



FINAL JEE–MAIN EXAMINATION – APRIL, 2023

Held On Thursday 06th April, 2023

TIME : 03:00 PM to 06:00 PM

SECTION - A

61. Match List I with List II

List I (Natural Amino acid)	List II (One Letter Code)
(A) Arginine	(I) D
(B) Aspartic acid	(II) N
(C) Asparagine	(III) A
(D) Alanine	(IV) R

Choose the correct answer from the options given below:

- (1) (A) – III, (B) – I, (C) – II (D) –IV (2) (A) – IV, (B) – I, (C) – II (D) –III
 (3) (A) – IV, (B) – I, (C) – III (D) –II (4) (A) – I, (B) – III, (C) – IV (D) –II

Sol. 2

Natural Amino acid	One Letter Code
(i) Arginine	R
(ii) Aspartic acid	D
(iii) Asparagine	N
(iv) Alanine	A

62. Formation of which complex, among the following, is not a confirmatory test of Pb^{2+} ions

- (1) lead sulphate (2) lead nitrate (3) lead chromate (4) lead iodide

Sol. 2

$\therefore Pb(NO_3)_2$ is a soluble colourless compound so it cannot be used in confirmatory test of Pb^{+2} ion.

Topic : Redox Reaction

Sub Topic : Titration

Level : Easy

63. The volume of 0.02 M aqueous HBr required to neutralize 10.0 mL of 0.01 M aqueous $Ba(OH)_2$ is (Assume complete neutralization)

- (1) 5.0 mL (2) 10.0 mL (3) 2.5 mL (4) 7.5 mL

Sol. 2

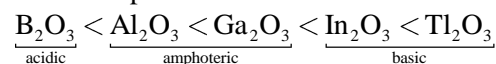
m.eq. of HBr = m.eq. of $Ba(OH)_2$
 $M_1 \times n_1 \times V_1(\text{mL}) = M_2 \times n_2 \times V_2(\text{mL})$
 $0.02 \times 1 \times V_1(\text{mL}) = 0.02 \times 2 \times 10$
 $V_1(\text{mL}) = 10 \text{ mL}$

64. Group–13 elements react with O_2 in amorphous form to form oxides of type M_2O_3 (M = element). Which among the following is the most basic oxide?

- (1) Al_2O_3 (2) Tl_2O_3 (3) Ga_2O_3 (4) B_2O_3

Sol. 2

As electropositive character increases basic character of oxide increases.



65. The IUPAC name of $K_3[Co(C_2O_4)_3]$ is -

- (1) Potassium tris(oxalate) cobaltate(III) (2) Potassium trioxalatocobalt(III)
 (3) Potassium trioxalatocobaltate(III) (4) Potassium tris(oxalate)cobalt(III)

Sol. 3

IUPAC name of $K_3[Co(C_2O_4)_3]$ is Potassium trioxalatocobaltate(III)

Topic : Atomic Structure
Sub Topic : De-Broglie Principle
Level : Moderate

66. If the radius of the first orbit of hydrogen atom is a_0 , then de Broglie's wavelength of electron in 3rd orbit is

- (1) $\frac{\pi a_0}{6}$ (2) $\frac{\pi a_0}{3}$ (3) $6\pi a_0$ (4) $3\pi a_0$

Sol. 3
 By De-Broglie principle

$$2\pi r = n\lambda$$

$$2\pi \times \frac{n^2}{z} a_0 = n\lambda$$

$$2\pi \times \frac{n}{z} a_0 = \lambda$$

$$\lambda = 2\pi \times \frac{3}{1} a_0 = 6\pi a_0$$

Topic : Chemistry in everyday life
Sub Topic : Pesticides
Level : Easy

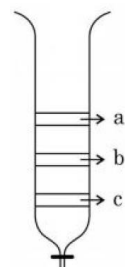
67. The group of chemicals used as pesticide is

- (1) Sodium chlorate, DDT, PAN (2) DDT, Aldrin
 (3) Aldrin, Sodium chlorate, Sodium arsinite (4) Dieldrin, Sodium arsinite, Tetrachlorothene

Sol. 2
 (Fact base)
 DDT & Aldrin are used as pesticide

Topic : Surface Chemistry
Sub Topic : Chromatography
Level : Moderate

68. From the figure of column, chromatography given below, identify incorrect statements.

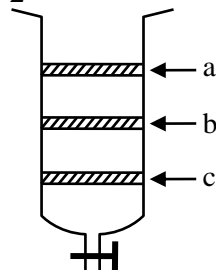


- A. Compound 'c' is more polar than 'a' and 'b'
 B. Compound 'a' is least polar
 C. Compound 'b' comes out of the column before 'c' and after 'a'
 D. Compound 'a' spends more time in the column

