



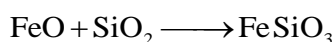
34. In the extraction of copper, its sulphide ore is heated in a reverberatory furnace after mixing with silica to :

- (1) separate CuO as  $\text{CuSiO}_3$
- (2) remove calcium as  $\text{CaSiO}_3$
- (3) decrease the temperature needed for roasting of  $\text{Cu}_2\text{S}$
- (4) remove FeO as  $\text{FeSiO}_3$

Official Ans. by NTA (4)

Ans. (4)

Sol. The copper ore contains iron, it is mixed with silica before heating in reverberatory furnace. FeO slags off as  $\text{FeSiO}_3$ .



35. Amongst the following compounds, which one is an antacid ?

- (1) Ranitidine
- (2) Meprobamate
- (3) Terfenadine
- (4) Brompheniramine

Official Ans. by NTA (1)

Ans. (1)

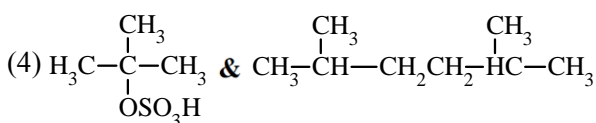
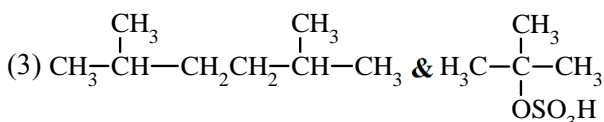
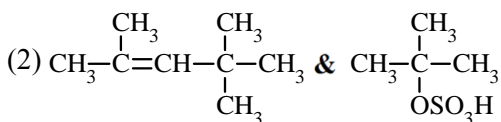
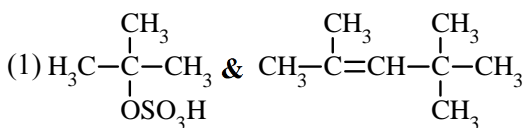
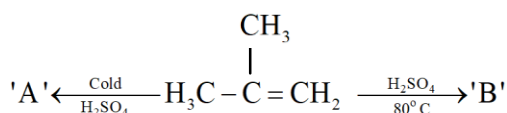
Sol. 1. **Ranitidine:** Antacid

2. **Meprobamate:** Tranquilizer

3. **Terfenadine:** Antihistamine

4. **Brompheniramine:** Antihistamine

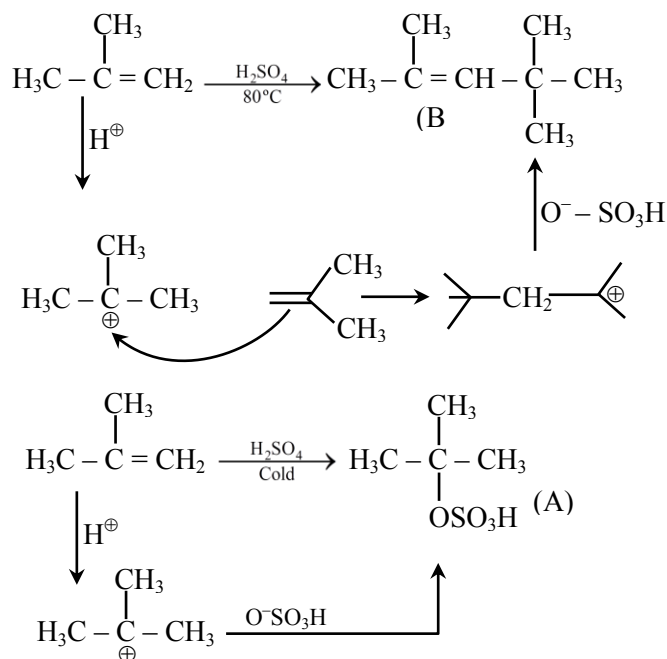
36. The major products 'A' and 'B', respectively, are



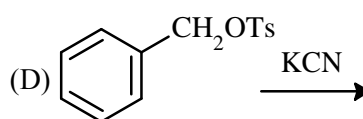
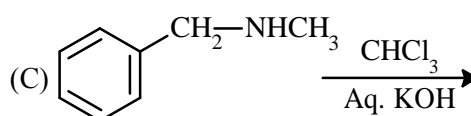
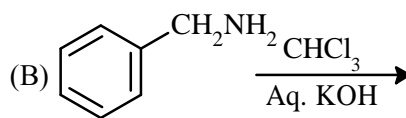
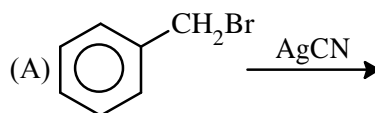
Official Ans. by NTA (1)

Ans. (1)

Sol.



