CHEMISTRY
JEE-MAIN (July-Attempt)
26 July (Shift-1) Paper Solution

SECTION - A

1. Match List - I with List - II.

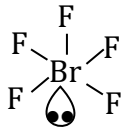
List - I **(Compound)**	List - II **(Shape)**
(A) BrF_5	(I) bent
(B) $[CrF_6]^{3-}$	(II) square pyramidal
(C) O_3	(III) trigonal bipyramidal
(D) PCl_5	(IV) octahedral

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

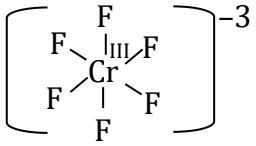
(A) (A)-(I),(B)-(II),(C)-(III),(D)-(IV) (B) (A)-(IV),(B)-(III),(C)-(II),(D)-(I)

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

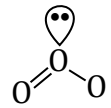
Sol. **C**

(A) 

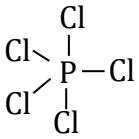
sp^3d^2(square Pyramidal)

(B) 

d^2sp^3 (octahedral)

(C) 

sp^2(Bent)

(D) 

sp^3d (T.B.P)

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

2. Match List - I with List - II.

List - I (Processes/Reactions)	**List - II (Catalyst)**
(A) $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$	(I) $Fe(s)$
(B) $4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$	(II) $Pt(s) - Rh(s)$
(C) $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$	(III) V_2O_5
(D) Vegetable oil $(l) + H_2 \rightarrow$ Vegetable ghee(s)	(IV) $Ni(s)$

Choose the correct answer from the options given below :

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

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

Sol. **B**

Fact

3. Given two statements below:

Statement I : In Cl_2 molecule the covalent radius is double of the atomic radius of chlorine.

Statement II : Radius of anionic species is always greater than their parent atomic radius.

Choose the most appropriate answer from options given below :

(A) Both **Statement I** and **Statement II** are correct.

(B) Both **Statement I** and **Statement II** are incorrect.

(C) **Statement I** is correct but **Statement II** is incorrect.

(D) **Statement I** is incorrect but **Statement II** is correct.

Sol. **D**

Radius of Anionic species is always greater than their parent atomic Radius but it can not say that covalent radius is double of the atomic radius.

4. Refining using liquation method is the most suitable for metals with :

(A) Low melting point

(B) High boiling point

(C) High electrical conductivity

(D) Less tendency to be soluble in melts than impurities

Sol. **A**

Fact

5. Which of the following can be used to prevent the decomposition of H_2O_2 ?

(A) Urea (B) Formaldehyde (C) Formic acid (D) Ethanol

Sol. **A**

Fact

6. Reaction of $BeCl_2$ with $LiAlH_4$ gives:

(A) $AlCl_3$ (B) BeH_2 (C) LiH (D) LiCl

(E) $BeAlH_4$

Choose the correct answer from options given below:

(A) (A), (D) and (E) (B) (A), (B) and (D) (C) (D) and (E) (D) (B), (C) and (D)

Sol. **B**

BeH_2 can not be formed direct reaction of Be and H_2 so it is prepeared by reaction of $BeCl_2$ and $LiAlH_4$

$2BeCl_2 + LiAlH_4 \rightarrow 2BeH_2 + LiCl + AlCl_3$

7. Borazine, also known as inorganic benzene, can be prepared by the reaction of 3-equivalents of "X" with 6-equivalents of "Y". "X" and "Y", respectively are :

(A) $B(OH)_3$ and NH_3 (B) B_2H_6 and NH_3

(C) B_2H_6 and HN_3 (D) NH_3 and B_2O_3

Sol. **B**

$$3B_2H_6 + \underset{\text{excess}}{6NH_3} \xrightarrow{\text{high temp}} 2B_3N_3H_6 + 12H_2$$

8. Which of the given reactions is not an example of disproportionation reaction ?

(A) $2H_2O_2 \rightarrow 2H_2O + O_2$ (B) $2NO_2 + H_2O \rightarrow HNO_3 + HNO_2$

(C) $MnO_4^- + 4H^+ + 3e^- \rightarrow MnO_2 + 2H_2O$ (D) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

Sol. **C**

In disproportionation reaction same element is simultaneously oxidized or reduced

