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

SECTION - A

1. Identify the incorrect statement from the following.

(A) A circular path around the nucleus in which an electron moves is proposed as Bohr's orbit.

(B) An orbital is the one electron wave function (ψ) in an atom

(C) The existence of Bohr's orbits is supported by hydrogen spectrum

(D) Atomic orbital is characterized by the quantum numbers n and *l* only

Sol. **D**

Orbital is represented by n, l, m.

2. Which of the following relation is not correct?

(A) $\Delta H = \Delta U - P\,\Delta V$ (B) $\Delta U = q + W$ (C) $\Delta S_{sys} + \Delta S_{surr} \geq 0$ (D) $\Delta G = \Delta H - T\Delta S$

Sol. **A**

$\Delta H = \Delta U + P\Delta V$

3. Match List –I with List – II.

List I	**List II**
(A) $Cd(s) + 2Ni(OH)_3(s) \rightarrow CdO(s) + 2Ni(OH)_2(s) + H_2O(l)$	(I) Primary battery
(B) $Zn(Hg) + HgO(s) \rightarrow ZnO(s) + Hg(l)$	(II) Discharging of secondary Battery
(C) $2PbSO_4(s) + 2H_2O(l) \rightarrow Pb(s) + PbO_2(s) + 2H_2SO_4$ (aq)	(III) Fuel cell
(D) $2H_2(g) + O_2(g) \rightarrow 2H_2O$ (l)	(IV) Charging of secondary battery

Choose the correct answer from the options given below:

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

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

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

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

Sol. **B**

4. Match List –I with List – II.

List I **Reaction**	**List II** **Catalyst**
(A) $4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$	(I) NO(g)
(B) $N_2(g) + 3H_2(s) \rightarrow 2NH_3(g)$	(II) $H_2SO_4(l)$
(C) $C_{12}H_{22}O_{11}(aq) + H_2O(l) \rightarrow C_6H_{12}O_6(s) + C_6H_{12}O_6 + C_6H_{12}O_6$	(III) Pt(s)
(D) $2SO_2(g) + O_2(g) \rightarrow 2SO_3$ (g)	(IV) Fe(s)

Choose the correct answer from the options given below:

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

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

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

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

Sol. **C**

(A) $4NH_3 + 5O_2 \xrightarrow{pt} 4NO + 6H_2O$

(B) $N_2(g) + 3H_2(s) \xrightarrow{Fe} 2NH_3(g)$

(C) $C_{12}H_{22}O_{11}(aq) + H_2O(l) \xrightarrow{H_2SO_4} C_6H_{12}O_6(\text{Glucose}) + C_6H_{12}O_6$ fructose

(D) $2SO_2(g) + O_2(g) \xrightarrow{NO} 2SO_3$

5. In which of the following pairs, electron gain enthalpies of constituent elements are nearly the same or identical?

(A) Rb and Cs (B) Na and K (C) Ar and Kr (D) I and At

Choose the correct answer from the options given below:

(A) (A) and (B) only (B) (B) and (C) only

(C) (A) and (C) only (D) (C) and (D) only

Sol. **C**

(A) Rb and Cs

(C) Ar and Kr are nearly same electron gain enthalpy.

6. Which of the reaction is suitable for concentrating ore by leaching process?

(A) $2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$

(B) $Fe_3O_4 + CO \rightarrow 3FeO + CO_2$

(C) $Al_2O_3 + 2NaOH + 3H_2O \rightarrow 2Na[Al(OH)_4]$

(D) $Al_2O_3 + 6Mg \rightarrow 6MgO + 4Al$

Sol. **C**

In Leaching process.

$Al_2O_3 + 2NaOH + 3H_2O \rightarrow 2Na[Al(OH)_4]$

7. The metal salts formed during softening of hardwater using Clark's method are:

(A) $Ca(OH)_2$ and $Mg(OH)_2$ (B) $CaCO_3$ and $Mg(OH)_2$

(C) $Ca(OH)_2$ and $MgCO_3$ (D) $CaCO_3$ and $MgCO_3$

Sol. **B**

Clark method.

