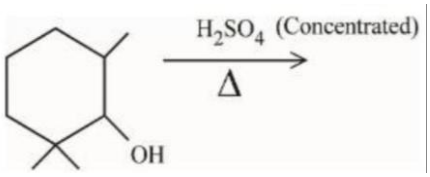
(3) decreases by 2 units (4) decreases by 3 units

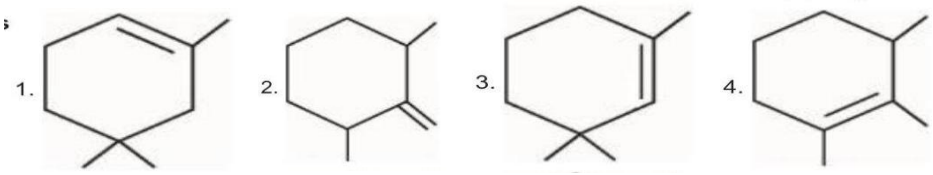
Sol. **4**

If $[H^+] \rightarrow 10^3$ times

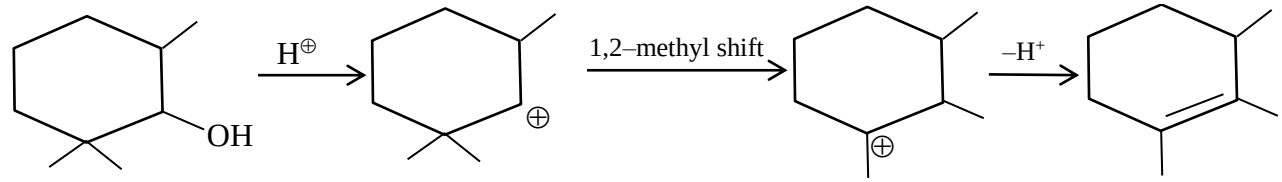
then pH decreases by 3 units.

32. Find out the major product from the following reaction.





Sol. **4**



33. Given below are two statements, one is labelled as Assertion **A** and the other is labelled as Reason **R**

Assertion A : Carbon forms two important oxides - CO and CO_2. CO is neutral whereas CO_2 is acidic in nature

Reason **R**: CO_2 can combine with water in a limited way to form carbonic acid, while CO is sparingly soluble in water

In the light of the above statements, choose the most appropriate answer from the options given below

(1) Both A and R are correct but R is NOT the correct explanation of A

(2) A is correct but R is not correct

(3) Both A and R are correct and R is the correct explanation of A

(4) A is not correct but R is correct

Sol. **3**

(i) CO_2 is acidic as it from carbonic acid

$$CO_2 + H_2O \rightarrow H_2CO_3$$

(ii) CO is almost insoluble in water

34. Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason **R**
Assertion A : The alkali metals and their salts impart characteristic colour to reducing flame.
Reason R : Alkali metals can be detected using flame tests.
In the light of the above statements, choose the most appropriate answer from the options given below
(1) A is not correct but R is correct
(2) Both A and R are correct but R is NOT the correct explanation of A
(3) A is correct but R is not correct
(4) Both A and R are correct and R is the correct explanation of A

Sol. **1**

The alkali metal and their salts impart characteristic colour to an oxidizing flame. this is because the heat from the flame excites the outemost orbital electron to a higher energy level : when the excited electron comes back to the ground state, there is emission of radiation in the visible region.
Alkali metal can therefore, be detected by the respective flame test and can be determined by flame photometry or atomic absorption spectroscopy.