$2H_2O_2 \longrightarrow 2H_2O + O_2$

$\downarrow \quad \downarrow \quad \downarrow$

$-1 \quad -2 \quad 0$

$2NO_2 + H_2O \longrightarrow HNO_3 + HNO_2$

$\downarrow \quad \downarrow \quad \downarrow$

$(+4) \quad (+5) \quad (+3)$

$3MnO_4^{2-} + 4H^+ \longrightarrow 2MnO_4^- + MnO_2 + 2H_2O$

$\downarrow \quad \downarrow \quad \downarrow$

$(+6) \quad (+7) \quad (+4)$

$\Rightarrow$ Above reactions are disproportionation while following reaction is not.

$MnO_4^- + 4H^+ + 3e^- \longrightarrow MnO_2 + 2H_2O$

$\downarrow \quad \downarrow$

$(+7) \quad (+4)$

9. The dark purple colour of $KMnO_4$ disappears in the titration with oxalic acid in acidic medium. The overall change in the oxidation number of manganese in the reaction is :

(A) 5 (B) 1 (C) 7 (D) 2

Sol. **A**

$KMnO_4$ act as oxidizing agent. It oxidises oxalic acid to CO_2 and itself changes to Mn^{2+} Ion which is colourless

$KMnO_4 \longrightarrow Mn^{2+}$

$\downarrow \quad \downarrow$

$(+7) \quad (+2)$

Change in oxidation no. = 5

10. $\dot{Cl} + CH_4 \rightarrow A + B$

A and B in the above atmospheric reaction step are :

(A) C_2H_6 and Cl_2 (B) $\dot{C}HCl_2$ and H_2 (C) $\dot{C}H_3$ and HCl (D) C_2H_6 and HCl

Sol. **C**

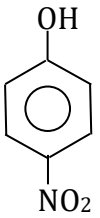
$\dot{Cl} + CH_4 \rightarrow HCl + \dot{C}H_3$

11. Which technique among the following, is most appropriate in separation of a mixture of 100mg of *p*-nitrophenol and picric acid ?

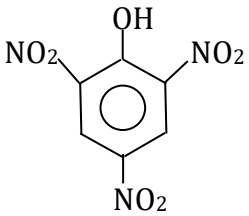
(A) Steam distillation (B) 2-5 ft long column of silica gel

(C) Sublimation (D) Preparative TLC (Thin Layer Chromatography)

Sol. **D**



Shows inter molecular H–bonding



Shows intra molecular H–bonding

12. The difference in the reaction of phenol with bromine in chloroform and bromine in water medium is due to :

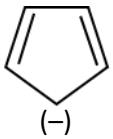
(A) Hyperconjugation in substrate (B) Polarity of solvent

(C) Free radical formation (D) Electromeric effect the substrate

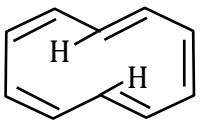
Sol. **B**

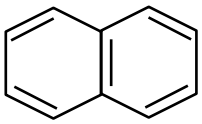
The difference in the reaction due to polarity of solvent.

13. Which of the following compounds is not aromatic?

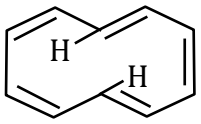
(A) 

(B) 

(C) 

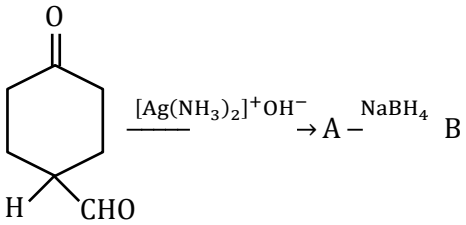
(D) 

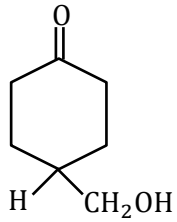
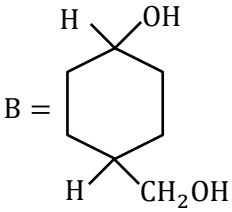
Sol. **C**

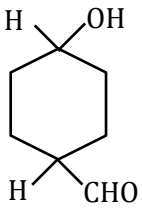
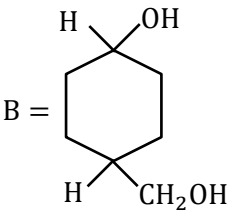


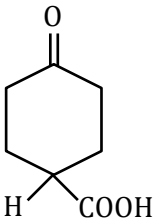
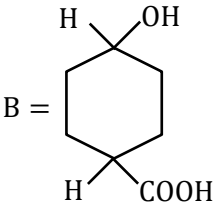
is non polar due to repulsion between hydrogen atom.