37. Benzyl isocyanide can be obtained by :



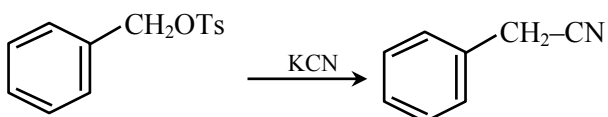
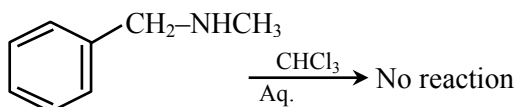
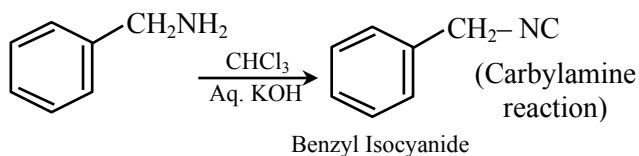
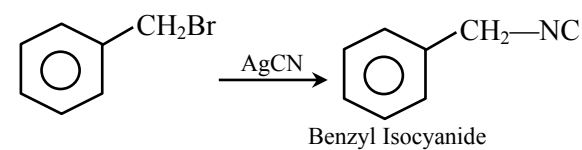
Choose the correct answer from the options given below :

- (1) A and D
- (2) Only B
- (3) A and B
- (4) B and C

Official Ans. by NTA (3)

Ans. (3)

Sol.



38. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

**Assertion (A)** : In expensive scientific instruments, silica gel is kept in watch-glasses or in semipermeable membrane bags.

**Reason (R)** : Silica gel adsorbs moisture from air via adsorption, thus protects the instrument from water corrosion (rusting) and / or prevents malfunctioning.

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

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

**Official Ans. by NTA (3)**

**Ans. (3)**

**Sol.** Silica gel prevents water corrosion (rusting) and instrument malfunction by adsorbing moisture from the air.

39. Match List I with List II

	List I	List II
A	<chem>c1ccccc1Cl</chem> + <chem>CCl</chem> $\xrightarrow{\text{Na}}$ <chem>Cc1ccccc1</chem>	I Fitting reaction
B	<chem>c1ccccc1Cl</chem> + 2Na $\rightarrow$ <chem>c1ccc(cc1)-c2ccccc2</chem>	II Wurtz Fitting reaction
C	<chem>c1ccccc1[N+]#N.[Cl-]</chem> $\xrightarrow{\text{Cu}_2\text{Cl}_2}$ <chem>c1ccccc1Cl</chem> + N <sub>2</sub>	III Finkelstein reaction
D	<chem>CCl</chem> + NaI $\rightarrow$ <chem>CI</chem> + NaCl	IV Sandmeyer reaction