$Ca(HCO_3)_2 + Ca(OH)_2 \rightarrow 2CaCO_3 + 2H_2O$

$Mg(HCO_3)_2 + 2Ca(OH)_2 \rightarrow 2CaCO_3 + Mg(OH)_2 + 2H_2O$

8. Which of the following statement is incorrect?

(A) Low solubility of LiF in water is due to its small hydration enthalpy

(B) KO_2 is paramagnetic

(C) Solution of sodium in liquid ammonia is conducting in nature

(D) Sodium metal has higher density than potassium metal

Sol. **A**

Due to high lattice energy LiF is less soluble in water.

9. Match List – I with List – II, match the gas evolved during each reaction.

List - I	**List – II**
(A) $(NH_4)_2Cr_2O_7 \xrightarrow{\Delta}$	(I) H_2
(B) $KMnO_4 + HCl \rightarrow$	(II) N_2
(C) $Al + NaOH + H_2O \rightarrow$	(III) O_2
(D) $NaNO_3 \xrightarrow{\Delta}$	(IV) Cl_2

Choose the correct answer from the options given below:

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

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

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

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

Sol. **C**

(A) $(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2 + Cr_2O_3 + H_2O$

(B) $KMnO_4 + HCl \rightarrow Cl_2\uparrow + KCl + MnCl_2 + H_2O$

(C) $Al + NaOH + H_2O \rightarrow Na[Al(OH)_4] + H_2\uparrow$

(D) $NaNO_3 \xrightarrow{\Delta} NaNO_2 + O_2\uparrow$

10. Which of the following has least tendency to liberate H_2 from mineral acids?

(A) Cu (B) Mn (C) Ni (D) Zn

Sol. **A**

In electrochemical series Cu is present below H_2, So least tendency to liberate H_2 from mineral acid.

11. Given below are two statements:

Statement I: In polluted water values of both dissolved oxygen and BOD are very low.

Statement II: Eutrophication results in decrease in the amount of dissolved oxygen.

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

(A) Both Statement I and Statement II are true

(B) Both Statement I and Statement II are false

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

(D) Statement I is false but Statement II is ture

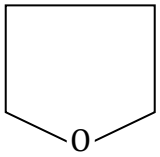
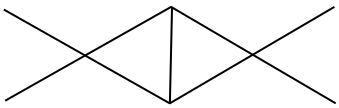
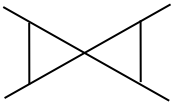
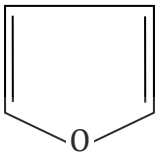
Sol. **D**

B.O.D. → Biological oxygen demand.

Statement I: In polluted water dissolved oxygen low and B.O. D levet is high

Statement II: Eutrophication decrease in amount of dissolved oxygen

12. Match List – I with List – II.

List – I	**List – II**
(A) 	(I) Spiro compound
(B) 	(II) Aromatic compound
(C) 	(III) Non-planar Heterocyclic compound
(D) 	(IV) Bicyclo compound

Choose the correct answer from the options given below:

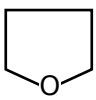
(A) (A) – (II), (B) - (I), (C) – (IV), (D) – (III)

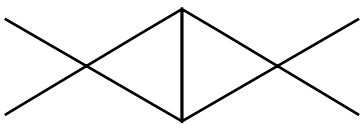
(B) (A) – (IV), (B) - (III), (C) – (I), (D) – (II)

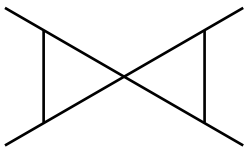
(C) (A) – (III), (B) - (IV), (C) – (I), (D) – (II)

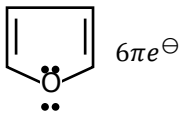
(D) (A) – (IV), (B) - (III), (C) – (II), (D) – (I)