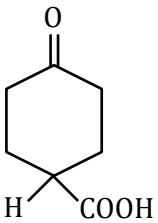
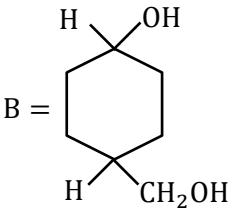
14. The products formed in the following reaction A and B are



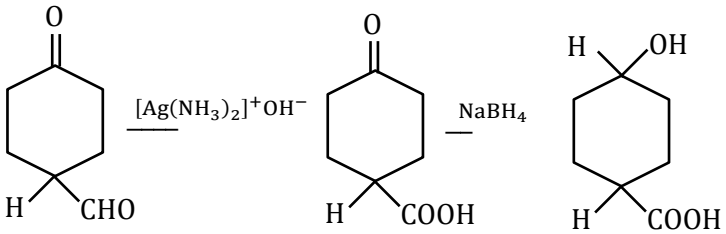
(A) A =  B = 

(B) A =  B = 

(C) A =  B = 

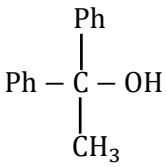
(D) A =  B = 

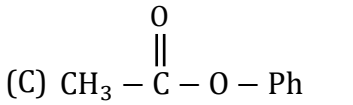
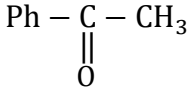
Sol. **C**



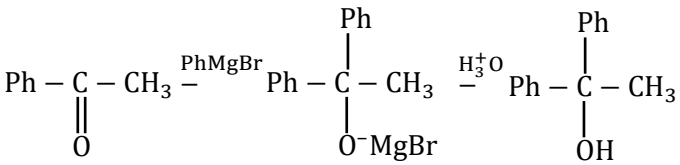
(A) (B)

15. Which reactant will give the following alcohol on reaction with one mole of phenyl magnesium bromide ($PhMgBr$) followed by acidic hydrolysis

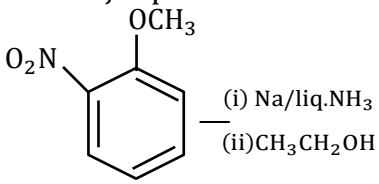


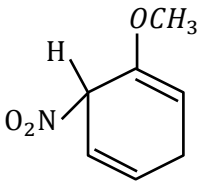
(A) $CH_3 - C \equiv N$ (B) $Ph - C \equiv N$ (C)  (D) 

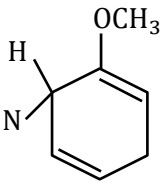
Sol. **D**

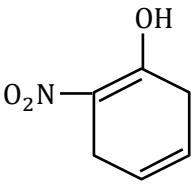


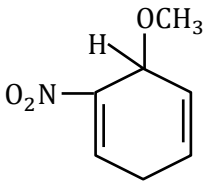
16. The major product of the following reaction is



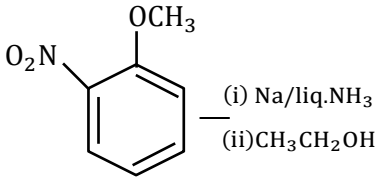
(A) 

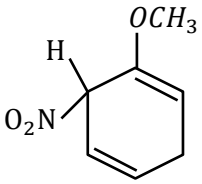
(B) 

(C) 

(D) 

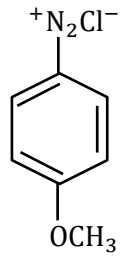
Sol. **A**

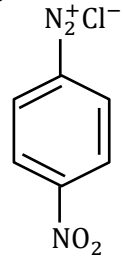


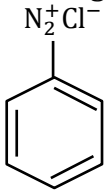


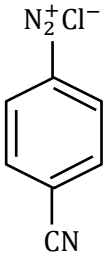
(birch reduction)

