

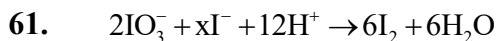
FINAL JEE-MAIN EXAMINATION – APRIL, 2023

(Held On Saturday 08th April, 2023)

TIME : 9 : 00 AM to 12 : 00 NOON

CHEMISTRY

SECTION-A



What is the value of x?

- (1) 12 (2) 2
(3) 6 (4) 10

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. Number of atoms of iodine on reactant side =
number of atoms of Iodine on product side

$$2 + x = 6 \times 2$$

$$X = 10$$



62. Which of the following metals can be extracted through alkali leaching technique?

- (1) Cu (2) Sn
(3) Pb (4) Au

Official Ans. by NTA (2)

Allen Ans. (2)

Sol. Reference : NCERT

63. Match List I with List II

A.	Saccharin	I.	High potency sweetener
B.	Aspartame	II.	First artificial sweetening agent
C.	Alitame	III.	Stable at cooking temperature
D.	Sucralose	IV.	Unstable at cooking temperature

Choose the correct answer from the options given below:

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

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. (A) Saccharin II. First artificial sweetener

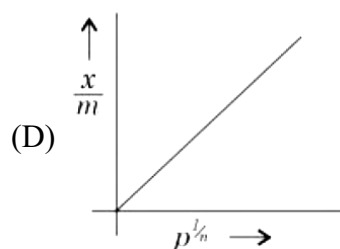
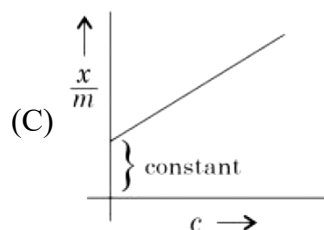
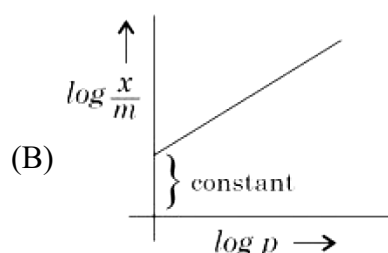
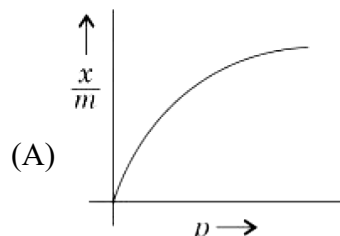
(B) Aspartame IV. Unstable at cooking temperature

(C) Alitame I. High potency sweetener

(D) Sucralose III. Stable at cooking temperature

TEST PAPER WITH SOLUTION

64. Which of the following represent the Freundlich adsorption isotherms?



Choose the correct answer from the options given below:

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

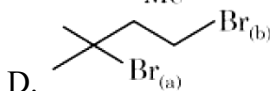
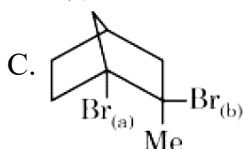
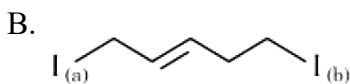
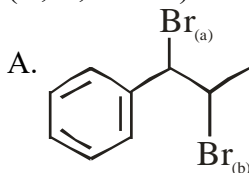
Official Ans. by NTA (2)

Allen Ans. (2)

Sol. $\frac{x}{m} = k p^{1/n}$

$$\text{and } \log \frac{x}{m} = \log k + \frac{1}{n} \log P$$

65. Choose the halogen which is most reactive towards S_N1 reaction in the given compounds (A, B, C & D)

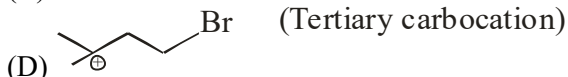
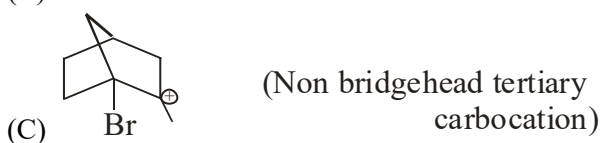
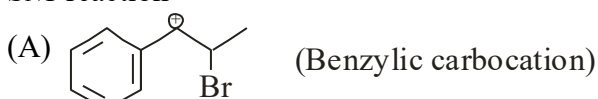