Choose the correct answer from the options given below:

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

Sol. 2



- (i) Since C is eluting first and a is last that means C is least polar and a is most polar.
 (ii) So incorrect options will be (A), (B), (C)

Adsorption of compound \propto Attraction

\propto Polarity

\propto Spend time in column

$\propto \frac{1}{\text{come out from column}}$

Order of polarity $\rightarrow a > b > c$

Come out from column order $\rightarrow c > b > a$

Spend time in column $\rightarrow a > b > c$

69. Ion having highest hydration enthalpy among the given alkaline earth metal ions is:

- (1) Be^{2+} (2) Ba^{2+} (3) Ca^{2+} (4) Sr^{2+}

Sol. 1

Hydration enthalpy $\propto \frac{1}{\text{size}}$

Down the group as size increases hydration enthalpy decreases

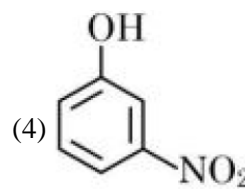
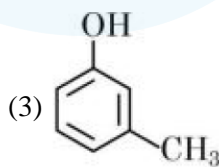
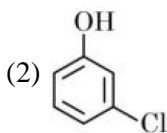
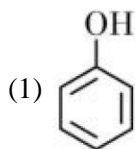
Order: $\text{Be}^{2+} > \text{Mg}^{2+} > \text{Ca}^{2+} > \text{Sr}^{2+} > \text{Ba}^{2+}$

Topic : Alcohol

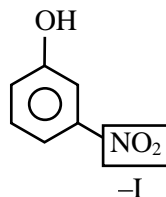
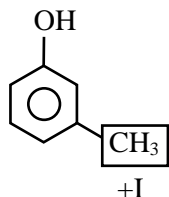
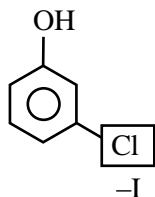
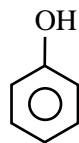
Sub Topic : Acidic Strength