35. Potassium dichromate acts as a strong oxidizing agent in acidic solution. During this process, the oxidation state changes from
(1) +2 to +1 (2) +3 to +1 (3) +6 to +2 (4) +6 to +3

Sol. **4**

$$Cr_2O_7^{-2} + 14H^+ + 6e^- \longrightarrow 2Cr^{+3} + 7H_2O$$

$$+6 \longrightarrow +3$$

36. Match List I with List II

LIST I (Name of polymer)		LIST II (Uses)	
A.	Glyptal	I.	Flexible pipes
B.	Neoprene	II.	Synthetic wool
C.	Acrilan	III	Paints and Lacquers
D.	LDP	IV.	Gaskets

Choose the correct answer from the options given below:
(1) A-III, B-IV, C-I, D-II (2) A-III, B-II, C-IV, D-I
(3) A-III, B-I, C-IV, D-II (4) A-III, B-IV, C-II, D-I

Sol. **4**

(A) Glyptal → Paints and Lacquers (III)

(B) Neoprene → Gaskets (IV)

(C) Acrilan → Synthetic wool (II)

(D) LDP → Flexible pipes (I)

37. Which of the following represents the correct order of metallic character of the given elements ?

(1) Si < Be < Mg < K (2) Be < Si < K < Mg

(3) Be < Si < Mg < K (4) K < Mg < Be < Si

Sol. **1**

Si < Be < Mg < K

Si is having Non-metallic character.

38. Match List I with List II

LIST I		LIST II	
A.	Cobalt catalyst	I.	$(H_2 + Cl_2)$ production
B.	Syngas	II.	Water gas production
C.	Nickel catalyst	III.	Coal gasification
D.	Brine solution	IV.	Methanol production

Choose the correct answer from the options given below:

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

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

Sol. **2**

(a) Cobalt catalyst → methanol production.

(b) Syngas → coal gasification

(c) Nickel Catalyst → water gas production .

(d) Brine solution → H_2 + Cl_2 production.

39. Match List I with List II

LIST I (Amines)		LIST II ($\mathbf{pK_b}$)	
A.	Aniline	I.	3.25
B.	Ethanamine	II.	3.00
C.	N-Ethylethanamine	III	9.38
D.	N. N-Diethylethanamine	IV.	3.29

Choose the correct answer from the options given below:

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

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

Sol. **1**

Basicity order

$Et - NH - Et > Et - \underset{\underset{Et}{|}}{N} - Et > Et - NH_2 >$ Aniline

pKb : 3.00, pKb : 3.25 pKb : 3.29 pKb : 9.38

40. Match List I with List II

	LIST I		LIST II
	Isomeric pairs		Type of isomers
A.	Propanamine and N-Methylethanamine	I.	Metamers
B.	Hexan-2-one and Hexan-3-one	II.	Positional isomers
C.	Ethanamide and Hydroxyethanimine	III.	Functional isomers
D.	o-nitrophenol and p-nitrophenol	IV.	Tautomers

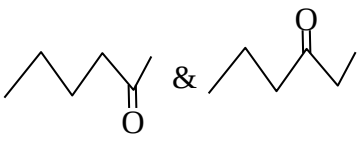
Choose the correct answer from the options given below:

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

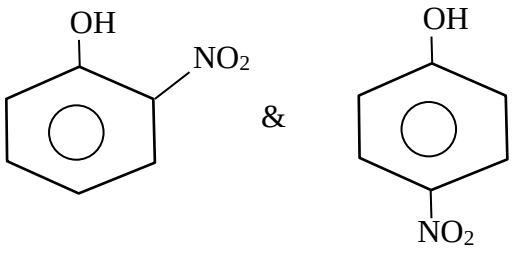
(3) A-III, B-IV, C-I, D-II (4) A-IV, B-III, C-I, D-II

Sol. **2**

(A) $C–C–C–NH_2$ & $C - NH - C - C$: functional isomer (III)

(B)  : Metamer (I)

(C) $CH_3 - \underset{\underset{O}{\|}}{C} - NH_2$ & $CH_3 - \underset{\underset{OH}{|}}{C} = NH$: Tautamer (IV)

(D)  : Position isomer (II)

41. What is the mass ratio of ethylene glycol ($C_2H_6O_2$, molar mass = 62 g/mol) required for making 500 g of 0.25 molal aqueous solution and 250 mL of 0.25 molal aqueous solution?