Sol. **C**

(A) 
Non-planer
Heterocyclic compound

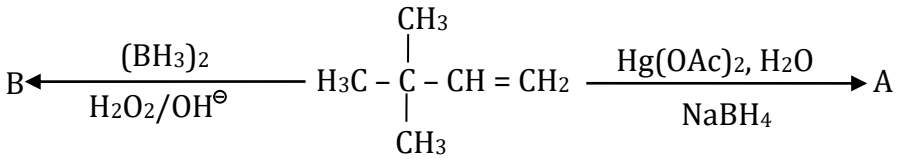
(B) 
Bicyclo compound

(C) 
Spiro compound

(D) 

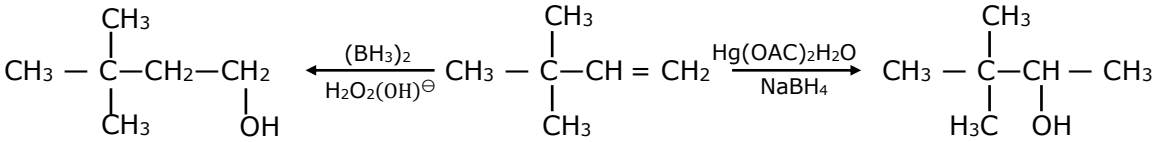
Aromatic compound

13. Choose the correct option for the following reactions.



(A) 'A' and 'B' are both Markovnikov additiohn products
(B) 'A' is Markovnikov product and 'B' is anti-Markovnikov product
(C) 'A' and 'B' are both anti-Markovnikov product
(D) 'B' is Markovnikov and 'A' is anti-Markovnikov product

Sol. **B**



Antimarkovnikov Rule (B)

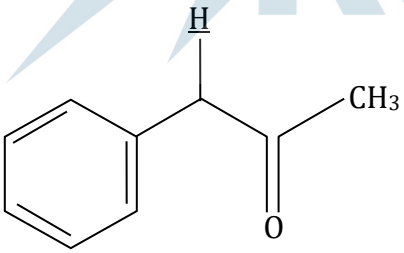
Markovnikov of Rule (A)

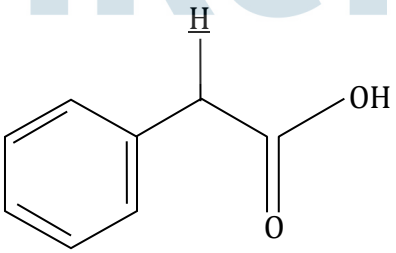
So A is Markovnikov product and 'B' is anti- Markovnikov product.

14. Among the following marked proton of which compound shows lowest pK_a value?

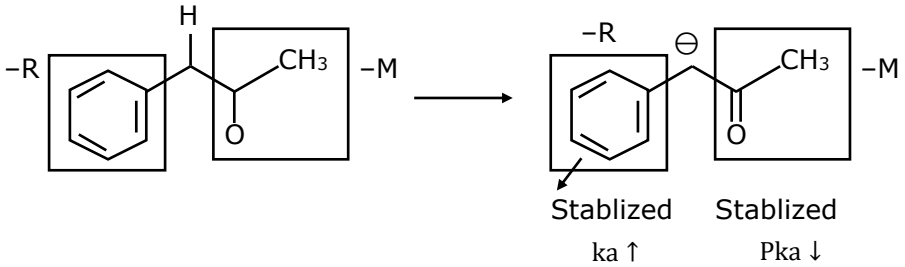
(A) 

(B) 

(C) 

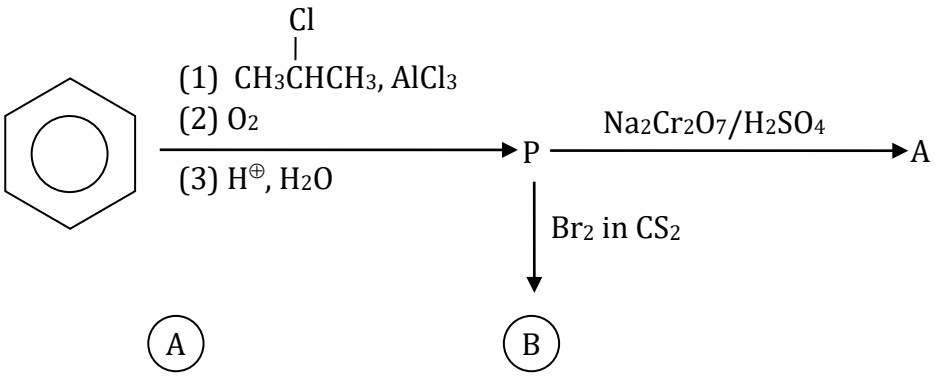
(D) 

