JEE–MAIN EXAMINATION – JANUARY 2026

(HELD ON WEDNESDAY 28TH JANUARY 2026) **TIME : 9:00 AM TO 12 :00 NOON**

CHEMISTRY — TEST PAPER WITH SOLUTION

SECTION-A

51. 20.0 dm^3 of an ideal gas 'X' at 600 K and 0.5 MPa undergoes isothermal reversible expansion until pressure of the gas is 0.2 MPa. Which of the following option is correct ?

(Given: log 2 = 0.3010 and log 5 = 0.6989)

(1) w = – 9.1 kJ, $\Delta U = 0$, $\Delta H = 0$, q = 9.1 kJ

(2) w = 9.1 J, ΔU = 9.1 J, $\Delta H = 0$; q = 0

(3) w = + 4.1 kJ, $\Delta U = 0$, $\Delta H = 0$; q = – 4.1 kJ

(4) w = – 3.9 kJ, $\Delta U = 0$, $\Delta H = 0$; q = 3.9 kJ

Ans. **(1)**

Sol. For isothermal reversible process $\Delta U = \Delta H = 0$

$$w_{iso} = -p_1 v_1 \ln\frac{P_1}{P_2}$$

$$w_{iso} = -0.5\times10^6 \times 20\times10^{-3} \ln\frac{0.5}{0.2}$$

$$w_{iso} = -0.5\times10^6 \times 20\times10^{-3} \times 2.303\times(.6989-.3010)$$

$w \simeq -9.1$ kJ

$q = -w = 9.1$ kJ

52. CORRECT order of stability for the following is

$CH_2 = CH^-, CH_3 - CH_2^-, CH \equiv C^-$

(1) $CH_3 - CH_2^- > CH_2 = CH^- > CH \equiv C^-$

(2) $CH_2 = CH^- > CH \equiv C^- > CH_3 - CH_2^-$

(3) $CH \equiv C^- > CH_2 = CH^- > CH_3 - CH_2^-$

(4) $CH \equiv C^- > CH_3 - CH_2^- > CH_2 = CH^-$

Ans. **(3)**

Sol. $CH_2 = \overline{CH}$ $CH_3 = \overline{CH_2}$ $CH \equiv \overline{C}$

Stability $\propto$ %S

Order of stability

$$CH \equiv \overline{C} > CH_2 = \overline{CH} > CH_3 - \overline{CH_2}$$

53. At T(K), 2 moles of liquid A and 3 moles of liquid B are mixed. The vapour pressure of ideal solution formed is 320 mm Hg. At this stage, one mole of A and one mole of B are added to the solution. The vapour pressure is now measured as 328.6 mm Hg. The vapour pressure (in mm Hg) of A and B are respectively:

(1) 300, 200 (2) 600, 400

(3) 400, 300 (4) 500, 200

Ans. **(4)**

Sol. 2 moles of A + 3 moles of B

$\Downarrow$

$X_A = 2/5, X_B = 3/5$

$$P_S = X_A P_A^\circ + X_B P_B^\circ$$

$$320 = P_A^\circ\left(\frac{2}{5}\right) + P_B^\circ\left(\frac{3}{5}\right)$$

$$2P_A^\circ + 3P_B^\circ = 1600 \ldots\ldots(I)$$

Now 1 mole of A & 1 mole of B is added

$$X_A' = \frac{3}{7}, X_B' = \frac{4}{7}$$

$$P_S' = 328.6 = P_A^\circ\left(\frac{3}{7}\right) + P_B^\circ\left(\frac{4}{7}\right)$$

$$3P_A^\circ + 4P_B^\circ = 2300.2 \ \ldots\ldots(II)$$

Now eq (I) × 3 – eq (II) × 2

$$6P_A^\circ + 9P_B^\circ = 4800$$

$$6P_A^\circ + 8P_B^\circ = 4600.4$$

$$P_B^\circ \simeq 200 \text{ mm of Hg}$$

$$P_A^\circ \simeq 500 \text{ mm of Hg}$$

54. Consider the following reaction sequence

$$\text{Compound (x)} \xrightarrow[(ii)H_3O^+]{(i)\,CO_2,NaOH,120^\circ C,\ \text{high pressure}} \text{Compound (y)}$$

[76.6%C, 6.38%H, vapour density 47]

(Major Product)

Compound (y) develops characteristic colour with neutral $FeCl_3$ solution.