Level : Easy

70. The strongest acid from the following is



Sol. 4

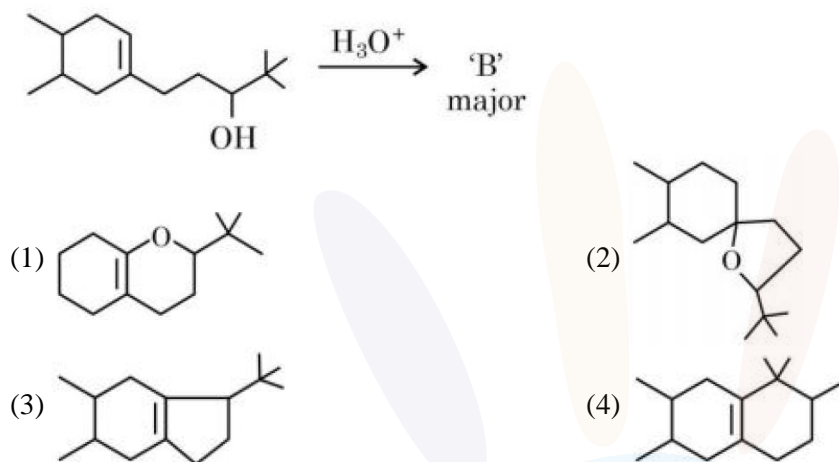


Since $-I$ of $-\text{NO}_2 > \text{Cl}$

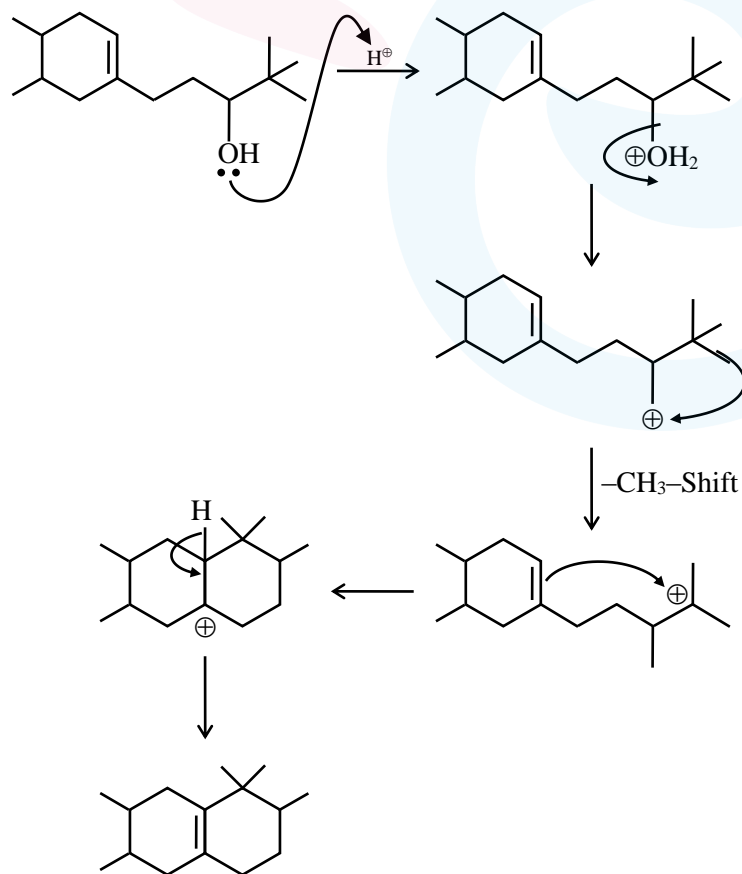
So, most acidic will be (4)

Topic : Hydrogen
Sub Topic : Alkene-Chemical Properties
Level : Moderate

71. In the following reaction, 'B' is



Sol. 4



72. Structures of BeCl_2 in solid state, vapour phase and at very high temperature respectively are:

- | | |
|-----------------------------------|-----------------------------------|
| (1) Polymeric, Dimeric, Monomeric | (2) Dimeric, Polymeric, Monomeric |
| (3) Monomeric, Dimeric, Polymeric | (4) Polymeric, Monomeric, Dimeric |

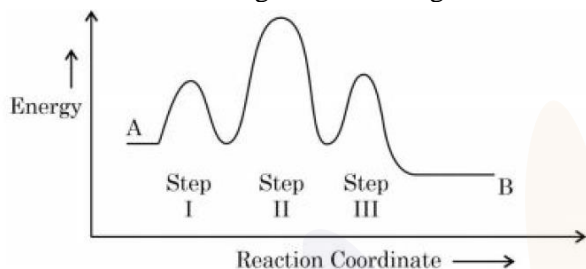
Sol. 1

In solid state BeCl_2 as polymer, in vapour state it form chloro-bridged dimer while above 1200K it is monomer.



Topic : Chemical Kinetic
Sub Topic : Complex Reaction/Activation energy
Level : Moderate

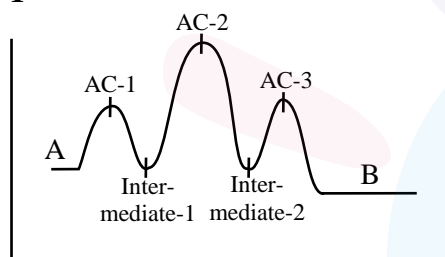
73. Consider the following reaction that goes from A to B in three steps as shown below:



Choose the correct option

	Number of intermediates	Number of Activated complex	Rate determining step
(1)	2	3	II
(2)	3	2	II
(3)	2	3	III
(4)	2	3	I

Sol. 1



Number of Intermediate \rightarrow 2
 Number of Activated complex \rightarrow 3
 Rate determining step \rightarrow II

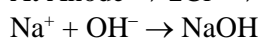
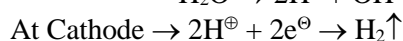
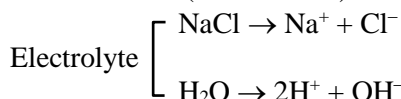
Topic : Electrochemistry
Sub Topic : Electrolyte Cell
Level : Easy

74. The product, which is not obtained during the electrolysis of brine solution is

- (1) HCl (2) NaOH (3) Cl₂ (4) H₂

Sol. 1

Brine solution (NaCl + H₂O)



Answer 1 (HCl)

75. Which one of the following elements will remain as liquid inside pure boiling water?

- (1) Li (2) Ga (3) Cs (4) Br

Sol. 2

Li, Cs reacts vigorously with water.

Br₂ changes in vapour state in boiling water (BP = 58°C)

Ga reacts with water above 100°C (MP = 29°C, BP = 2400°C)

76. Given below are two statements: one is labelled as “**Assertion A**” and the other is labelled as “**Reason R**”

Assertion A: In the complex $\text{Ni}(\text{CO})_4$ and $\text{Fe}(\text{CO})_5$, the metals have zero oxidation state.