(1) 1 : 1 (2) 2 : 1 (3) 1 : 2 (4) 3 : 1

Sol. 2

Case I

x gm $C_2H_6O_2$ present

$$0.25 = \frac{x/62}{500 - x} \times 1000$$

$$125 = \left(\frac{1000}{62} + 0.25\right) x \qquad \text{.....(1)}$$

Case II

y gm $C_2H_6O_2$ is present.

$$0.25 = \frac{y/62}{250 - y} \times 1000$$

$$62.5 - 0.25y = \frac{1000}{62} y$$

$$62.5 = \left(\frac{1000}{62} + 0.25\right) y \qquad \text{.....(2)}$$

equation (1) ÷ equation (2)

$$\frac{x}{y} = \frac{125}{62.5} = \frac{2}{1}$$

42. Match list I with List II

LIST I Coordination entity		LIST II Wavelength of light absorbed in nm	
A.	$[CoCl(NH_3)_5]^{2+}$	I.	310
B.	$[Co(NH_3)_6]^{3+}$	II.	475
C.	$[Co(CN)_6]^{3-}$	III.	535
D.	$[Cu(H_2O)_4]^{2+}$	IV.	600

Choose the correct answer from the options given below:

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

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

Sol. **3**

$\Delta_o \uparrow \lambda \downarrow$

(splitting energy = $\frac{hc}{\lambda_{abs}}$)

43. Given below are two statements, one is labelled as Assertion A and the other is labelled as Reason **R**

Assertion A : Butylated hydroxy anisole when added to butter increases its shelf life.

Reason R : Butylated hydroxy anisole is more reactive towards oxygen than food.

In the light of the above statements, choose the most appropriate answer from the options given below

(1) A is correct but R is not correct

(2) A is not correct but R is correct

(3) Both A and R are correct and R is the correct explanation of A

(4) Both A and R are correct but R is NOT the correct explanation of A

Sol. **3**

The molecule BHA = Butylated hydroxyanisole commonly used as food preservatives which normally acts as antifungal and antiviral BHA reduces the rancidity of oil and fat which halps in retaining the nutrients (Butter contains saturated fats).

44. The isomeric deuterated bromide with molecular formula C_4H_8DBr having two chiral carbon atoms is

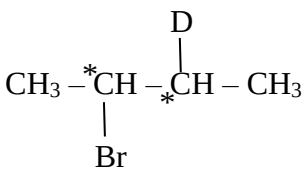
(1) 2 - Bromo - 2 - deuterobutane

(2) 2 - Bromo-1-deuterobutane

(3) 2 - Bromo - 1 - deutero - 2 - methylpropane

(4) 2 - Bromo -3 – deuterobutane

Sol. **4**



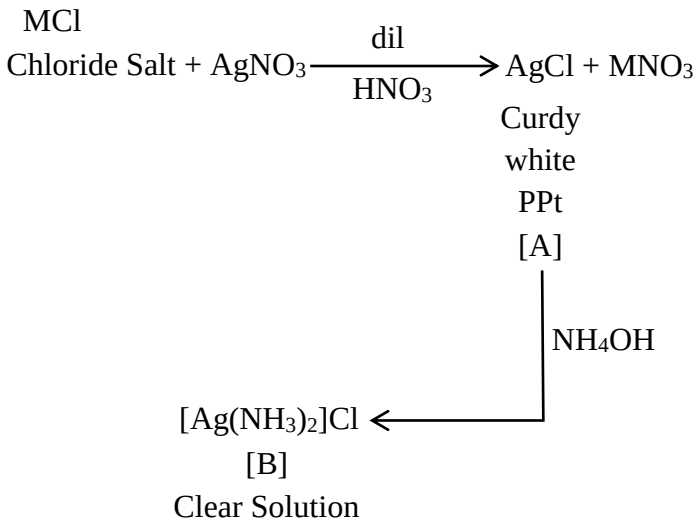
2 - Bromo -3 – deuterobutane

45. A chloride salt solution acidified with dil. HNO_3 gives a curdy white precipitate, [A], on addition of $AgNO_3$ · [A] on treatment with NH_4OH gives a clear solution, B. A and B are respectively