Identify the **INCORRECT** statement from the following for the above sequence.

(1) Both compounds x and y will dissolve in NaOH.

(2) Compound y will dissolve in $NaHCO_3$ and evolve a gas.

(3) Compound x is more acidic than compound y.

(4) Both compounds x and y will burn with sooty flame.

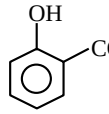
Ans. (3)

Sol. (X) $\xrightarrow[(2)H_3O^{\oplus}]{(1)CO_2/NaOH}$ Y_{Major}

76.6%C

6.38% H

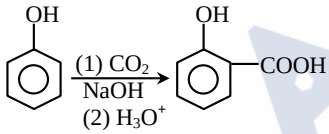
Vapour Density 47

Y =  Gives colour with $FeCl_3$

Soluble in $NaHCO_3$

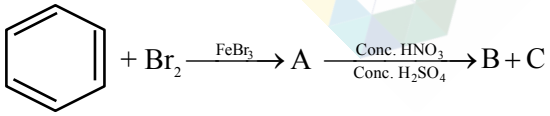
Salicylic acid

Soluble in NaOH

Compound (X) is 

Kolbe Schmitt reaction

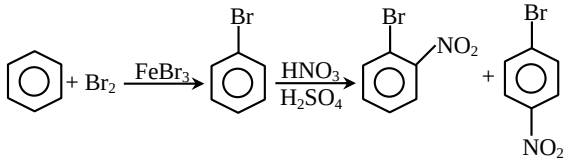
55. Method used for separation of mixture of products (B and C) obtained in the following reaction is:



(1) Simple distillation (2) sublimation

(3) steam distillation (4) fractional distillation

Ans. (4)

Sol. 

B & C separate by

Fractional Distillation method

Due to their different boiling point.

56. Consider a weak base 'B' of $pK_b = 5.699$. 'x' mL of 0.02 M HCl and 'y' mL of 0.02 M weak base 'B' are mixed to make 100 mL of a buffer of pH 9 at 25ºC. The values of 'x' and 'y' respectively are:

[Given: log 2 = 0.3010, log 3 = 0.4771, log 5 = 0.699]

(1)

x	y
11.1	88.9

(2)

x	y
42.7	57.3

(3)

x	y
14.3	85.7

(4)

x	y
85.7	14.3

Ans. (3)

Sol.

	HCl	+	B	→	$BH^+ + Cl^-$
	0.02M		0.02M		
	x ml		y ml		
t_f	0		0.02y–0.02x		0.02x

$$pOH = pK_b + \log\left[\frac{Salt}{Base}\right]$$

$$5 = 5.699 + \log\left[\frac{Salt}{Base}\right]$$

$$\frac{x}{y-x} = \frac{1}{5}$$

$6x = y$

$7x = 100$

$x = \frac{100}{7}$ ml

& $y = \frac{600}{7}$ ml

57. An organic compound undergoes first order decomposition. The time taken for decomposition to $\left(\frac{1}{8}\right)^{th}$ and $\left(\frac{1}{10}\right)^{th}$ of its initial concentration are $t_{1/8}$ and $t_{1/10}$ respectively.

What is the value of $\frac{t_{1/8}}{t_{1/10}} \times 10$?