- (1) A-Br(b) ; B-I(b) ; C-Br(b) ; D-Br(b)
(2) A-Br(a) ; B-I(a) ; C-Br(b) ; D-Br(a)
(3) A-Br(b) ; B-I(a) ; C-Br(a) ; D-Br(a)
(4) A-Br(b) ; B-I(a) ; C-Br(a) ; D-Br(a)

Official Ans. by NTA (2)

Allen Ans. (2)

- Sol.** Stable is the carbocation, faster will be rate of S_N1 reaction



66. Sulphur (S) containing amino acids from the following are:

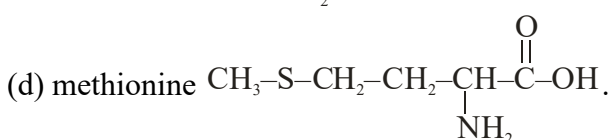
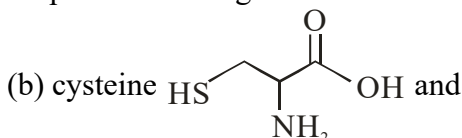
- (a) isoleucine (b) cysteine (c) lysine
(d) methionine (e) glutamic acid

- (1) a, d (2) b, d
(3) b, c, e (4) a, b, c

Official Ans. by NTA (2)

Allen Ans. (2)

- Sol.** Sulphur containing amino acids

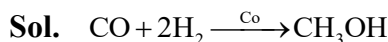


67. The water gas on reacting with cobalt as a catalyst forms

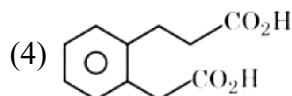
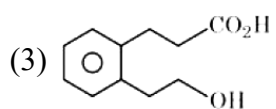
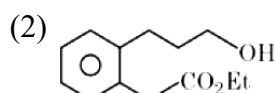
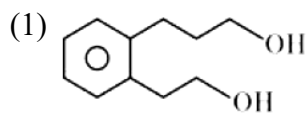
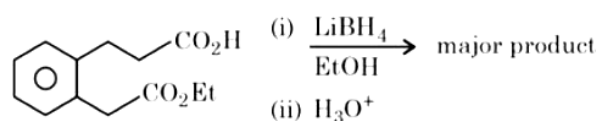
- (1) Ethanol (2) Methanoic acid
(3) Methanal (4) Methanol

Official Ans. by NTA (4)

Allen Ans. (4)

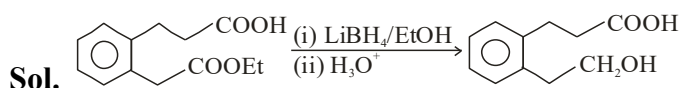


68. The major product formed in the following reaction is:



Official Ans. by NTA (3)

Allen Ans. (3)



LiBH_4 can reduce ester selectively but not carboxylic acids.

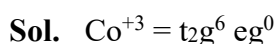
Hence correct answer is option (3).

69. Which of the following complex is octahedral, diamagnetic and the most stable?

- (1) $\text{Na}_3[\text{CoCl}_6]$ (2) $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$
(3) $\text{K}_3[\text{Co}(\text{CN})_6]$ (4) $[\text{Co}(\text{H}_2\text{O})_6]\text{Cl}_2$

Official Ans. by NTA (3)

Allen Ans. (3)

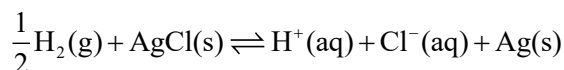


CN^- -strong field ligand

All d-electrons should be paired ($\mu_s = 0$)

Hence diamagnetic.

70. The reaction



occurs in which of the given galvanic cell.

- (1) $\text{Pt}|\text{H}_2(\text{g})|\text{KCl}(\text{sol}^n)|\text{AgCl}(\text{s})|\text{Ag}$
- (2) $\text{Pt}|\text{H}_2(\text{g})|\text{HCl}(\text{sol}^n)|\text{AgCl}(\text{s})|\text{Ag}$
- (3) $\text{Ag}|\text{AgCl}(\text{s})|\text{KCl}(\text{sol}^n)|\text{AgCl}(\text{s})|\text{Ag}$
- (4) $\text{Pt}|\text{H}_2(\text{g})|\text{HCl}(\text{sol}^n)|\text{AgNO}_3(\text{sol}^n)|\text{Ag}$