17. The correct stability order of the following diazonium slat is

(A) 

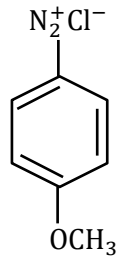
(B) 

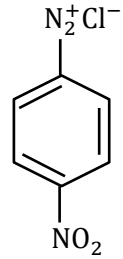
(C) 

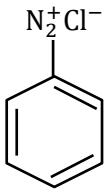
(D) 

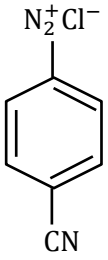
(A) (A) > (B) > (C) > (D) (B) (A) > (C) > (D) > (B)
(C) (C) > (A) > (D) > (B) (D) (C) > (D) > (B) > (A)

Sol. **B**

(A) 

(B) 

(C) 

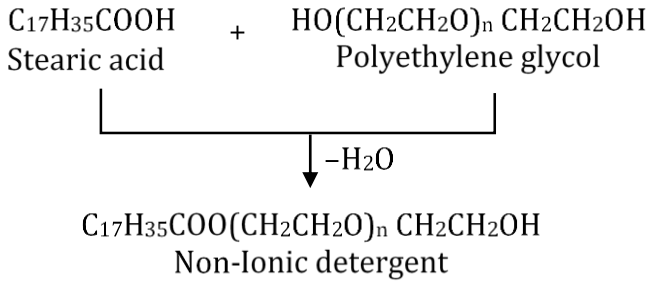
(D) 

+M – M – M

18. Stearic acid and polyethylene glycol react to form which one of the following soap/s detergents?

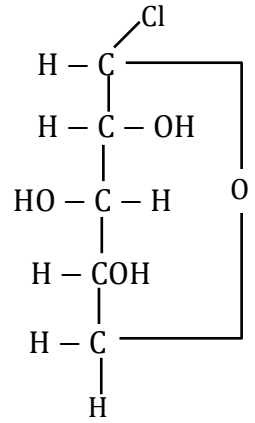
(A) Cationic detergent (B) Soap
(C) Anionic detergent (D) Non-ionic detergent

Sol. **D**

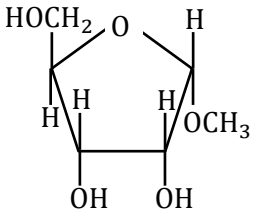


19. Which of the following is a reducing sugar?

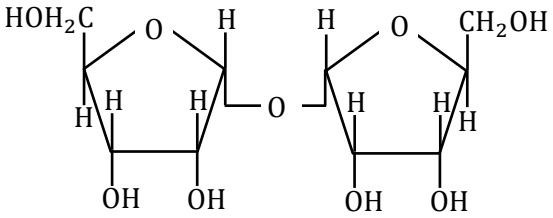
(A)



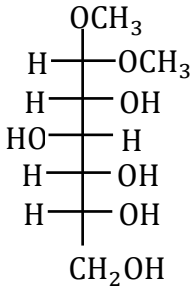
(B)



(C)



(D)



Sol. **A**

In which –OH group is present on anomeric carbon act as a reducign sugar.

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

Assertion (A) : Experimental reaction of CH_3Cl with aniline and anhydrous $AlCl_3$ does not give *o* and *p*-methylaniline.

Reason (R) : The $-NH_2$ group of aniline becomes deactivating because of salt formation with anhydrous $AlCl_3$ and hence yields *m*-methyl aniline as the product.

In the light of the above statements, choose the **most appropriate** answer from the options given below :

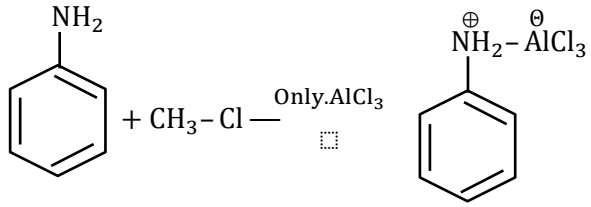
(A) Both **(A)** and (R) are true and (R) is the correct explanation of (A).

(B) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(C) (A) is true, but (R) is false.

(D) (**A**) is false, but (**R**) is true.