(log 2 = 0.3)

(1) 9 (2) 0.9

(3) 3 (4) 30

Ans. (1)

Sol. $t = \frac{1}{k}\ln\frac{A_0}{A_t}$

$$t_{1/8} = \frac{1}{k}\ln\frac{A_0}{A_0/8} = \frac{1}{k}\ln 8$$

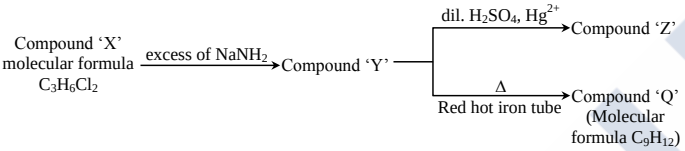
$$t_{1/10} = \frac{1}{k}\ln\frac{A_0}{A_0/10} = \frac{1}{k}\ln 10$$

$$\frac{t_{1/8}}{t_{1/10}} = \frac{\ln 8}{\ln 10} = \frac{\log 8}{\log 10}$$

$$\frac{t_{1/8}}{t_{1/10}} = \log 8 = 3\log 2 = 0.9$$

$$\frac{t_{1/8}}{t_{1/10}} \times 10 = 9$$

58. Given below are two statements for the following reaction sequence.



Statement I: Compound 'Z' will give yellow precipitate with NaOI.

Statement II: Compound 'Q' has two different types of 'H' atoms (aromatic : aliphatic) in the ratio 1 : 3.

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

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

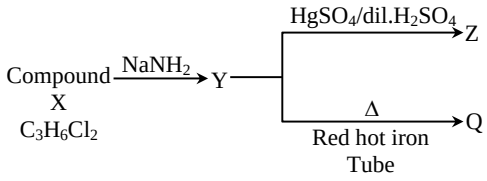
(2) Both Statement I and Statement II are true

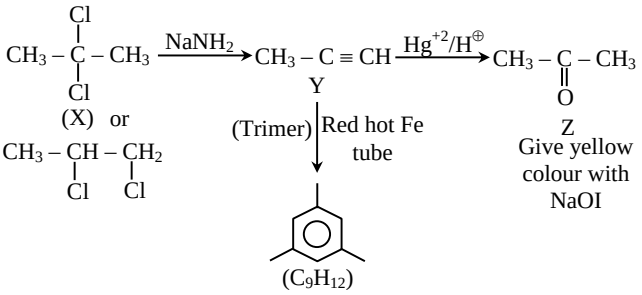
(3) Statement I is false but Statement II is true

(4) Both Statement I and Statement II are false

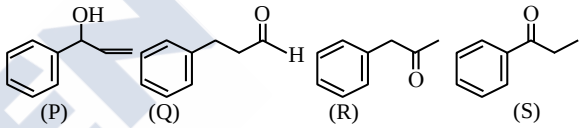
Ans. (2)

Sol.





59. Given below are the four isomeric compounds (P, Q, R, S)



Identify **correct** statements from below.

A. Q, R and S will give precipitate with 2, 4 - DNP.

B. P and Q will give positive Bayer's test.

C. Q and R will give sooty flame.

D. R and S will give yellow precipitate with I_2/NaOH.

E. Q alone will deposit silver with Tollen's reagent

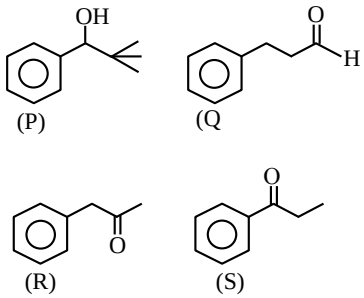
Choose the correct option.

(1) A, C and E only (2) A and E only

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

Ans. (1)

Sol.



(A) Q, R, S all three give 2, 4 DNP test as they have Aldehyde/ketone group

(C) Q & R gives sooty flame

(E) Q gives Tollens reagent test

60. Given below are two statements:

Statement I: The number of species among BF_4^-, SiF_4, XeF_4 and SF_4, that have unequal E–F bond lengths is two. Here, E is the central atom.

Statement II: Among O_2^-, O_2^{2-}, F_2 and O_2^+, O_2^- has the highest bond order.