Official Ans. by NTA (2)**Allen Ans. (2)**

Sol. Anode: $\frac{1}{2}\text{H}_2(\text{g}) \rightleftharpoons \text{H}^+(\text{aq}) + \text{e}^-$

Cathode: $\text{AgCl}(\text{s}) + \text{e}^- \rightarrow \text{Ag}(\text{s}) + \text{Cl}^-(\text{aq})$

71. Match List-I with List-II :

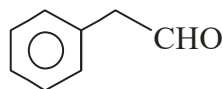
	List-I (Reagents used)		List-II (Compound with functional group detected)
A.	Alkaline solution of copper sulphate and sodium citrate	I.	
B.	Neutral FeCl_3 solution	II.	
C.	Alkaline chloroform solution	III.	
D.	Potassium iodide and sodium hypochlorite	IV.	

Choose the correct answer from the options given below:

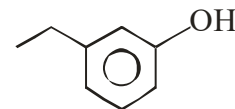
- (1) A-II, B-IV, C-III, D-I
- (2) A-IV, B-I, C-II, D-III
- (3) A-III, B-IV, C-I, D-II
- (4) A-III, B-IV, C-II, D-I

Official Ans. by NTA (4)**Allen Ans. (4)**

Sol. A. Alkaline solution of copper sulphate and sodium citrate is known as Benedict's solution and it is used to test aliphatic aldehydes. Hence it can be used to test compound (III) i.e.



B. Neutral FeCl_3 solution is used to test



phenolic compound (IV) i.e.

C. Alkaline chloroform solution is used to test

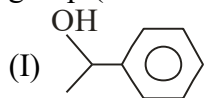


primary amines (II) i.e.

D. $2\text{KI} + \text{NaOCl} + \text{H}_2\text{O} \rightarrow \text{NaCl} + \text{I}_2 + 2\text{KOH}$

Potassium iodide and sodium hypochlorite gives ($\text{I}_2 + \text{KOH}$) which is used to test those

compounds which have $\text{CH}_3\text{-C}(=\text{O})\text{-}$ or $\text{CH}_3\text{-CH}(\text{OH})\text{-}$ group (iodoform test). Hence the compound is



72. Given below are two statements: One is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A: Butan -1- ol has higher boiling point than ethoxyethane.

Reason R: Extensive hydrogen bonding leads to stronger association of molecules.

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

- (1) Both A and R are true and R is the correct explanation of A
- (2) A is true but R is false
- (3) Both A and R are true but R is not the correct explanation of A
- (4) A is false but R is true

Official Ans. by NTA (1)**Allen Ans. (1)**

Sol. Butan-1-ol ($\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$) can undergo hydrogen bonding. Ethoxyethane ($\text{CH}_3\text{CH}_2\text{-O-CH}_2\text{CH}_3$) has no hydrogen (attached with F, O, N) which can undergo hydrogen bonding. More is the extent of intermolecular H-bonding, more will be association of molecules. Thus leading to higher boiling point.

Hence both Assertion (A) and Reason(R) are true and (R) is the correct explanation of (A).

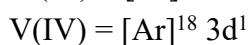
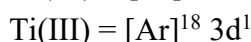
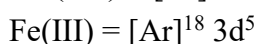
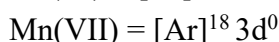
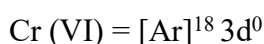
73. In chromyl chloride, the number of d-electrons present on chromium is same as in (Given at no. of Ti : 22, V : 23, Cr : 24, Mn : 25, Fe : 26)

- (1) Ti (III) (2) Fe (III)
(3) V (IV) (4) Mn (VII)

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. In CrO_2Cl_2 oxidation state of Cr is +6



Hence Cr (VI) and Mn (VII) have same d⁰ configuration.

74. What is the purpose of adding gypsum to cement?

- (1) To facilitate the hydration of cement
(2) To speed up the process of setting
(3) To slow down the process of setting
(4) To give a hard mass

Official Ans. by NTA (3)

Allen Ans. (3)