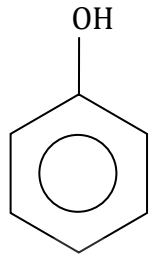
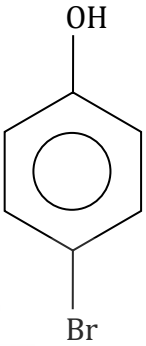
Sol. **C**

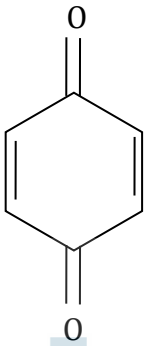
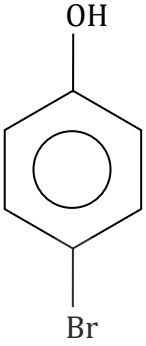


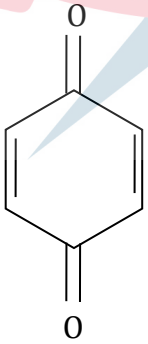
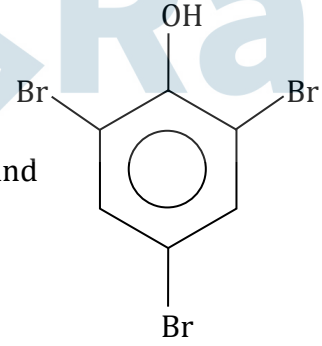
So given compound have maximum acedic hydrogen so lowest Pka.

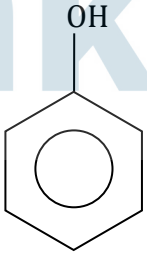
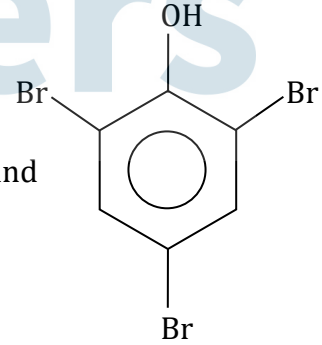
15. Identify the major products A and B for the below given reaction sequence.