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

(1) Both Statement I and Statement II are false

(2) Both Statement I and Statement II are true

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

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

Ans. **(1)**

Sol. In BF_4^-, SiF_4 and XeF_4 all bond lengths are identical

Molecules		B.O.
O_2^+	→	2.5
O_2^-	→	1.5
O_2^{2-}	→	1
F_2	→	1

61. Regarding the hydrides of group 15 elements EH_3 (E = N, P, As, Sb), select the correct statement from the following:

A. The stability of hydrides decreases down the group.

B. The basicity of hydrides decreases down the group.

C. The reducing character increases down the group.

D. The boiling point increases down the group.

Choose the ***correct*** answer from the options given below:

(1) A, B & C only (2) A & D only

(3) A, B, C & D (4) B & C only

Ans. **(1)**

Sol. Stability : $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$

Basicity : $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$

Reducing character : $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$

Boiling point : $PH_3 < AsH_3 < NH_3 < SbH_3 < BiH_3$

62. Given below are two statements:

Statement I: Griss–Ilosvay test is used for the detection of nitrite ion, which involves the use of sulphanilic acid and α–naphthylamine reagent.

Statement II: In the above test, sulphanilic acid is diazotized by the acidified nitrite ion, which on further coupling with α–naphthylamine forms an azo-dye.

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

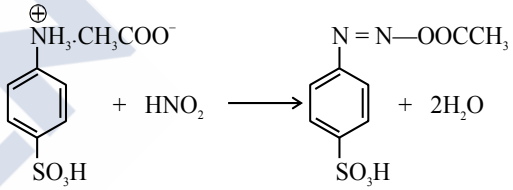
(2) Both Statement I and Statement II are true

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

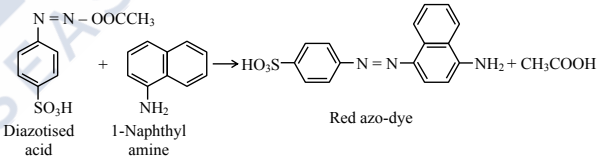
(4) Both Statement I and Statement II are false

Ans. **(2)**

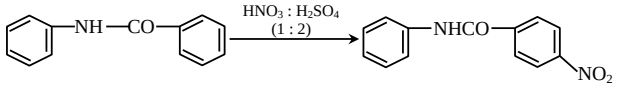
Sol. $NO_2^- + CH_3COOH \rightarrow HNO_2 + CH_3COO^-$

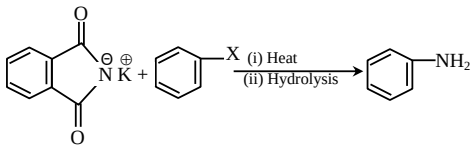


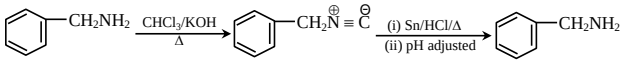
(Sulphanilic acid solution)

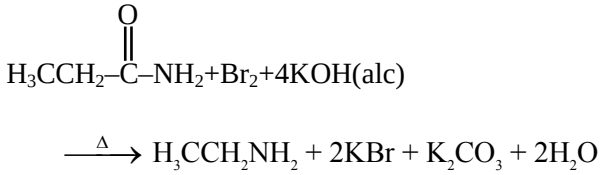


63. Consider the following reactions giving major product. Identify the correct reaction.

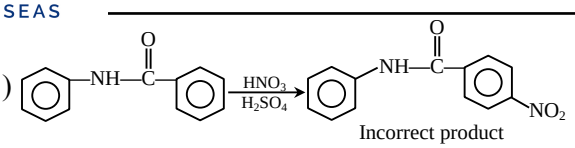
(1) 

(2) 

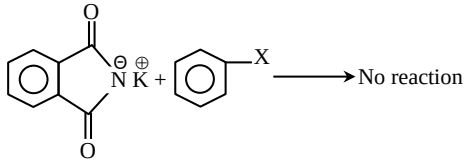
(3) 

(4) 