Sol. **C**



21. Chlorophyll extracted from the crushed green leaves was dissolved in water to make 2 L solution of Mg of concentration 48ppm. The number of atoms of Mg in this solution is $x \times 10^{20}$ atoms. The value of x is_____ (Nearest Integer)

(Given: Atomic mass of Mg is 24 g mol^{-1}; $N_A = 6.02 \times 10^{23}$ mol^{-1})

Sol. **24**

$\because$ $d_{solution} \approx 1gm/ml$

Volume of solution = 2L = 2000 ml

Mass of solution = 2000 gm

ppm = $\frac{mass\ of\ solute}{mass\ of\ solution} \times 10^6$

48 = $\frac{mass\ of\ Mg}{2000} \times 10^6$

$48 \times 2 \times 10^{-3}$ = mass of Mg

Mole of Mg = $\frac{48 \times 2 \times 10^{-3}}{24}$

$= 4 \times 10^{-3}$ mol

No. of Mg-atoms

= mole × N_A

$= 4 \times 10^{-3} \times 6.02 \times 10^{23}$

$= 24.08 \times 10^{20}$

$= x \times 10^{20}$

$\boxed{x = 24}$

22. A mixture of hydrogen and oxygen contains 40% by hydrogen by mass when then pressure is 2.2 bar. The partial pressure of hydrogen is _____ bar. (Nearest Integer)

Sol. 8

$H_2 + O_2$

↓

40% by mass

Let mass of mixture = 100 gm

Mass of H_2 = 40 gm

Mass of O_2 = 60 gm

Mole of $H_2 = \frac{40}{2}$ = 20 mol

Mole of $O_2 = \frac{60}{32} mol = \frac{15}{8} mol$

Partial pressure of H_2

$= \frac{n_{H_2}}{n_{H_2} + n_{O_2}} \times P_{total}$

$= \frac{20}{20+\frac{15}{8}} \times 2.2$

$= (\frac{20\times8}{160+15}) \times 2.2$

$= \frac{160\times2.2}{175}$

$= \frac{352}{175}$ = 2.011 ≈ 2 bar

23. The wavelength of an electron and a neutron will become equal when the velocity of the electron is x times the velocity of neutron. The value of x is (Nearest Integer)
(Mass of electron is 9.1×10^{-31} kg and mass of neutron is 1.6×10^{-27} kg)

Sol. **176**

$\lambda_{e^-} = \frac{h}{m_e v_n}$ $\lambda_n = \frac{h}{m_n v_n}$

If $V_e = x\ V_n$

then $\lambda_e = \lambda_n$

$\frac{h}{m_e v_e} = \frac{h}{m_n v_n}$

$\frac{h}{m_e \times x v_n} = \frac{h}{m_n v_n}$

$X = \frac{m_n}{m_e} = \frac{1.6\times10^{-27}}{9.1\times10^{-31}}$

= 175.82

≈ 176

24. 2.4g coal is brunt in a bomb calorimeter in excess of oxygen at 298K and 1 atm pressure. The temprature of the calorimeter rises from 298K to 300 K. The enthalpy change during the combustion of coal is $-x\ kJ\ mol^{-1}$. The value of x is _______(Nearest Integer)

Sol. **200**

$\Delta T = 2K$

$\Delta H = -x$ KJ/mole

Coal $\rightarrow$ 2.4gm $\Rightarrow \frac{2.4}{12}$

= 0.2 mole

ΔH for 0.2 mole

= 0.2 × (–x) KJ

= – 0.2 x KJ

$q_{cal} = C\Delta T$

0.2x = 20 × 2 = 40 KJ

X = $\frac{40}{0.2}$ = 200 $\because q_{cal} = -\Delta H$

25. When 800 mL of 0.5 M nitic acid is heated in a beaker, its volume is reduced to half and 11.5 g of nitric acid is evaporated. The molarity of the remaining nitric acid solution is x $\times\ 10^{-2}$M. (Nearest Integer)

