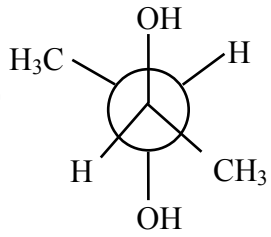
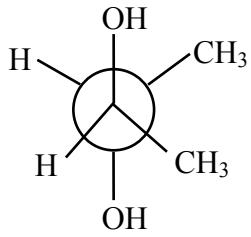
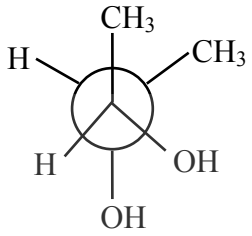
CHEMISTRY

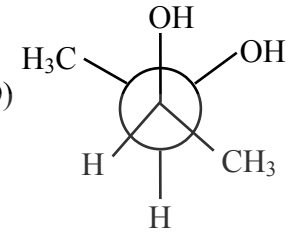
SCQ

1. Which of the following is most stable meso conformation of Butane-2,3-diol?

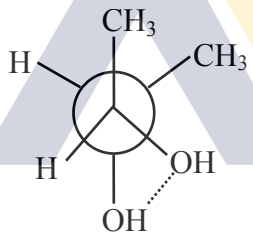
(A) 

(B) 

(C) 

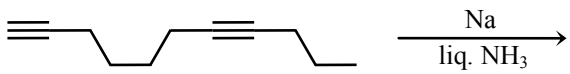
(D) 

Ans. (C)

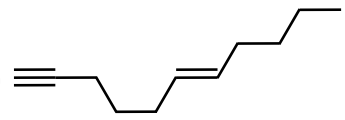
Sol. 

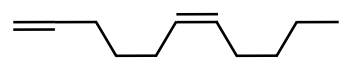
Due to H-bonding, Gauche form of Butane-2,3-diol is the most stable.

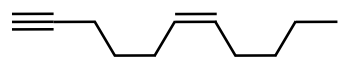
SCQ

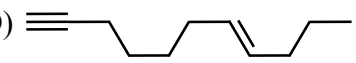
2. 

Product is

(A) 

(B) 

(C) 

(D) 

Ans. (D)

MCQ

3. Which of the following is/are correct?

(A) Micelles are macromolecular solids.

(B) Surfactants form micelles at a concentration greater than CMC. CMC depends upon temperature.

(C) Freezing point of colloidal solution is greater than true solution.

(D) Peptization is the process of converting colloidal to precipitate.

Ans. **(BC)**

MCQ

4. $\underset{\text{ppt}}{\text{White}} \xleftarrow[\text{Room Temp}]{\text{dil. NaOH}} \text{A solution containing two metal salts} \xrightarrow[\text{Room temp}]{\text{dil. HCl}} \underset{\text{ppt}}{\text{White}}$ only

Metal salts can be

(A) $AgNO_3$, $Bi(NO_3)_3$

(B) $Pb(NO_3)_2$, $Hg(NO_3)_2$

(C) $Pb(NO_3)_2$, $Bi(NO_3)_2$

(D) $Pb(NO_3)_2$, $Zn(NO_3)_2$

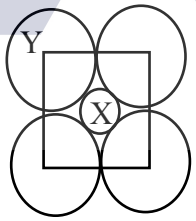
Ans. **(CD)**

Sol. $Pb(NO_3)_2(aq) \xrightarrow{\text{dil. HCl}} PbCl_2\downarrow$ white ppt

$Pb(NO_3)_2(aq) \xrightarrow{\text{aq. NaOH}} Pb(OH)_2\downarrow$ white

SCQ

5.



$X \rightarrow$ Cation, $Y \rightarrow$ Anion

One face of lattice is given.

Calculate packing fraction of solid.