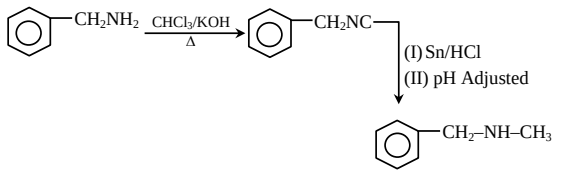
Ans. **(4)**

Sol. (1) 

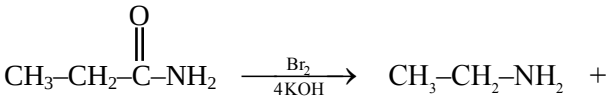
Incorrect product

(2) 

Aromatic halide does not give gabriel phthalimide reaction

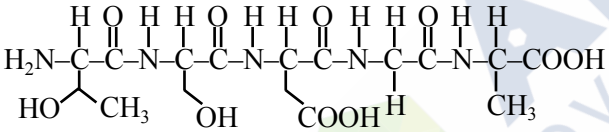
(3) 

(4) Hoffmann bromamide degradation



$2KBr + K_2CO_3 + 2H_2O$

64. In the given pentapeptide, find out an essential amino acid (Y) and the sequence present in the pentapeptide:



Choose the correct answer from the options given below:

(1)

(Y)	(Sequence)
Threonine	Ser – Thr – Asp – Gly – Ala

(2)

(Y)	(Sequence)
Serine	Thr – Ser – Asp – Ala – Gly

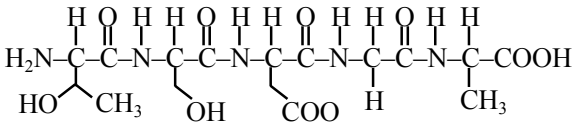
(3)

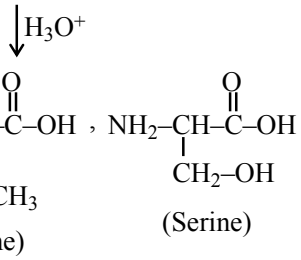
(Y)	(Sequence)
Threonine	Thr – Ser – Asp – Gly – Ala

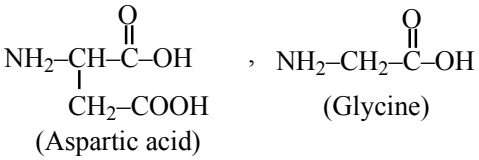
(4)

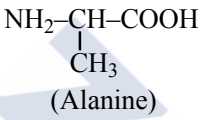
(Y)	(Sequence)
Serine	Ser – Asp – Thr – Ala – Gly

Ans. (3)

Sol. 







65. $Ph-CH=CH_2 \xrightarrow[HBr]{(PhCOO)_2} Product$

Consider the above reaction

A. The reaction proceeds through a more stable radical intermediate.

B. The role of peroxide is to generate $\dot{H}$ (Hydrogen radical).

C. During this reaction, benzene is formed as a biproduct.

D. 1-Bromo-2-phenylethane is fanned as the minor product.

E. The same reaction in absence of peroxide proceeds via carbocation intermediate.

Identify the correct statements. Choose the ***correct*** answer from the options given below:

(1) A & E Only

(2) A, B & D Only

(3) C, D & E Only

(4) A, C & E Only

Ans. (4)

Sol. $Ph–CH=CH_2 \xrightarrow[HBr]{(PhCOO)_2} Ph–CH_2–CH_2–Br$

Anti Markovnikov addition

- Reaction follow radical addition in presence of peroxide
- In absence of peroxide follow carbocation mechanism
- Benzene also formed

$$Ph–\underset{\underset{O}{\|}}{C}–O–O–\underset{\underset{O}{\|}}{C}–Ph \rightarrow 2Ph–\underset{\underset{O}{\|}}{\overset{\bullet}{C}}–O$$

$$Ph–\underset{\underset{O}{\|}}{C}–\overset{\bullet}{O} \longrightarrow \overset{\bullet}{Ph} + CO_2$$

$$\overset{\bullet}{Ph} + HBr \longrightarrow Ph – H + \overset{\bullet}{Br}$$

$$Ph–CH = CH_2 + \overset{\bullet}{Br} \longrightarrow Ph–\overset{\bullet}{C}H–CH_2–Br$$

$$\downarrow HBr$$

$$Ph–CH_2–CH_2–Br$$

66. The wave numbers of three spectral lines of H atom are considered. Identify the set of spectral lines belonging to Balmer series.