(1) $AgCl\&(NH_4)[Ag(OH)_2]$ (2) $AgCl\&[Ag(NH_3)_2]Cl$

(3) $H[AgCl_3]\&(NH_4)[Ag(OH)_2]$ (4) $H[AgCl_3]\&[Ag(NH_3)_2]Cl$

Sol. **2**



46. Statement I : Dipole moment is a vector quantity and by convention it is depicted by a small arrow with tail on the negative centre and head pointing towards the positive centre.

Statement II : The crossed arrow of the dipole moment symbolizes the direction of the shift of charges in the molecules.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Statement I is incorrect but Statement II is correct

(2) Statement I is correct but Statement II is incorrect

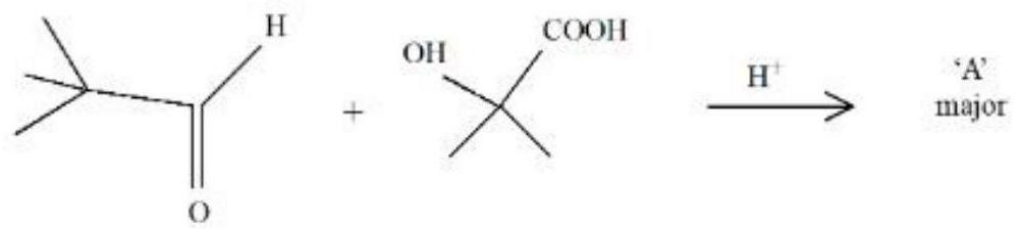
(3) Both Statement I and Statement II are incorrect

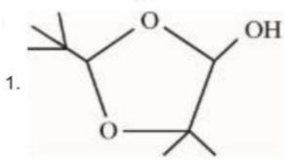
(4) Both Statement I and Statement II are correct

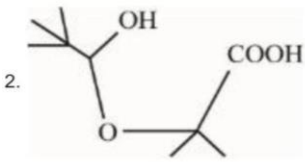
Sol. **2**

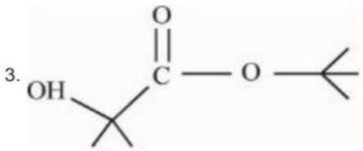
The crossed arrow of the dipole moment symbolizes the direction of the shift of electron density in the molecules.