Reason R: Low oxidation states are found when a complex has ligands capable of π -donor character in addition to the σ -bonding.

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

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

Sol. 2

Low oxidation state of metals can be stabilized by synergic bonding so ligand has to be π -acceptor.

Topic : Chemistry in everyday life

Sub Topic : Chemical in medicines

Level : Easy

77. Given below are two statements:

Statement I: Morphine is a narcotic analgesic. It helps in relieving pain without producing sleep.

Statement II: Morphine and its derivatives are obtained from opium poppy.

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

- (1) Statement I is true but statement II is false
- (2) Both statement I and statement II are true
- (3) Statement I is false but statement II is true
- (4) Both Statement I and Statement II are false

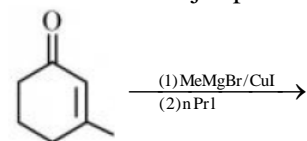
Sol. 2

Fact

Morphine →

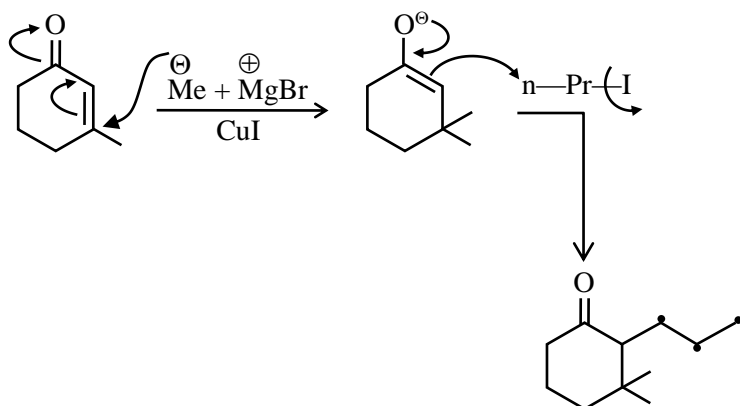
- (i) Morphine is a narcotic analgesic, it helps in relieving pain and producing sleep.
- (ii) Morphine and its derivatives are obtained from opium.

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



- (1)
- (2)
- (3)
- (4)

Sol. 3

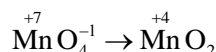




79. During the reaction of permanganate with thiosulphate, the change in oxidation of manganese occurs by value of 3. Identify which of the below medium will favour the reaction
 (1) aqueous neutral (2) aqueous acidic
 (3) both aqueous acidic and neutral (4) both aqueous acidic and faintly alkaline

Sol. 1

In neutral or weakly alkaline solution oxidation state of Mn changes by 3 unit



80. Element not present in Nessler's reagent is
 (1) K (2) N (3) I (4) Hg

Sol. 2

Nessler reagent is- $\text{K}_2[\text{HgI}_4]$

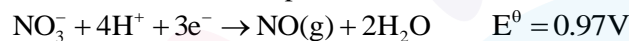
SECTION - B

Topic : Electrochemistry

Sub Topic : Reactivity Series of Metal

Level : Moderate

81. The standard reduction potentials at 298 K for the following half cells are given below:



The number of metal(s) which will be oxidized by NO_3^- in aqueous solution is _____

Sol. 3

Metal + $\text{NO}_3^- \rightarrow$ Metal Nitrate

(V, Fe, Ag)

↓

Less value of reaction potential than 0.97 volt.

Answer 3

Topic : Solid State

Sub Topic : Types of Crystal System

Level : Tough

82. Number of crystal system from the following where body centred unit cell can be found, is _____
 Cubic, tetragonal, orthorhombic, hexagonal, rhombohedral, monoclinic, triclinic