(1) A – II, B – I, C – III, D – IV

(2) A – III, B – II, C – IV, D – I

(3) A – IV, B – II, C – III, D – I

(4) A – II, B – I, C – IV, D – III

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

**Ans. (4)**

**Sol.**

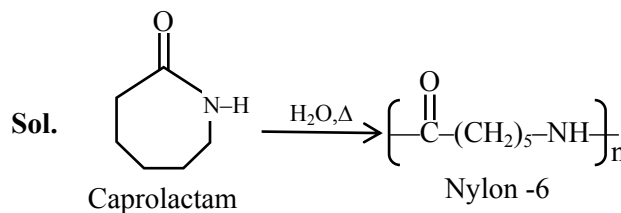
	LIST-I	LIST-II
A.	<chem>c1ccccc1Cl</chem> + <chem>CCl</chem> $\xrightarrow{\text{Na}}$ <chem>Cc1ccccc1</chem>	Wurtz-fitting reaction
B.	<chem>c1ccccc1Cl</chem> + 2Na $\rightarrow$ <chem>c1ccc(cc1)-c2ccccc2</chem>	Fitting reaction
C.	<chem>c1ccccc1[N+]#N.[Cl-]</chem> $\xrightarrow{\text{Cu}_2\text{Cl}_2}$ <chem>c1ccccc1Cl</chem> + N <sub>2</sub>	Sandmeyer reaction
D.	<chem>CCl</chem> + NaI $\rightarrow$ <chem>CI</chem> + NaCl	Finkelstein reaction

40. Caprolactam when heated at high temperature in presence of water, gives

- (1) Teflon
- (2) Dacron
- (3) Nylon 6, 6
- (4) Nylon 6

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

**Ans. (4)**



41. The alkaline earth metal sulphate(s) which are readily soluble in water is/are:

- (A)  $\text{BeSO}_4$   
 (B)  $\text{MgSO}_4$   
 (C)  $\text{CaSO}_4$   
 (D)  $\text{SrSO}_4$   
 (E)  $\text{BaSO}_4$

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

- (1) A only                                      (2) B only  
 (3) A and B                                    (4) B and C

**Official Ans. by NTA (3)**

**Ans. (3)**

**Sol.** Due to high hydration energy  $\text{Be}^{2+}$  and  $\text{Mg}^{2+}$ ,  $\text{BeSO}_4$  and  $\text{MgSO}_4$  are readily soluble in water.

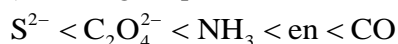
42. Which of the following is correct order of ligand field strength?

- (1)  $\text{CO} < \text{en} < \text{NH}_3 < \text{C}_2\text{O}_4^{2-} < \text{S}^{2-}$   
 (2)  $\text{S}^{2-} < \text{C}_2\text{O}_4^{2-} < \text{NH}_3 < \text{en} < \text{CO}$   
 (3)  $\text{NH}_3 < \text{en} < \text{CO} < \text{S}^{2-} < \text{C}_2\text{O}_4^{2-}$   
 (4)  $\text{S}^{2-} < \text{NH}_3 < \text{en} < \text{CO} < \text{C}_2\text{O}_4^{2-}$

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

**Ans. (2)**

**Sol.** The increasing order of field strength of ligands (according to spectrochemical series)



43. Formation of photochemical smog involves the following reaction in which A, B and C are respectively.

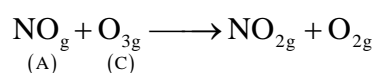
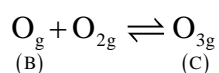
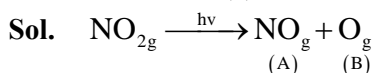
- (i)  $\text{NO}_2 \xrightarrow{h\nu} \text{A} + \text{B}$   
 (ii)  $\text{B} + \text{O}_2 \rightarrow \text{C}$   
 (iii)  $\text{A} + \text{C} \rightarrow \text{NO}_2 + \text{O}_2$

Choose the correct answer from the options given below:

- (1) O,  $\text{NO}$  &  $\text{NO}_3^-$                       (2) O,  $\text{N}_2\text{O}$  &  $\text{NO}$   
 (3) N,  $\text{O}_2$  &  $\text{O}_3$                         (4)  $\text{NO}$ , O &  $\text{O}_3$

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

**Ans. (4)**

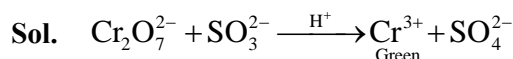


44. During the qualitative analysis of  $\text{SO}_3^{2-}$  using dilute  $\text{H}_2\text{SO}_4$ ,  $\text{SO}_2$  gas is evolved which turns  $\text{K}_2\text{Cr}_2\text{O}_7$  solution (acidified with dilute  $\text{H}_2\text{SO}_4$ ):

- (1) Black                                      (2) Red  
 (3) Green                                      (4) Blue

**Official Ans. by NTA (3)**

**Ans. (3)**



45. To inhibit the growth of tumours, identify the compounds used from the following:

- (A) EDTA  
 (B) Coordination Compounds of Pt  
 (C) D – Penicillamine  
 (D) Cis – Platin

Choose the correct answer from the option given below:

- (1) B and D Only  
 (2) C and D Only  
 (3) A and B Only  
 (4) A and C Only

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

**Ans. (1)**

**Sol.** Cis – Platin is used in chemotherapy to inhibit the growth of tumours. ( $\text{cis}[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ )

46. In the wet tests for identification of various cations by precipitation, which transition element cation doesn't belong to group IV in qualitative inorganic analysis?