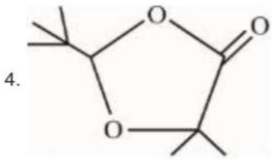
47. ' A ' in the given reaction is



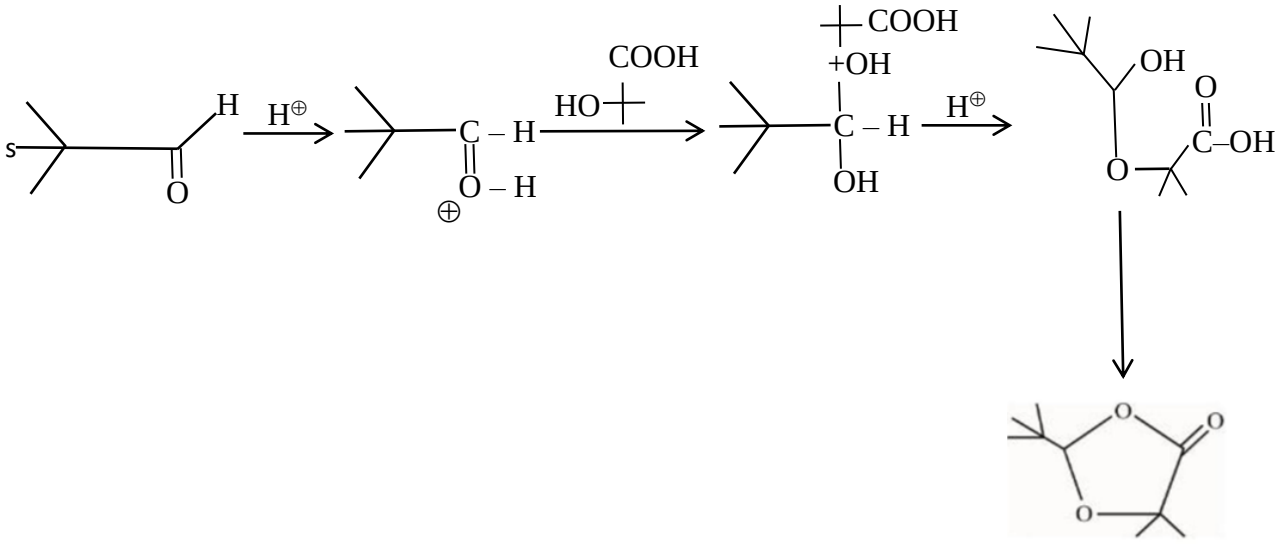
1. 

2. 

3. 

4. 

Sol. **4**



48. A. Ammonium salts produce haze in atmosphere.

B. Ozone gets produced when atmospheric oxygen reacts with chlorine radicals.

C. Polychlorinated biphenyls act as cleansing solvents.

D. 'Blue baby' syndrome occurs due to the presence of excess of sulphate ions in water.

Choose the correct answer from the options given below:

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

Sol. **3**

(i) Ammonium salt are major component of both atmospheric nitrogen aerosols and wet deposited.

(iii) PCB belongs to a broad family of man-made organic chemicals known. as chlorinated hydrocarbons.

49. Given below are two statements:

Statement I : In froth floatation method a rotating paddle agitates the mixture to drive air out of it.

Statement II : Iron pyrites are generally avoided for extraction of iron due to environmental reasons.

In the light of the above statements, choose the correct answer from the options given below:

(1) Statement I is false but Statement II is true

(2) Both Statement I and Statement II are false

(3) Statement I is true but Statement II is false

(4) Both Statement I and Statement II are true

Sol. **1**

The rotating paddle in the froth flotation process violently agitates the suspension of powdered ore in water, as well the collectors and froth stablisers, generating frothing.

50. Which one among the following metals is the weakest reducing agent?

(1) Li (2) K (3) Rb (4) Na

Sol. **4**

Na metals is the weakest Reducing agent.

Section B

51. Total number of moles of AgCl precipitated on addition of excess of $AgNO_3$ to one mole each of the following complexes $[Co(NH_3)_4Cl_2]Cl$, $[Ni(H_2O)_6]Cl_2$, $[Pt(NH_3)_2Cl_2]$ and $[Pd(NH_3)_4]Cl_2$ is

Sol. **5**

(i) $[Co(NH_3)_4Cl_2]Cl + AgNO_3 \rightarrow [Co(NH_3)_4Cl_2]^+ + AgCl$

(ii) $[Ni(H_2O)_6]Cl_2 + AgNO_3 \rightarrow [Ni(H_2O)_6]^{+2} + 2AgCl$

(iii) $[Pt(NH_3)_2Cl_2] + AgNO_3 \rightarrow$ no AgCl mole are ppt

(iv) $[Pd(NH_3)_4]Cl_2 + AgNO_3 \rightarrow [Pd(NH_3)_4]^{+2} + 2AgCl$

Total 5 mole AgCl are formed.

52. The number of incorrect statement/s from the following is/are

A. Water vapours are adsorbed by anhydrous calcium chloride.

B. There is a decrease in surface energy during adsorption.

C. As the adsorption proceeds, ΔH becomes more and more negative.

D. Adsorption is accompanied by decrease in entropy of the system.

Sol. **2**

A & C are incorrect

$CaCl_2$ absorbs water vapour.