Sol. 3

BCC present in \rightarrow Cubic, Tetragonal orthorhombic

Topic : Carbonyl

Sub Topic : Chemical Properties

Level : Easy

83. Among the following the number of compounds which will give positive iodoform reaction is _____

(a) 1-Phenylbutan-2-one

(b) 2-Methylbutan-2-ol

(c) 3-Methylbutan-2-ol

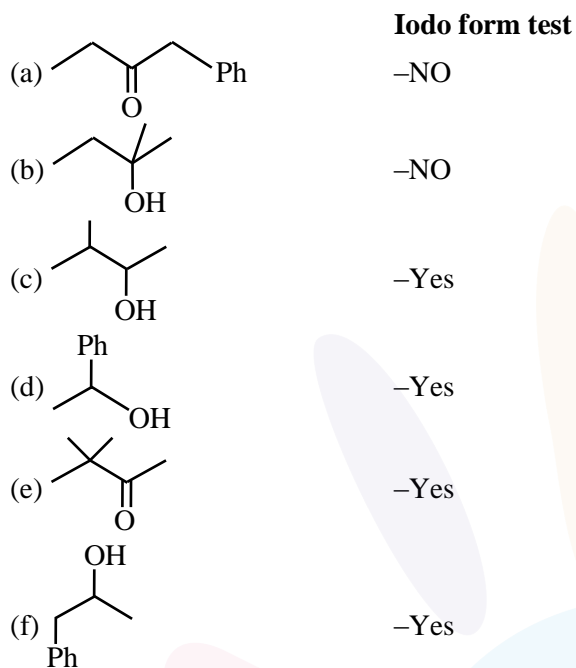
(d) 1-Phenylethanol

(e) 3,3-dimethylbutan-2-one

(f) 1-Phenylpropan-2-ol



Sol. 4



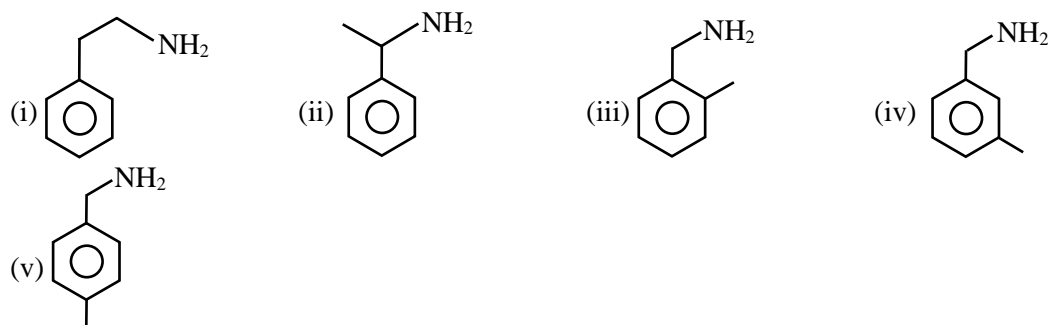
For carbonyl compound $\begin{array}{|c|} \hline \text{C}-\text{CH}_3 \\ \hline \parallel \\ \text{O} \end{array}$ for alcohol $\begin{array}{|c|} \hline \text{CH}-\text{CH}_3 \\ \hline | \\ \text{OH} \end{array}$ should be present for iodoform test.

Topic : Nitrogen Contain
Sub Topic : Isomerism
Level : Moderate

84. Number of isomeric aromatic amines with molecular formula $\text{C}_8\text{H}_{11}\text{N}$, which can be synthesized by Gabriel Phthalimide synthesis is _____

Sol. 5
 By Gabriel phthalimide synthesis \rightarrow i-amine is prepared
 $\text{C}_8\text{H}_{11}\text{N} \rightarrow$ Should be aromatic & i-amine

$$\begin{aligned} \text{Du} &= \text{C} + 1 - \frac{\text{H} - \text{N}}{2} \\ &= 8 + 1 - \frac{11 - 1}{2} \\ &= 9 - \frac{10}{2} = 9 - 5 = 4 \rightarrow \text{it means benzene ring} \end{aligned}$$





Topic : Liquid Solution

Sub Topic : Osmotic Pressure

Level : Easy

85. Consider the following pairs of solution which will be isotonic at the same temperature. The number of pairs of solutions is/are _____

- A. 1 M aq. NaCl and 2 M aq. Urea
 B. 1 M aq. CaCl₂ and 1.5 M aq. KCl
 C. 1.5 M aq. AlCl₃ and 2 M aq. Na₂SO₄
 D. 2.5 M aq. KCl and 1 M aq. Al₂(SO₄)₃

Sol. 4

- A. 1 M aq. NaCl \Rightarrow 2 M aq. Ions }
 2 M aq. Urea \Rightarrow 2 M aq. Urea } — Isotonic
- B. 1 M aq. CaCl₂ \Rightarrow 3 M aq. Ions }
 1.5 M aq. KCl \Rightarrow 3 M aq. Ions } — Isotonic
- C. 1.5 M aq. AlCl₃ \Rightarrow 6 M aq. Ions }
 2 M aq. Na₂SO₄ \Rightarrow 6 M aq. Ions } — Isotonic
- D. 2.5 M aq. KCl \Rightarrow 5 M aq. Ions }
 1 M aq. Al₂(SO₄)₃ \Rightarrow 5 M aq. Ions } — Isotonic