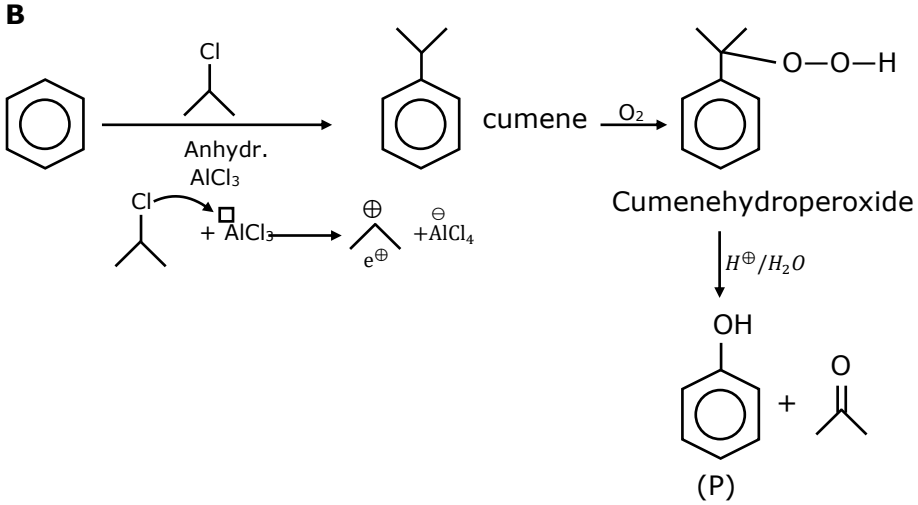
(A)  and 

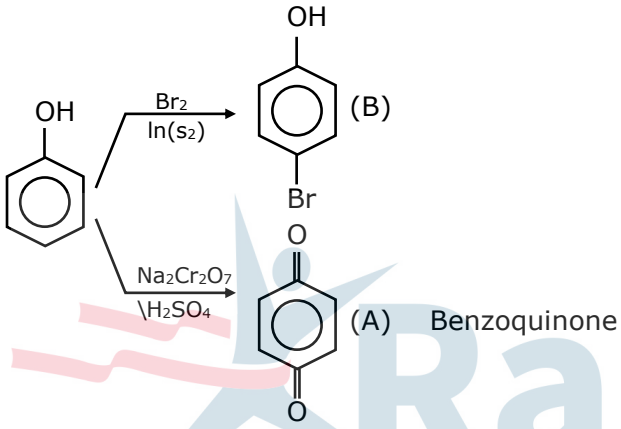
(B)  and 

(C)  and 

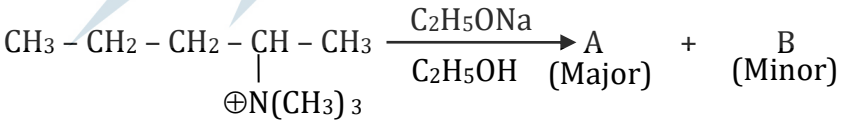
(D)  and 

Sol. **B**



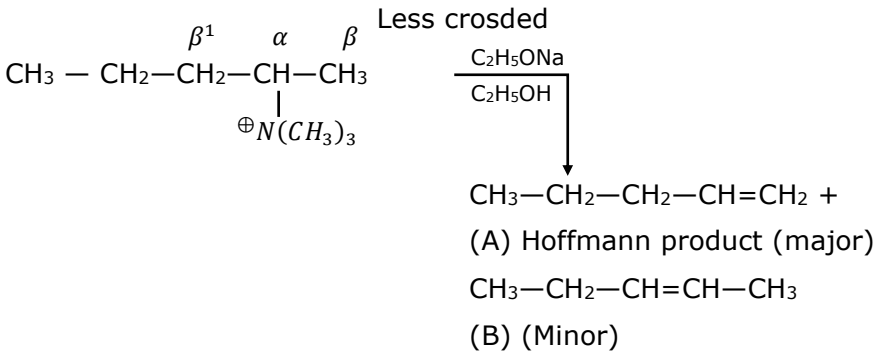


16. Identify the correct statement for the below given transformation.



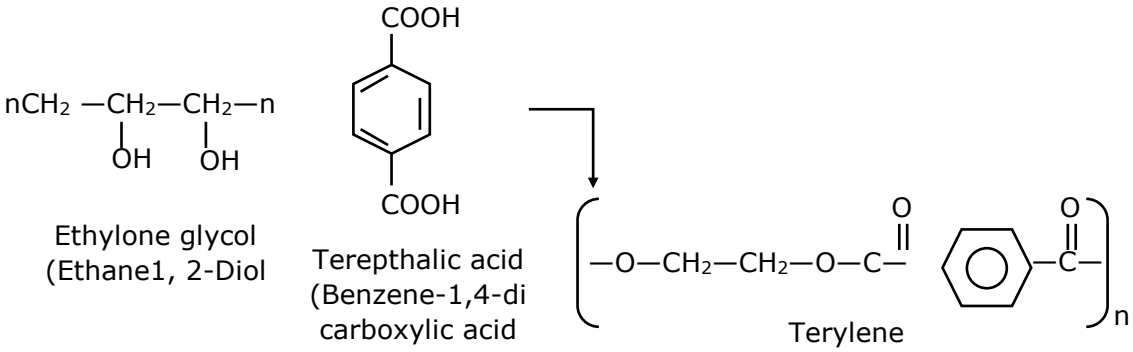
(A) A – $CH_3CH_2CH{=}CH{-}CH_3$, B – $CH_3CH_2CH_2CH = CH_2$, Saytzeff products
(B) A – $CH_3CH_2CH{=}CH{-}CH_3$, B – $CH_3CH_2CH_2CH = CH_2$, Hofmann products
(C) A – $CH_3CH_2CH_2CH{=}CH_2$, B – $CH_3CH_2CH = CHCH_3$, Hofmann products
(D) A – $CH_3CH_2CH_2CH{=}CH_2$, B – $CH_3CH_2CH = CHCH_3$, Saytzeff products