As adsorption proceeds,

ΔH becomes less negative.

53. Number of hydrogen atoms per molecule of a hydrocarbon A having 85.8% carbon is (Given: Molar mass of A = 84 g mol^{-1})

Sol. **12**

$C \rightarrow 85.8\%$

$H \rightarrow 14.2\ \%$

mass of H in one molecule = $84 \times \frac{14.2}{100} \approx 12$

No. of H– atoms = $\frac{12}{1}$

$= 12$

54. The number of given orbitals which have electron density along the axis is

$P_x, P_y, P_z, d_{xy}, d_{yz}, d_{xz}, d_z^2, d_{x^2} - y^2$

Sol. 5

$Px, Py, Pz, dz^2, dx^2 - y^2$ have Electron density along the axis.

55. 28.0 L of CO_2 is produced on complete combustion of 16.8 L gaseous mixture of ethene and methane at 25°C and 1 atm. Heat evolved during the combustion process is_____ kJ.

Given : $\Delta H_c(CH_4) = -900\,kJ\,mol^{-1}$

$\Delta H_c(C_2H_4) = -1400\ kJ\ mol^{-1}$

Sol. **847**

Moles of mixture = $\frac{Pv}{RT} = \frac{1\times16.8}{0.0821\times298} = 0.6866$ moles

Moles of CO_2 = $\frac{1\times28}{0.0821\times298} = 1.144$ mole

$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

x x

$C_2H_4 + 3O_2 \longrightarrow 2CO_2 + 2H_2O$

$(0.6866 - x)$ $2(0.686 - x)$

Total CO_2 produced = 1.144

x + 2 (0.6866 – x) = 1.144

x = 1.3732 – 1.144

= 0.2292

Moles of CH_4 = 0.2292

Moles of C_2H_4 = 0.6866 – 0.2292

= 0.4574

Total Heat produced

= (900 × 0.2292) + (0.4574 × 1400)

= 206.28 + 640.36 = 846.64

56. $Pt(s)|H_2(g)(1bar)||H^+(aq)(1M) \parallel M^{3+}(aq), M^+(aq)|Pt(s)$

The E_{cell} for the given cell is 0.1115 V at 298 K when $\frac{[M^+(aq)]}{[M^{3+}(aq)]} = 10^a$

The value of a is

Given : $E^{\theta} M^{3+}/M^{+} = 0.2$ V

$\frac{2.303RT}{F} = 0.059$ V

Sol. **3**

Cell Reaction

$$H_2 + M^{3+} \longrightarrow 2H^+ + M^+$$

$$E_{cell} = E^o_{cell} - \frac{2.303RT}{2F}\log\frac{\left[M^+\right]\left[H^+\right]^2}{[M^{3+}]}$$

$$0.1115 = 0.2 - \frac{0.059}{2}\log 10^a$$

$$\frac{0.059}{2}\log 10^a = 0.0885$$

a = 3

57. The number of pairs of the solutions having the same value of the osmotic pressure from the following is (Assume 100% ionization)

A. 0.500 M C_2H_5OH (aq) and 0.25 M KBr (aq)

B. 0.100 M $K_4[Fe(CN)_6]$ (aq) and 0.100 M $FeSO_4(NH_4)_2SO_4$ (aq)

C. 0.05 M $K_4[Fe(CN)_6]$ (aq) and 0.25 M NaCl (aq)

D. 0.15 M NaCl(aq) and 0.1 M $BaCl_2$(aq)

E. 0.02 M $KCl \cdot MgCl_2 \cdot 6H_2O$(aq) and 0.05 M KCl(aq)

Sol. **4**

(a) $(ic)_{c_2H_5OH} = 0.5$

$(ic)_{kBr} = 2\times0.25 = 0.5$

osmotic pressure will be same.