(A) 0.48 (B) 0.52 (C) 0.63 (D) 0.74

Ans. (C)

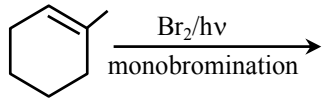
Sol. $2(r_x - r_y) = a\sqrt{2}$; $2r_y = a \therefore r_y = 0.5a$

$\therefore 2r_x = \left(\sqrt{2}-1\right)a \therefore r_x = 0.207a$

$$\text{P.F.} \frac{3\times\frac{4}{3}\pi r_x^3 + \frac{4}{3}\pi r_y^3}{a^3}$$

$$= \left(3(0.207)^3 + 0.125\right)\times\frac{4}{3}\times\frac{22}{7} = 0.63$$

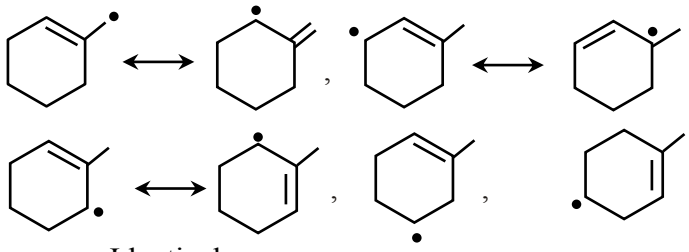
Integer

6. 

All possible product including stereoisomers

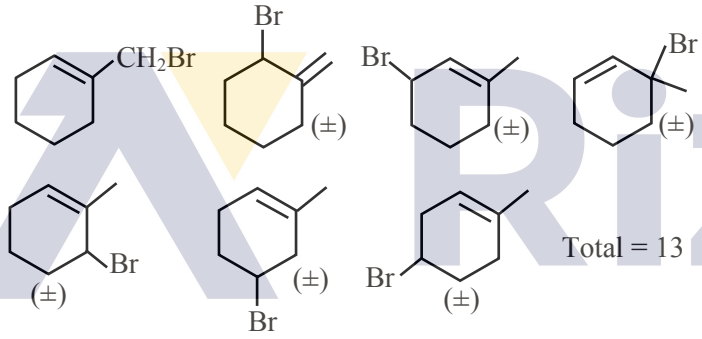
Ans. 13

Sol. Carbon free radicals formed in this reaction are:



Identical

Monobromination products ;



Integer

7. Determine total number of isomers of $[Pt(NH_3)_4Cl_2]Br_2$ are

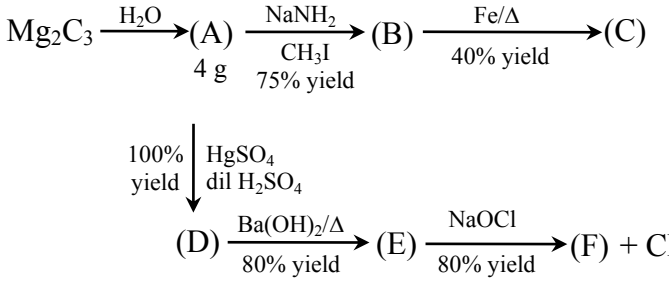
Ans. 6

Sol. $[Pt(NH_3)_4Cl_2]Br_2$ G.I. = 2

$[Pt(NH_3)_4ClBr]BrCl$ G.I. = 2

$[Pt(NH_3)_4Br_2]Cl_2$ G.I. = 2

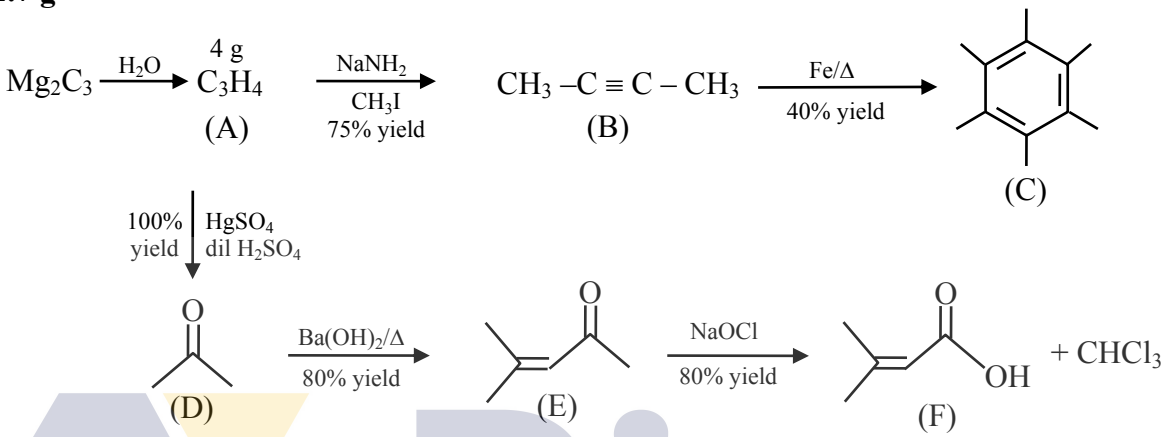
Comprehension-1 (Q.8 to Q.9)