- (1)  $\text{Fe}^{3+}$   
 (2)  $\text{Zn}^{2+}$   
 (3)  $\text{Co}^{2+}$   
 (4)  $\text{Ni}^{2+}$

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

**Ans. (1)**

**Sol.**  $\text{Zn}^{2+}$ ,  $\text{Co}^{2+}$ ,  $\text{Ni}^{2+}$  = IV<sup>th</sup> Group  
 $\text{Fe}^{3+}$  = III<sup>rd</sup> Group

47. Match List I with List II

LIST-I (molecules/ions)		LIST-II (No. of lone pairs of e <sup>-</sup> on central atom)	
(A)	IF <sub>7</sub>	I.	Three
(B)	ICl <sub>4</sub> <sup>-</sup>	II.	One
(C)	XeF <sub>6</sub>	III.	Two
(D)	XeF <sub>2</sub>	IV.	Zero

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

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

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

**Ans. (2)**

**Sol.** IF<sub>7</sub> zero lone pair

ICl<sub>4</sub><sup>-</sup> two lone pair

XeF<sub>6</sub> one lone pair

XeF<sub>2</sub> three lone pair

48. For OF<sub>2</sub> molecule consider the following:

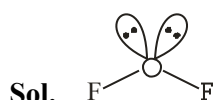
- (A) Number of lone pairs on oxygen is 2.  
 (B) FOF angle is less than 104.5°.  
 (C) Oxidation state of O is –2.  
 (D) Molecule is bent ‘V’ shaped.  
 (E) Molecular geometry is linear.

**Correct** options are:

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

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

**Ans. (4)**



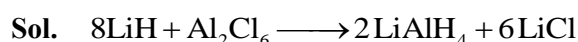
- Two lone pair one oxygen
- Molecule is ‘v’ shaped
- Bond angle is less than 104.5°(102°)
- O.S. of ‘O’ is +2

49. Lithium aluminium hydride can be prepared from the reaction of

- (1) LiCl and Al<sub>2</sub>H<sub>6</sub>  
 (2) LiH and Al<sub>2</sub>Cl<sub>6</sub>  
 (3) LiCl, Al and H<sub>2</sub>  
 (4) LiH and Al(OH)<sub>3</sub>

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

**Ans. (2)**



50. Match List – I with List – II

LIST-I (Atomic number)		LIST-II (Block of periodic table)	
(A)	37	I.	p-block
(B)	78	II.	d-block
(C)	52	III.	f-block
(D)	65	IV.	s-block

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

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

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

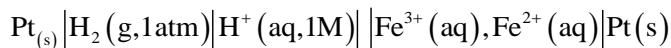
**Ans. (4)**

**Sol.**

Atomic number	Block
37 (K)	s-block
78 (Pt)	d-block
52 (Te)	p-block
65 (Tb)	f-block

SECTION-B

51. Consider the cell



When the potential of the cell is 0.712 V at 298 K, the ratio  $\frac{[\text{Fe}^{2+}]}{[\text{Fe}^{3+}]}$  is \_\_\_\_\_.