Sol. C

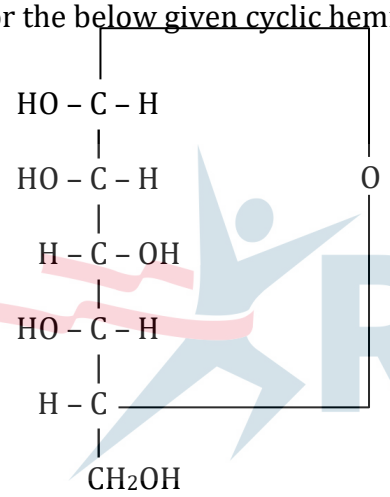


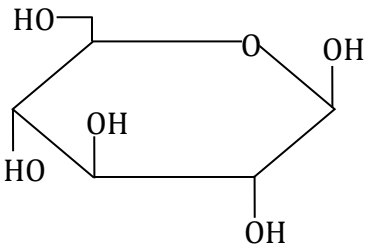
17. Terylene polymer is obtained by condensation of:
(A) Ethane-1, 2-diol and Benzene-1, 3 dicarboxylic acid
(B) Propane-1, 2-diol and Benzene-1, 4 dicarboxylic acid
(C) Ethane-1, 2-diol and Benzene-1, 4 dicarboxylic acid
(D) Ethane-1, 2-diol and Benzene-1, 2 dicarboxylic acid

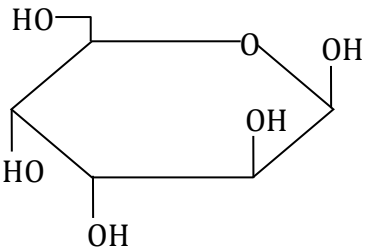
Sol. **C**

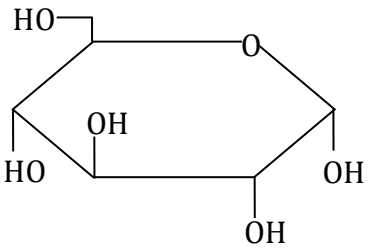


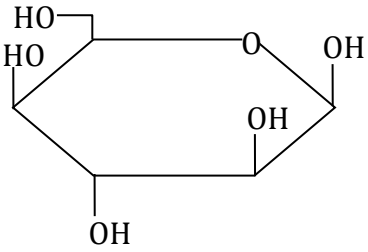
18. For the below given cyclic hemiacetal (X), the correct pyranose structure is:



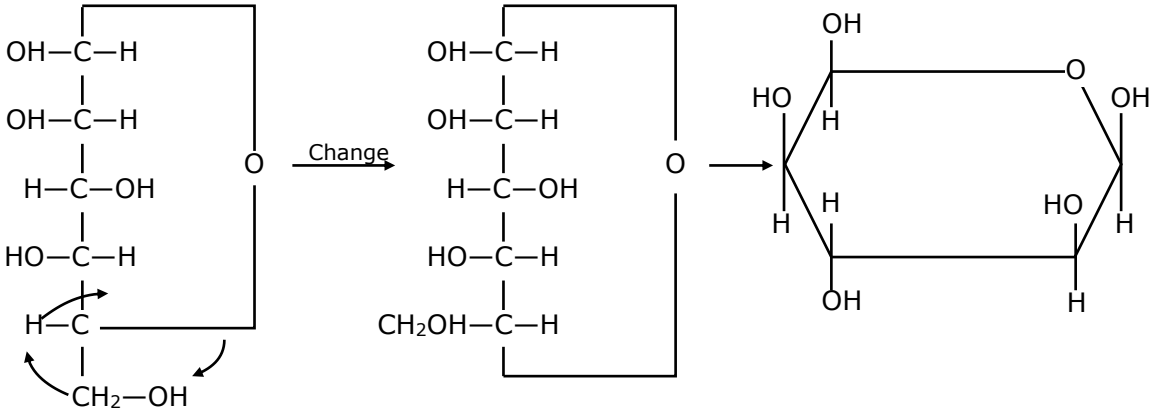
(A) 