8. Find the mass of compound C?

Ans. **2.7 g**

Sol.



Moles of $C_3H_4 = 1/10$

Moles of $B = \frac{75}{10\times100}$

Moles of $C = \frac{75\times40}{10\times100\times100}$

Mass of $C = \frac{75\times40\times90}{100000} = 2.7$ g

9. Find the mass of compound F

Sol. Moles of $D = \frac{1}{10}$

Moles of $E = \frac{40}{1000}$

Moles of $F = \frac{40\times80}{100000}$

Mass of $F = \frac{40\times80\times100}{100000} = 3.2$ g

Comprehension-2 (Q.10 to Q.11)

$K_3[Fe(CN)_6] + FeSO_4 \longrightarrow$ We obtain very dark blue ppt called as turn bull blue.

When $FeSO_4$ is added to a solution of $K_4[Fe(CN)_6]$ then we obtain a white ppt X.

When $FeSO_4$ solution is added to metal nitrate solution along concentrated H_2SO_4. A brown ring complex Y is obtained.

10. Molecular formula of X is

(A) $K_2Fe[Fe(CN)_6]$ (B) $K\ Fe\ [Fe(CN)_6]$

(C) $Fe_4[Fe(CN)_6]_3$ (D) None of these

Ans. **(A)**

11. Formula of Y is-

(A) $[Fe(H_2O)_5(NO)]^{2+}$ (B) $[Fe(H_2O)_4(NO)_2]^{2+}$

(C) $[Fe(H_2O)_5(SO_4)]$ (D) $[Fe(H_2O)_4(NO)(SO_4)]$

Ans. **(A)**

Comprehension-3 (Q.12 to Q.13)

Solution 'A' contains 0.1m $AgNO_3$, to this solution equal volume of 0.1m $BaCl_2$ solution is added to form solution 'B'. (Consider complete dissociation of $AgNO_3$ & density of solutions same as density of water)

K_b of water = 0.5 Km^{-1}

12. Boiling point of solution 'A' is

13. Difference between boiling points of solution A & B is $x \times 10^{-2}$, x is

Sol. ΔT_b of solution A

$\Delta T_b = 2 \times 0.5 \times 0.1 = 0.1$

B.P. of solution A = 100.1°C

Considering molarity ≈ molality

	Solution A	+	Solution B ⟶			
	$2AgNO_3$	+	$BaCl_2$ ⟶	$Ba(NO_3)_{2(aq)}$	+	$2AgCl\downarrow$
Mol	0.1V(L.R.)		0.1V			
	0		0.05V	0.05V		0.1V

Final concentration of solution (B) = $\frac{3\times0.05V+3\times0.05V}{2V} = \frac{3\times0.1V}{2V} = 0.15m$

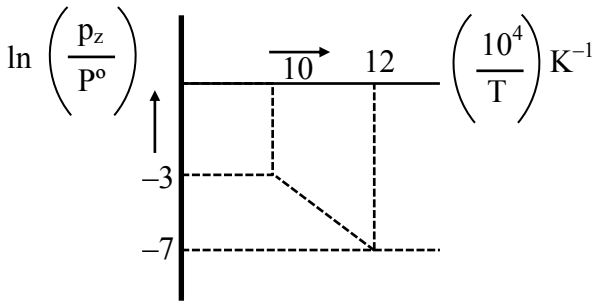
ΔT_b of solution B = 0.5 × 0.15 = 0.075

T_f of solution B = 100.075°C

Difference in B.P. of solution B and A = 0.025

Comprehension-4 (Q.14 to Q.15)

For the reaction $x(s) \rightleftharpoons y(s) + z(g)$ $\quad P^o = 1$ bar



14. ΔH^o Determine for the given reaction.