(Nearest integer)

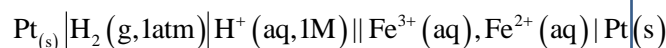
Given:  $\text{Fe}^{3+} + e^- = \text{Fe}^{2+}$ ,  $E^\circ_{\text{Fe}^{3+}/\text{Fe}^{2+}} | \text{Pt} = 0.771$

$$\frac{2.303RT}{F} = 0.06\text{V}$$

Official Ans. by NTA (10)

Ans. (10)

Sol



at anode  $\text{H}_2 \longrightarrow 2\text{H}^+ + 2e^-$

At cathode  $\text{Fe}^{3+}_{\text{aq}} + e^- \longrightarrow \text{Fe}^{2+}_{\text{aq}}$

$$E^\circ = E^\circ_{\text{H}_2|\text{H}^+} + E^\circ_{\text{Fe}^{3+}|\text{Fe}^{2+}} = 0.771\text{V}$$

$$E = E^\circ - \frac{0.06}{1} \log \frac{\text{Fe}^{2+}}{\text{Fe}^{3+}}$$

$$0.712 = (0 + 0.771) - \frac{0.06}{1} \log \frac{\text{Fe}^{2+}}{\text{Fe}^{3+}}$$

$$\log \frac{\text{Fe}^{2+}}{\text{Fe}^{3+}} = \frac{0.059}{0.06} \approx 1$$

$$\boxed{\frac{\text{Fe}^{2+}}{\text{Fe}^{3+}} = 10}$$

52. A 300 mL bottle of soft drink has 0.2 M  $\text{CO}_2$  dissolved in it. Assuming  $\text{CO}_2$  behaves as an ideal gas, the volume of the dissolved  $\text{CO}_2$  at STP is \_\_\_\_\_ mL. (Nearest integer)

Given: At STP, molar volume of an ideal gas is  $22.7\text{L mol}^{-1}$

Official Ans. by NTA (1362)

Ans. ( 1362 ml)

Sol. Mole of  $\text{CO}_2 = 0.2\text{M} \times (300 \times 10^{-3})\text{L}$   
 $= 0.06\text{Mole}$

Volume of 0.06 mole  $\text{CO}_2$  at S.T.P  
 $= 0.06 \times 22.7$   
 $= 1.362\text{L}$

53. A solution containing 2 g of a non-volatile solute in 20 g of water boils at 373.52 K. The molecular mass of the solute is \_\_\_\_\_  $\text{g mol}^{-1}$ . (Nearest integer)

Given, water boils at 373 K,  $K_b$  for water  $= 0.52\text{K kg mol}^{-1}$

Official Ans. by NTA (100g)

Ans. (100g)

Sol.  $\Delta T_b = 373.52 - 373$   
 $= 0.52$

$$\Delta T_b = K_b \cdot m$$

$$0.52 = 0.52 \times \frac{2}{\text{Molar Mass}} \times \frac{1}{20 \times 10^{-3}}$$

Molar Mass = 100g/mol

54. If compound A reacts with B following first order kinetics with rate constant  $2.011 \times 10^{-3}\text{s}^{-1}$ . The time taken by A (in seconds) to reduce from 7 g to 2 g will be \_\_\_\_\_. (Nearest Integer)

[  $\log 5 = 0.698, \log 7 = 0.845, \log 2 = 0.301$  ]

Official Ans. by NTA (623)

Ans. (623)

Sol.  $\text{A} + \text{B} \rightarrow \text{P}$

$t = 0$             7g

$t = t$             2g

at constant volume

$$t = \frac{2.303}{K} \log \frac{[\text{A}]_0}{[\text{A}]_t}$$

$$= \frac{2.303}{2.011 \times 10^{-3}} \log \frac{7}{2}$$

$$= \frac{2.303 \times 0.544}{2.011 \times 10^{-3}}$$

$$= 622.989$$

$$\approx 623$$

55. The energy of one mole of photons of radiation of frequency  $2 \times 10^{12}$  Hz in  $\text{J mol}^{-1}$  is \_\_\_\_\_.  
(Nearest integer)

(Given:  $h = 6.626 \times 10^{-34}$  Js

$N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$ )

**Official Ans. by NTA (798)**

**Ans. (798)**

- Sol.** For one photon  $E = h\nu$

For one mole photon,

$$E = 6.023 \times 10^{23} \times 6.626 \times 10^{-34} \times 2 \times 10^{12}$$

$$= 798.16 \text{ J}$$

$$\approx 798 \text{ J}$$

56. The number of electrons involved in the reduction of permanganate to manganese dioxide in acidic medium is \_\_\_\_\_.