Sol. Factual

75. The correct order of spin only magnetic moments for the following complex ions is

- (1) $[\text{Fe}(\text{CN})_6]^{3-} < [\text{CoF}_6]^{3-} < [\text{MnBr}_4]^{2-} < [\text{Mn}(\text{CN})_6]^{3-}$
(2) $[\text{Fe}(\text{CN})_6]^{3-} < [\text{Mn}(\text{CN})_6]^{3-} < [\text{CoF}_6]^{3-} < [\text{MnBr}_4]^{2-}$
(3) $[\text{MnBr}_4]^{2-} < [\text{CoF}_6]^{3-} < [\text{Fe}(\text{CN})_6]^{3-} < [\text{Mn}(\text{CN})_6]^{3-}$
(4) $[\text{CoF}_6]^{3-} < [\text{MnBr}_4]^{2-} < [\text{Fe}(\text{CN})_6]^{3-} < [\text{Mn}(\text{CN})_6]^{3-}$

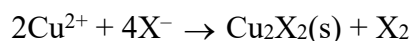
Official Ans. by NTA (2)

Allen Ans. (2)

Unpaired e⁻

Sol. $[\text{Fe}(\text{CN})_6]^{3-}$ $\text{Fe}^{+3} \Rightarrow t_2g^5 e_g^0$, 1
 $[\text{Mn}(\text{CN})_6]^{3-}$ $\text{Mn}^{+3} \Rightarrow t_2g^4 e_g^0$, 2
 $[\text{CoF}_6]^{3-}$ $\text{Co}^{+3} \Rightarrow t_2g^4 e_g^2$, 4
 $[\text{MnBr}_4]^{2-}$ $\text{Mn}^{+2} \Rightarrow e^2 t_2^3$, 5
Spin magnetic moment $\mu = \sqrt{n(n+2)}$ B.M

76. Which halogen is known to cause the reaction given below:



- (1) Only Iodine (2) Only Bromine
(3) All halogens (4) Only Chlorine

Official Ans. by NTA (1)

Allen Ans. (1)

Sol. $2\text{Cu}^{2+} + 4\text{I}^- \rightarrow \text{Cu}_2\text{I}_2(\text{s}) + \text{I}_2$

77. Match List-I with List-II :

	List-I (Species)		List-II (Maximum allowed concentration in ppm in drinking water)
A.	F^-	I.	< 50 ppm
B.	SO_4^{2-}	II.	< 5 ppm
C.	NO_3^-	III.	< 2 ppm
D.	Zn	IV.	< 500 ppm

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

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

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

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

Official Ans. by NTA (4)

Allen Ans. (Bonus)

Sol. Correct answer

A-III, B-IV, C-I, D-II

78. The correct order of electronegativity for given elements is:

(1) $\text{C} > \text{P} > \text{At} > \text{Br}$

(2) $\text{Br} > \text{P} > \text{At} > \text{C}$

(3) $\text{P} > \text{Br} > \text{C} > \text{At}$

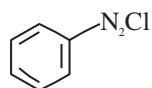
(4) $\text{Br} > \text{C} > \text{At} > \text{P}$

Official Ans. by NTA (4)

Allen Ans. (4)

Sol. Atom E.N.
Br 3.0
C 2.5
At 2.2
P 2.1

79. Match List I with List II:



is reacted with reagents in List I to form products in List II.

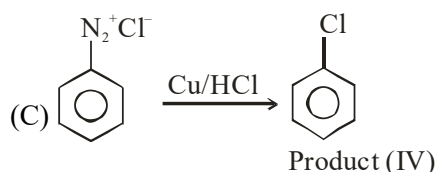
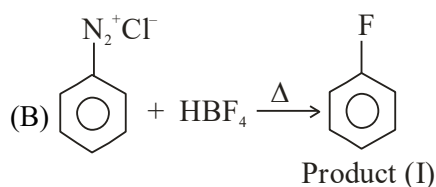
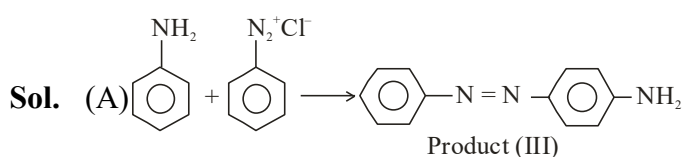
	List-I (Reagent)		List-II (Product)
A.		I.	
B.	HBF_4, Δ	II.	
C.	Cu, HCl	III.	
D.	CuCN/KCN	IV.	