(R = Rydberg constant)

(1) $\frac{5R}{36}, \frac{3R}{16}, \frac{21R}{100}$

(2) $\frac{5R}{36}, \frac{8R}{9}, \frac{15R}{16}$

(3) $\frac{7R}{144}, \frac{3R}{16}, \frac{16R}{255}$

(4) $\frac{3R}{4}, \frac{3R}{16}, \frac{7R}{144}$

Ans. **(1)**

Sol. Balmer series line $\Rightarrow \bar{\nu} = R_H z^2\left[\frac{1}{2^2} - \frac{1}{n^2}\right]$

if $n = 3 \Rightarrow \bar{\nu} = R(1)^2\left[\frac{1}{2^2} - \frac{1}{3^2}\right] = \frac{5R}{36}$

if $n = 4 \Rightarrow \bar{\nu} = \frac{3R}{16}$

if $n = 5 \Rightarrow \bar{\nu} = \frac{21R}{100}$

67.

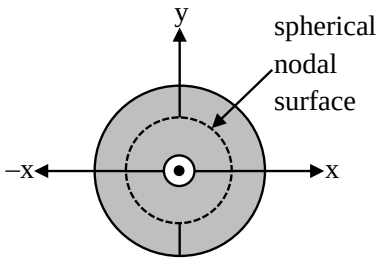


Figure 1. electron probability density for 2s orbital

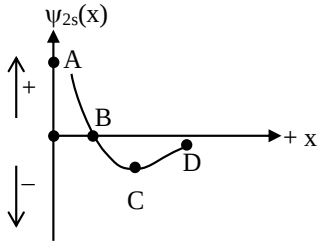


Figure 2. wave function for 2s orbital

Which of the following point in Figure 2 most accurately represents the nodal surface as shown in Figure 1 ?

(1) B (2) D

(3) C (4) A

Ans. **(1)**

Sol. At spherical node

$\psi_r = 0$

68. Given below are two statements :

Statement I : The number of pairs, from the following, in which both the ions are coloured in aqueous solution is 3.

$[Sc^{3+}, Ti^{3+}]$, $[Mn^{2+}, Cr^{2+}]$, $[Cu^{2+}, Zn^{2+}]$ and $[Ni^{2+}, Ti^{4+}]$

Statement II : Th^{4+} is the strongest reducing agent among Th^{4+}, Ce^{4+}, Gd^{3+} and Eu^{2+}.

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) Statement I is false but Statement II is true

(3) Both Statement I and Statement II are false

(4) Both Statement I and Statement II are true

Ans. **(3)**

Sol. Sc^{3+}, Ti^{4+} and Zn^{2+} are colourless

Th^{4+} cannot act as a reducing agent.

69. In period 4 of the periodic table, the elements with highest and lowest atomic radii are respectively.

(1) Na & Cl

(2) K & Se

(3) K & Br

(4) Rb & Br

Ans. **(3)**

Sol. In a period moving from left to right atomic size decreases.

70. The correct statement among the following is :

(1) $[Ni(CN)_4]^{2-}$ and $[NiCl_4]^{2-}$ are diamagnetic and $Ni(CO)_4$ is paramagnetic.

(2) $Ni(CO)_4$ and $[NiCl_4]^{2-}$ are diamagnetic and $[Ni(CN)_4]^{2-}$ is paramagnetic.

(3) $Ni(CO)_4$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $[NiCl_4]^{2-}$ is paramagnetic.

(4) $Ni(CO)_4$ is diamagnetic and $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are paramagnetic.