Ans. **166.28 KJ**

Sol. $\ln K = -2\left(\frac{10^4}{T}\right) + C$

$-3 = -2\,[10] + C$

$-3 = -20 + C$

$C = 17$

$\ln K = -2\left(\frac{10^4}{T}\right) + 17$

$\ln K = -\frac{\Delta H^o}{RT} + \frac{\Delta S^o}{R}$

$-\frac{\Delta H^o}{R} = -2\times10^4$

$\Delta H^o = 2 \times 10^4\, R$

$= 20 \times 8.314 =$ **166.28 KJ**

15. Determine ΔS^o for the given reaction.

Ans. **141.338 J/K**

Sol. $\therefore \frac{\Delta S^o}{R} = 17$

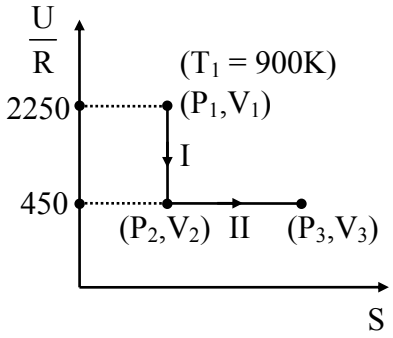
$\Delta S^o = 17\, R$

$= 17 \times 8.314$

141.338 J/K

Integer

16.



Process I and II are reversible

$C_V = \frac{5R}{2}$

$(W_I = W_{II})$

$\ln\frac{V_3}{V_2} = ?$

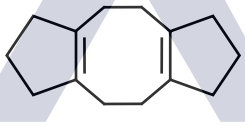
Ans. **10**

Sol. $\Delta U_I = nC_V\Delta T \Rightarrow -1800R = 1 \times \frac{5R}{2} \times \Delta T \quad \therefore \Delta T_I = -720K \quad \therefore T_2 = 180K$

$W_{II} = -nRT\ln\left(\frac{V_3}{V_2}\right) \Rightarrow -1800R = -R \times 180\ln\left(\frac{V_3}{V_2}\right) \quad \therefore \ln\left(\frac{V_3}{V_2}\right) = 10$

Integer

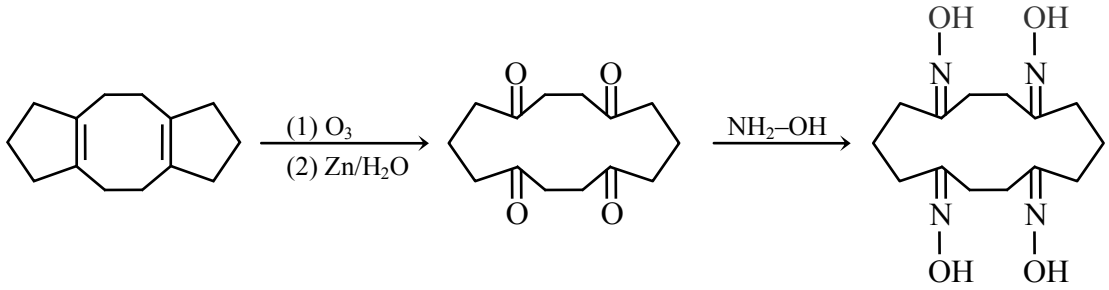
17.



Number of sp^2 atoms in the final product

Ans. **12**

Sol.



Number of sp^2 hybridised atoms = 12 (4-carbon, 4-nitrogen & 4-oxygen)