Choose the correct answer from the options given below:

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

Official Ans. by NTA (4)

Allen Ans. (4)



80. Given below are two statements:

Statement I: Lithium and Magnesium do not form superoxide

Statement II: The ionic radius of Li^+ is larger than ionic radius of Mg^{2+}

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 correct
- (4) Both Statement I and Statement II are incorrect

Official Ans. by NTA (3)

Allen Ans. (3)

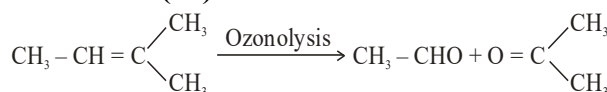
Sol. Li & Mg form oxide and order of size $\text{Li}^+ > \text{Mg}^{2+}$

SECTION-B

81. Molar mass of the hydrocarbon (X) which on ozonolysis consumes one mole of O_3 per mole of (X) and gives one mole each of ethanal and propanone is _____ g mol^{-1} (Molar mass of C : 12 g mol^{-1} , H : 1 g mol^{-1})

Official Ans. by NTA (70)

Allen Ans. (70)



Sol. Hydrocarbon (X)

Hence molar mass of hydrocarbon (X) is 70.

82. The number of following factors which affect the percent covalent character of the ionic bond is _____

- (a) Polarising power of cation
- (b) Extent of distortion of anion
- (c) Polarisability of the anion
- (d) Polarising power of anion

Official Ans. by NTA (3)

Allen Ans. (3)

Sol. (a), (b) and (c) are factors which affect the percent covalent character of the ionic bond according to Fajan's rule

83. When a 60 W electric heater is immersed in a gas for 100s in a constant volume container with adiabatic walls, the temperature of the gas rises by 5°C. The heat capacity of the given gas is _____ J K⁻¹ (Nearest integer)

Official Ans. by NTA (1200)

Allen Ans. (1200)

Sol. Power of heater = 60 W

$$= 60 \text{ J/sec}$$

Total energy emitted

$$= 60 \times 100 = 6000 \text{ J}$$

Heat capacity \times temp difference = 6000

$$\text{Heat capacity} = \frac{6000}{5} = 1200 \text{ JK}^{-1}$$

84. The number of given statement/s which is/are correct is _____

(A) The stronger the temperature dependence of the rate constant, the higher is the activation energy.

(B) If a reaction has zero activation energy, its rate is independent of temperature.

(C) The stronger the temperature dependence of the rate constant, the smaller is the activation energy.

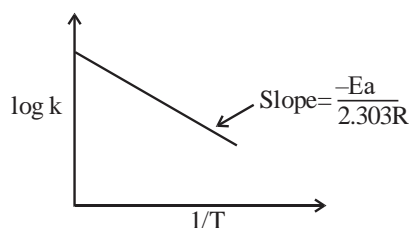
(D) If there is no correlation between the temperature and the rate constant then it means that the reaction has negative activation energy.

Official Ans. by NTA (2)

Allen Ans. (2)

Sol. $k = A \cdot e^{-E_a/RT}$

$$\log k = \log A - \underbrace{\frac{E_a}{2.303R}}_m \cdot \underbrace{\frac{1}{T}}_x$$

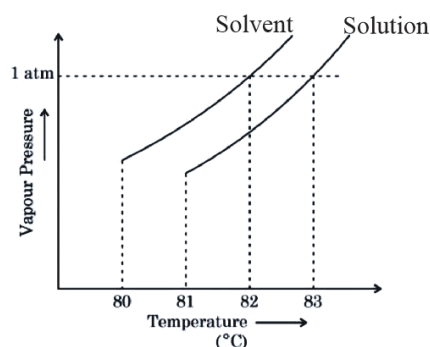


Higher is E_a , stronger is the temperature dependence of k (i.e. steeper the slope)

$$(B) \Rightarrow \frac{1}{k} \frac{dk}{dT} = \frac{E_a}{R} \cdot \frac{1}{T^2}$$

$$\Rightarrow \frac{dk}{dT} = A \times e^{-\frac{E_a}{R}} \cdot \frac{E_a}{RT^2}$$

85. The vapour pressure vs. temperature curve for a solution solvent system is shown below.



The boiling point of the solvent is _____ °C

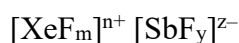
Official Ans. by NTA (82)

Allen Ans. (82)

Sol. Boiling point of solvent is 82°C

Boiling point of solution is 83°C

86. XeF_4 reacts with SbF_5 to form



$$m + n + y + z = \underline{\hspace{2cm}}$$

Official Ans. by NTA (11)

Allen Ans. (11)

Sol. $\text{XeF}_4 + \text{SbF}_5 \rightarrow [\text{XeF}_3]^+ [\text{SbF}_6]^-$

$$m = 3$$

$$n = 1$$

$$y = 6$$

$$z = 1$$

$$m + n + y + z = 11$$

87. 0.5 g of an organic compound (X) with 60% carbon will produce _____ $\times 10^{-1}$ g of CO_2 on complete combustion.