(B) 

(C) 

(D) 

Sol. **(D)**



19. Statements about Enzyme Inhibitor Drugs are given below:

(A) There are Competitive and Non-competitive inhibitor drugs

(B) These can bind at the active sites and allosteric sites

(C) Competitive Drugs are allosteric site blocking drugs

(D) Non-competitive Drugs are active site blocking drugs

Choose the correct answer from the options given below:

(A) (A), (D) only (B) (A), (C) only (C) (A), (B) only (D) (A), (B), (C) only

Sol. **(C)**

Enzyme inhibitors are both competitive inhibitors as well as non-competitive inhibitors. Competitive inhibitors compete with natural substracts for attachement on active side of enzyme non-competitives inhibitors binds to allosteric site.

20. For kinetic study of the reaction of iodide ion with H_2O_2 at room temperature:

(A) Always use freshly prepared starch solution

(B) Always keep the concentration of sodium thiosulphate solution less then that of KI solution

(C) Record the time immediately after the appearance of blue colour

(D) Record the time immediately before the appearance of blue colour

(E) Always keep the concentration of sodium thiosulphate solution more than that of KI solution

Choose the correct answer from the options given below:

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

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

Sol. **A**

Time is recorded immediately after the blue colour appears.

$Na_2S_2O_3$ is kept in limited amount.

SECTION – B

21. In the given reaction,

$X + Y + 3Z \rightleftharpoons XYZ_3$

If one mole of each of X and Y with 0.05 mol of Z gives compound XYZ_3. (Given: Atomic masses of X, Y and Z are 10, 20 and 30 amu, respectively) The yield of XYZ_3 is _____g. (Nearest integer)

Sol. **2**

	x	+	y	+	3z	⇋	xyz_3
n	1		1		0.05		
% mass	10		20		30		

Limiting reagent = Z

Moles of product formed $= \frac{1}{3} \times 0.05$

$= \frac{0.05}{3} Moles$

Amount = Moles × Molecular mass

$= \frac{0.05}{3} \times (10 + 20 + 3 \times 30)$

$\Rightarrow \frac{0.05}{3} \times 120 = 2$ g

22. An element M crystallises in a body centred cubic unit cell with a cell edge of 300 pm. The density of the element is 6.0 g cm^{-3}. The number of atoms present in 180 g of the element is _____ $\times 10^{23}$. (Nearest integer)

Sol. **2**

$d = \frac{z \times M}{N_A \times a^3}$

$6 = \frac{2 \times M}{N_A \times 3^3 \times 10^{-24}}$

$6 = \frac{2 \times M}{N_A \times 3^3 \times 10^{-24}}$

$6 = \frac{M}{8.1}$ = M = 8.1 × 6 = 48.6 gm/mole

$\therefore$ 180 g of sample contains $= \frac{180}{48.6} \times 6 \times 10^{23} = 22.22 \times 10^{23}$

23. The number of paramagnetic species among the following is _____.

$B_2, Li_2, C_2, C_2^-, O_2^{2-}, O_2^+$ and He_2^+

Sol. **4**

	No. of e^-
B_2 → Pera	10
Li_2 → dia	6
C_2 → dia	12
C_2^- → Para	13
O_2^{2-} → dia	18
O_2^+ → Para	15
He_2^+ → Para	3

24. 150g of acetic acid was contaminated with 10.2 g ascorbic acid ($C_6H_8O_6$) to lower down its freezing point by ($x \times 10^{-1}$)°C. The value of x is _____. (Nearest integer)
[Given K_f = 3.9 K kg mol^{-1}; molar mass of ascorbic acid = 176 g mol^{-1}]