Ans. **(3)**

Sol. $[Ni(CN)_4]^{2-} \rightarrow 3d^8 \rightarrow$ diamagnetic $\rightarrow dsp^2$

$[Ni(CO)_4] \rightarrow 3d^{10} \rightarrow$ diamagnetic $\rightarrow sp^3$

$[NiCl_4]^{2-} \rightarrow 3d^8 \rightarrow e^{2,2}\ t_2^{2,1,1} \rightarrow sp^3 \rightarrow$ paramagnetic.

SECTION-B

71. 500 mL of 1.2 M KI solution is mixed with 500 mL of 0.2 M $KMnO_4$ solution in basic medium. The liberated iodine was titrated with standard 0.1 M $Na_2S_2O_3$ solution in the presence of starch indicator till the blue color disappeared. The volume (in L) of $Na_2S_2O_3$ consumed is_____. (Nearest integer)

Ans. **(3)**

Sol. $MnO_4^- + I^- \rightarrow MnO_2 + I_2$

$I_2 + S_2O_3^{2-} \rightarrow S_4O_6^{2-} + I^-$

gram eq of $KMnO_4$ = gram eq of $Na_2S_2O_3$

$$0.2 \times \frac{500}{1000} \times 3 = 0.1 \times V \times 1$$

$V = 3$ L

72. Consider the following redox reaction taking place in acidic medium

$$BH_4^-(aq) + ClO_3^-(aq) \rightarrow H_2BO_3^-(aq) + Cl^-(aq)$$

If the Nernst equation for the above balanced reaction is

$$E_{cell} = E^o_{cell} - \frac{RT}{nF}\ \ell n\ Q,$$

Then the value of n is _____. (Nearest integer)

Ans. **(24)**

Sol. $3BH_4^- + 4ClO_3^- \longrightarrow 4Cl^- + 3H_2BO_3^- + 3H_2O$

n-factor = 8

moles = 3

$\therefore$ n = 3 × 8 = 24

73. X is the number of geometrical isomers exhibited by $[Pt(NH_3)(H_2O)BrCl]$.

Y is the number of optically inactive isomer(s) exhibited by $[CrCl_2(ox)_2]^{3-}$

Z is the number of geometrical isomers exhibited by $[Co(NH_3)_3(NO_2)_3]$

The value of X + Y + Z is _____ .

Ans. **(6)**

Sol. Here

X = 3 (Two cis + one trans isomers)

Y = 1 (trans isomer)

Z = 2 (Fac- mer isomer)

X+Y+Z = 3 + 1 + 2 = 6

74. 0.53 g of an organic compound (x) when heated with excess of nitric acid (concentrated) and then with silver nitrate gave 0.75 g of silver bromide precipitate. 1.0 g of (x) gave 1.32 g of CO_2 gas on combustion. The percentage of hydrogen in the compound (x) is _____ %. [Nearest Integer]

[Given : Molar mass in g mol^{-1} H : 1, C : 12, Br : 80, Ag : 108, O : 16; Compound (x) : $C_xH_yBr_z$]

Ans. (4)

Sol.

$$C_xH_yBr_z \rightarrow CO_2$$
$$1g \qquad 1.32g$$

$$\%C = \frac{1.32 \times 12}{44 \times 1} \times 100 = 36\%$$

$$C_xH_yBr_z \rightarrow AgBr$$
$$0.53g \qquad 0.75g$$

$$\%Br = \frac{0.75 \times 80}{188 \times 0.53} \times 100 = 60.2\%$$

$\%H = 100 - (36 + 60.2)$

$\%H \simeq 4\%$

75. Consider the dissociation equilibrium of the following weak acid $HA \rightleftharpoons H^+(aq) + A^-(aq)$

If the pKa of the acid is 4, then the pH of 10 mM HA solution is _____. (Nearest integer)

[Given : The degree of dissociation can be neglected with respect to unity]

Ans. (3)

Sol. $pH = \frac{1}{2}[pK_a - \log c]$

$pH = \frac{1}{2}[4 - \log 10^{-2}]$

$pH = 3$