Official Ans. by NTA (11)

Allen Ans. (11)

Sol. Percentage of Carbon

$$= \frac{12}{44} \times \frac{\text{mass of } \text{CO}_2 \text{ formed}}{\text{mass of compound taken}} \times 100$$

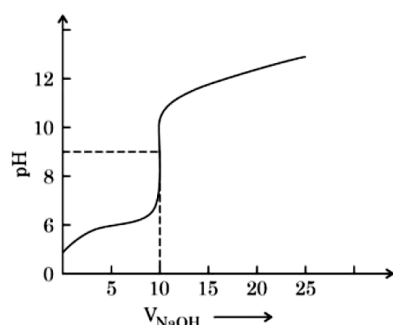
$$60 = \frac{12}{44} \times \frac{\text{mass of } \text{CO}_2 \text{ formed}}{0.5} \times 100$$

$$\text{Mass of } \text{CO}_2 \text{ formed} = \frac{60 \times 44 \times 0.5}{12 \times 100} \text{ g}$$

$$= 1.1 \text{ gram}$$

$$= 11 \times 10^{-1} \text{ gram}$$

88. The titration curve of weak acid vs. strong base with phenolphthalein as indicator) is shown below. The $K_{\text{phenolphthalein}} = 4 \times 10^{-10}$. Given: $\log 2 = 0.3$



The number of following statements which is/are correct about phenolphthalein is _____

- A. It can be used as an indicator for the titration of weak acid with weak base.
- B. It begins to change colour at pH = 8.4
- C. It is a weak organic base
- D. It is colourless in acidic medium

Official Ans. by NTA (2)

Allen Ans. (2)

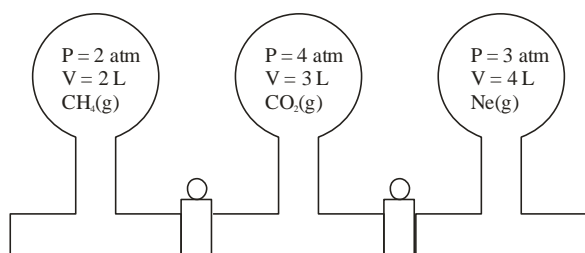
- Sol.** (B) $\text{p}K_{\text{In}} = -\log (4 \times 10^{-10}) = 9.4$

Indicator range

$$\Rightarrow \text{p}K_{\text{In}} \pm 1$$

i.e. 8.4 to 10.4

(D) In acidic medium, phenolphthalein is in unionized form and is colourless.



89.

Three bulbs are filled with CH_4 , CO_2 and Ne as shown in the picture. The bulbs are connected through pipes of zero volume. When the stopcocks are opened and the temperature is kept constant throughout, the pressure of the system is found to be _____ atm. (Nearest integer)

Official Ans. by NTA (3)

Allen Ans. (3)

Sol. $P_T V_T = n_T R T$

For CH_4

$$2 \times 2 = n_1 R T$$

$$\Rightarrow n_1 = \frac{4}{R T}$$

For CO_2

$$\Rightarrow n_2 = \frac{12}{R T}$$

For Ne

$$\Rightarrow n_3 = \frac{12}{R T}$$

$$\Rightarrow n_T = \frac{1}{R T} [4 + 12 + 12] = \frac{28}{R T}$$

$$P_T = \frac{28}{R T} \frac{R T}{V_T}$$

$$P_T = \frac{28}{V_T} = 3.11$$

90. The number of following statement/s which is/are incorrect is _____

- (A) Line emission spectra are used to study the electronic structure
- (B) The emission spectra of atoms in the gas phase show a continuous spread of wavelength from red to violet
- (C) An absorption spectrum is like the photographic negative of an emission spectrum
- (D) The element helium was discovered in the sun by spectroscopic method

Official Ans. by NTA (1)

Allen Ans. (1)

Sol. Statement (B) is incorrect.