Topic : Surface Chemistry

Sub Topic : Classification of Colloids

Level : Easy

86. The number of colloidal systems from the following, which will have 'liquid' as the dispersion medium, is _____

Gem stones, paints, smoke, cheese, milk, hair cream, insecticide sprays, froth, soap lather

Sol. 5

Liquid dispersion medium

Paints, milk, hair cream, froth, soap lather

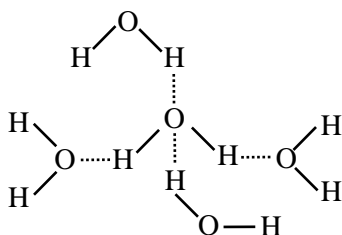
Topic : Solid State

Sub Topic : Classification of Solid

Level : Moderate

87. In an ice crystal, each water molecule is hydrogen bonded to _____ neighbouring molecules.

Sol. 2





Topic : Thermochemistry
Sub Topic : Heat of Combustion
Level : Moderate

88. Consider the following data

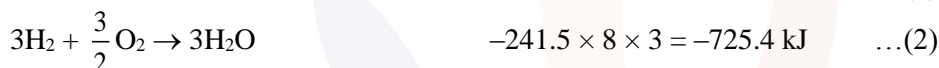
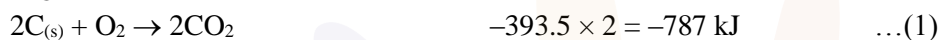
$$\text{Heat of combustion of } \text{H}_2(\text{g}) = -241.8 \text{ kJ mol}^{-1}$$

$$\text{Heat of combustion of } \text{C}(\text{s}) = -393.5 \text{ kJ mol}^{-1}$$

$$\text{Heat of combustion of } \text{C}_2\text{H}_5\text{OH}(\text{l}) = -1234.7 \text{ kJ mol}^{-1}$$

The heat of formation of $\text{C}_2\text{H}_5\text{OH}(\text{l})$ is $(-)$ _____ kJ mol^{-1} (Nearest integer).

Sol. 278



$$\begin{aligned} \text{eq (5)} &= \text{eq (1)} + \text{eq (2)} + \text{eq (4)} \\ &= (-787) + (-725.4) + (1234.7) \\ &= -277.7 = 278 \end{aligned}$$

Topic : Chemical Equilibrium
Sub Topic : Dissociation
Level : Tough

89. The equilibrium composition for the reaction $\text{PCl}_3 + \text{Cl}_2 \rightleftharpoons \text{PCl}_5$ at 298 K is given below:

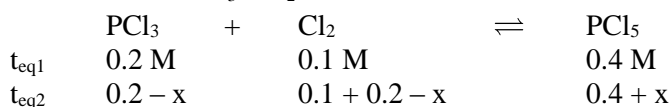
$$[\text{PCl}_3]_{\text{eq}} = 0.2 \text{ mol L}^{-1}, [\text{Cl}_2]_{\text{eq}} = 0.1 \text{ mol L}^{-1}, [\text{PCl}_5]_{\text{eq}} = 0.40 \text{ mol L}^{-1}$$

If 0.2 mol of Cl_2 is added at the same temperature, the equilibrium concentrations of PCl_5 is _____ $\times 10^{-2} \text{ mol L}^{-1}$

Given: K_c for the reaction at 298 K is 20

Sol. 48

$$K_c = \frac{[\text{PCl}_5]}{[\text{PCl}_3][\text{Cl}_2]} = \frac{0.4}{0.2 \times 0.1} = 20$$



$$K_c = 20 = \frac{0.4 + x}{(0.2 - x)(0.3 - x)}$$

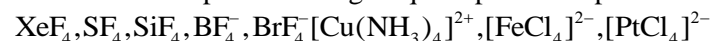
After solving by quadratic equation. We can get value of x.

$$x = 0.084$$

$$\begin{aligned} [\text{PCl}_5] &= 0.4 + x \\ &= 0.4 + 0.084 \\ &= 0.484 = 48.4 \times 10^{-2} \end{aligned}$$

Ans. 48

90. The number of species having a square planar shape from the following is _____



Sol. 4

$\text{XeF}_4, \text{BrF}_4^-, [\text{Cu}(\text{NH}_3)_4]^{2+}, [\text{PtCl}_4]^{2-}$ has square planar shape.