(b) $(i\,c)_{k_4[Fe(CN)_6]} = 0.1\times5 = 0.5$

$(i\,c)_{FeSO_4.(NH_4)_2SO_4} = 0.1\times5 = 0.5$

osmotic pressure will be same.

(c) $(i\,c)_{k_4[Fe(CN)_6]} = 5\times0.05 = 0.25$

$(i\,c)_{NaCl} = 0.25\times2 = 0.5$

osmotic pressure will not be same.

(d) $(i\,c)_{NaCl} = 0.15\times2 = 0.3$

$(i\ c)_{BaCl_2} = 0.1 \times 3 = 0.3$

osmotic pressure will be same.

(e) $(i\ c)_{Kcl.MgCl.6H_2O} = 0.02 \times 5 = 0.1$

$(i\ c)_{Kcl} = 0.05 \times 2 = 0.1$

osmotic pressure will be same.

58. A first order reaction has the rate constant, $= 4.6 \times 10^{-3}\ s^{-1}$. The number of correct statement/s from the following is/are

Given: log 3 = 0.48

A. Reaction completes in 1000 s.

B. The reaction has a half-life of 500 s.

C. The time required for 10% completion is 25 times the time required for 90% completion.

D. The degree of dissociation is equal to $\left(1 - e^{-kt}\right)$

E. The rate and the rate constant have the same unit.

Sol. **1**

$k = 4.6 \times 10^{-3}\ sec^{-1}$

for Ist order :-

$t½ = \frac{0.693}{k} = \frac{0.693}{4.6 \times 10^{-3}} = 150.65 sec.$

$t_{completion} = \infty$

Degree of dissociation $(\propto) = \frac{x}{[A]_0} = \frac{[A]_0 - [A]_t}{[A]_0}$

$= \frac{[A]_0 - [A]_0 e^{-kt}}{[A]_0} = 1 - e^{-kt}$

rate and rate constant have different units

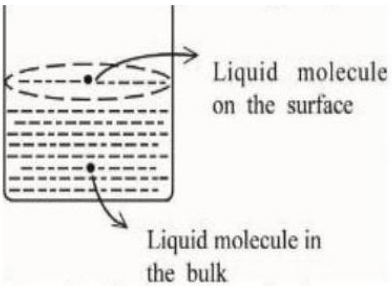
$t_{10\%} = \frac{1}{K} \ln \frac{100}{90}$

$t_{90\%} = \frac{1}{K} \ln \frac{100}{10}$

$$\frac{t_{10\%}}{t_{90\%}} = \frac{\log 10 - \log 9}{\log 10} = 0.045$$

$$t_{10\%} = 0.045 t_{90\%}$$

59. Based on the given figure, the number of correct statement/s is/are _____



A. Surface tension is the outcome of equal attractive and repulsive forces acting on the liquid molecule in bulk.

B. Surface tension is due to uneven forces acting on the molecules present on the surface.

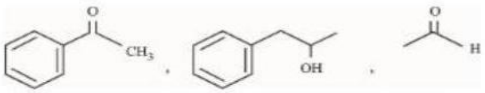
C. The molecule in the bulk can never come to the liquid surface.

D. The molecules on the surface are responsible for vapours pressure if system is a closed system.

Sol. 2

B & D option are correct.

60. Number of compounds giving (i) red colouration with ceric ammonium nitrate and also (ii) positive iodoform test from the following is



Sol. **3**

मोशन है, तो भरोसा है।

#RankBhiSelectionBhi

ADMISSION ANNOUNCEMENT

Session 2023-24 (English & हिन्दी Medium)

Target: JEE/NEET 2025
Nurture & प्रयास Batch
Class 10th to 11th Moving

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

Target: JEE/NEET 2024
Dropper & प्रयास Batch
Class 12th to 13th Moving

Target: PRE FOUNDATION
SIP, Evening & Tapasya Batch
Class 6th to 10th Students

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