Sol. **54**

800 ml of 0.5 M nitric acid

M moles of nitric acid

= V × M

= 800 × 0.5

= 400 m mol

Mass of Nitric acid before heating

= 400 × 10^{-3} × 63

= 25.2 gm

Mass of nitric acid after heating

= 25.2 – 11.5

= 13.7 gm

Volume of solution after heating

= $\frac{800}{2}$ = 400 ml

$M_{final} = \frac{mole}{V_{solution}}$

= $\frac{13.7/63}{400} \times 1000$

= 0.54365

= 54.365 × 10^{-2}

= x × 10^{-2}

$\boxed{x \approx 54}$

26. At 298K, the equilibrium constant is 2×10^{15} for the reaction:
$Cu(s) + 2Ag^+(aq) \rightleftharpoons Cu^{2+}(aq) + 2Ag(s)$
The equilibrium constant for the reaction
$\frac{1}{2}Cu^{2+}(aq) + Ag(s) \rightleftharpoons \frac{1}{2}Cu(s) + Ag^+(aq)$
Is $x \times 10^{-8}$. The value of x is ……. (Nearest Integer)

Sol. **2**

$Cu(S) + 2Aq^+(aq) \rightleftharpoons Cu^{2+}(aq) + 2Ag(s)$

$K = 2 \times 10^{15}$

$Cu^{2+}(aq) + 2Ag(s) \rightleftharpoons Cu(s) + 2Ag^+(aq)$

$K' = \frac{1}{K} = \frac{1}{2\times10^{15}}$

$\frac{1}{2}Cu^{2+}(aq) + Ag(s) \rightleftharpoons \frac{1}{2}Cu(s) + Ag^+(aq)$

$K'' = (K')^{1/2}$

$= (\frac{1}{2\times10^{15}})^{1/2}$

$= (5 \times 10^{-16})^{1/2}$

$= \sqrt{5} \times 10^{-8}$

$= 2.23 \times 10^{-8}$

$= x \times 10^{-8}$

$\boxed{x \approx 2}$

27. The amount of charge in F (Faraday) required to obtain one mole of iron from Fe_3O_4 is_____(Nearest Integer)

Sol. **8**

$Fe_3O_4 \longrightarrow$ one mole Fe

Oxidation No. of Iron in $Fe_3O_4 = +\frac{8}{3}$

For 1 mole Fe, $\left(\frac{8}{3} \times 3\right)$ mole of e^- are required.

Charge of one mole $e^- = 1F$

So, change of $\left(\frac{8}{3} \times 3\right)$ mole of $e^- = \frac{8}{3} \times 3F = 8F$

$= 8F$

28. For a reaction $A \rightarrow 2B + C$ the half lives are 100 s and 50 s when the concentration of reactant A is 0.5 and 1.0 $mol\ L^{-1}$ respectively. The order of the reaction is _____(Nearest Integer)

Sol. **2**

$A \rightarrow 2B + C$

$T_{1/2} = 100s\ [A] = 0.5\ M$

$T_{1/2} = 50s\ [A] = 1M$

$T_{1/2}\ \alpha\ \frac{1}{[C_0]^{n-1}}$

$\frac{(t_{1/2})_1}{(t_{1/2})_2} = \frac{[Co]_2^{n-1}}{[Co]_1^{n-1}}$

$\frac{100}{50} = \left(\frac{1}{0.5}\right)^{n-1}$

$(2)^1 = (2)^{n-1}$

$n - 1 = 1$

$\boxed{n = 2}$ $\boxed{order = 2}$

29. The difference between spin only magnetic moment value of $[Co(H_2O)_6]Cl_2$ and $[Cr(H_2O)_6]Cl_3$ is_____(Nearest Integer)

Sol. **0**

$[Co(H_2O)_6]Cl_2 \rightarrow t_2g^5eg^2$

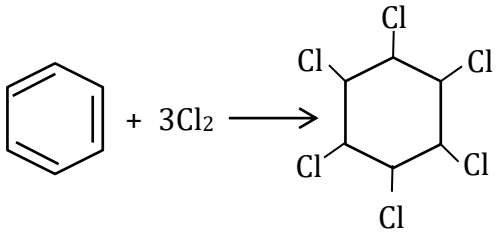
$\mu = \sqrt{3(3+2)} = \sqrt{15} = 3.87$

$[Cr(H_2O)_6]Cl_3 \rightarrow t_2g^3eg^2$

$\mu = \sqrt{3(3+2)} = \sqrt{15} = 3.87$

30. In the presence of sunlight, benzene reacts with Cl_2 to give product X; The number of hydrogens in X is_____. (Nearest Integer)

Sol. **6**



(BHC)