Sol. **15**

$\Delta T_f = K_f m$

$= 3.9 \times \frac{10.2}{176 \times 150} \times 1000$

$= 1.51$ K

$= 15 \times 10^{-1}$ K

x = 15

25. K_a for butyric acid (C_3H_7COOH) is 2×10^{-5}. The pH of 0.2 M solution of butyric acid is _____ $\times 10^{-1}$. (Nearest integer)
[Given log 2 = 0.30]

Sol. **27**

K_a of Butyric acid $\Rightarrow 2 \times 10^{-5}$ PKa $= 4.7$

pH of 0.2 M solution

$pH = \frac{1}{2}pK_a - \frac{1}{2}\log C = \frac{1}{2}(4.7) - \frac{1}{2}\log(0.2)$ = 2.35 + 0.35 = 2.7

pH = 27×10^{-1}

26. For the given first order reaction

$A \rightarrow B$

The half life of the reaction is 0.3010 min. The ratio of the initial concentration of reactant to the concentration of reactant at time 2.0 min will be equal to _____. (Nearest integer)

Sol. **100**

$A \longrightarrow B$

For first order reaction, $t_{1/2}$ = 0.3010 min

$\therefore K = \frac{0.693}{t_{1/2}} = \frac{0.693}{0.3010} = 2.303\ min^{-1}$

$C_t = C_0 e^{-Kt}$

$\frac{C_0}{C_t} = e^{Kt} = e^{2.303 \times 2}$

$\frac{C_0}{C_t} = e^{(\ln 10)^2}$

$\frac{C_0}{C_t} = 100$

27. The number of interhalogens from the following having square pyramidal structure is:
ClF_3, IF_7, BrF_5, BrF_3, I_2Cl_6, IF_5, ClF, ClF_5

Sol. **3**

Square pyramidal structures are

BrF_5, IF_5 and ClF_5

28. The disproportionation of MnO_4^{2-} in acidic medium resulted in the formation of two manganese compounds A and B. If the oxidation state of Mn in B is smaller than that of A, then the spin only magnetic moment (μ) value of B in BM is _____. (Nearest integer)

Sol. 4

$$3MnO_4^{-2} + 4H^+ \rightarrow \underset{(A)}{2\overset{+7}{Mn}O_4^-} + \underset{(B)}{\overset{+4}{Mn}O_2} + H_2O$$

$$_{25}Mn^{+4} \rightarrow [Ar]4s^2 3d^5 \Rightarrow [Ar]4s^0 3d^3$$

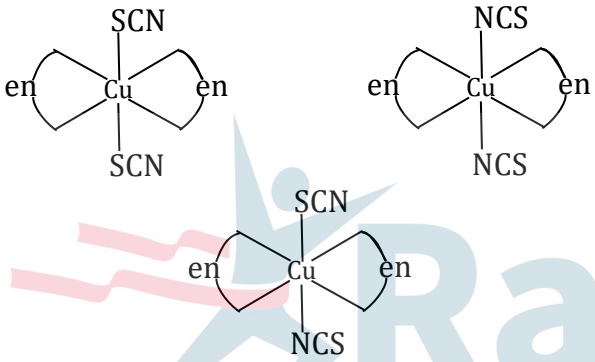
$$\mu = \sqrt{n(n+2)}$$

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

= 4 BM

29. Total number of relatively more stable isomer(s) possible for octahedral complex $[Cu(en)_2(SCN)_2]$ will be _____.

Sol. **3**



30. On complete combustion of 0.492 g of an organic compound containing C, H and O, 0.7938g of CO_2 and 0.4428g of H_2O was produced. The % composition of oxygen in the compound is _____.

Sol. **46**

$C_xH_yO_z$	+	$O_2(g)$	→	$CO_2(g)$	+	H_2O
0.429 g		0.7938 g				0.4428 g

Mass of carbon $= \frac{0.7938}{44} \times 12 = 0.2164g$

Mass of Hydrogen $= \frac{0.4428}{18} \times 2 = 0.0492g$

Total mass of oxygen = 0.492 – (0.2164 + 0.0492) = 0.2264

% of oxygen $= \frac{0.2264}{0.492} \times 100 \simeq 46$