**Official Ans. by NTA (3)**

**Ans. (3)**

- Sol.**  $\text{MnO}_4^- + 4\text{H}^+ + 3\text{e}^- \longrightarrow \text{MnO}_2 + 2\text{H}_2\text{O}$

57. When 2 litre of ideal gas expands isothermally into vacuum to a total volume of 6 litre, the change in internal energy is \_\_\_\_\_ J. (Nearest integer)

**Official Ans. by NTA (0)**

**Ans. (0)**

- Sol.** For ideal gas  $U = f(T)$

and for isothermal process,  $\Delta U = 0$

58. 600 mL of 0.01M HCl is mixed with 400 mL of 0.01 M  $\text{H}_2\text{SO}_4$ . The pH of the mixture is \_\_\_\_\_  $\times 10^{-2}$ . (Nearest integer)

[Given  $\log 2 = 0.30$ ,  $\log 3 = 0.48$

$\log 5 = 0.69$   $\log 7 = 0.84$

$\log 11 = 1.04$ ]

**Official Ans. by NTA (186)**

**Ans. (186)**

- Sol.** Total milimoles of  $\text{H}^+ = (600 \times 0.01) + (400 \times 0.01 \times 2)$   
 $= 14$

$$[\text{H}^+] = \frac{14}{1000} = 14 \times 10^{-3}$$

$$\text{pH} = 3 - \log 14$$

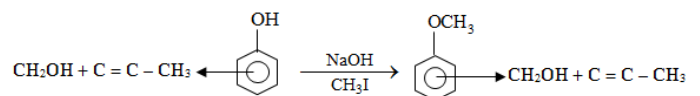
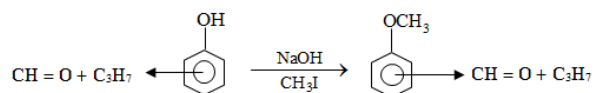
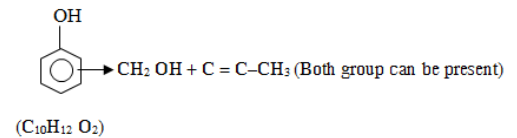
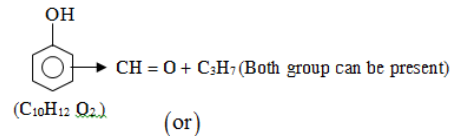
$$= 1.86$$

$$= 186 \times 10^{-2}$$

59. A trisubstituted compound 'A',  $\text{C}_{10}\text{H}_{12}\text{O}_2$  gives neutral  $\text{FeCl}_3$  test positive. Treatment of compound 'A' with  $\text{NaOH}$  and  $\text{CH}_3\text{Br}$  gives  $\text{C}_{11}\text{H}_{14}\text{O}_2$ , with hydroiodic acid gives methyl iodide and with hot conc.  $\text{NaOH}$  gives a compound B,  $\text{C}_{10}\text{H}_{12}\text{O}_2$ . Compound 'A' also decolorises alkaline  $\text{KMnO}_4$ . The number of  $\pi$  bond/s present in the compound 'A' is \_\_\_\_\_.

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

**Ans. (4)**



60. Some amount of dichloromethane ( $\text{CH}_2\text{Cl}_2$ ) is added to 671.141 mL of chloroform ( $\text{CHCl}_3$ ) to prepare  $2.6 \times 10^{-3}$  M solution of  $\text{CH}_2\text{Cl}_2$  (DCM). The concentration of DCM is \_\_\_\_\_ ppm (by mass).

Given: Atomic mass : C = 12; H = 1; Cl = 35.5  
density of  $\text{CHCl}_3 = 1.49 \text{ g cm}^{-3}$

**Official Ans. by NTA (221)**

**Ans. (148)**

- Sol.** Molarity =  $\frac{\text{mole}}{\text{volume}}$

$$2.6 \times 10^{-3} = \frac{x/85}{0.67141}$$

$$x = 0.148 \text{ g}$$

$$\text{conc. of DCM in ppm} = \frac{0.148}{1.49 \times 671.141} \times 10^6$$

$$= 148 \text{ ppm}$$