

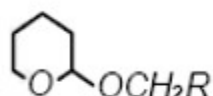
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IIT-JEE  
Previous Year  
Paper - II  
“2011”  
(Chemistry)

**CHEMISTRY PAPER II**  
**PART-1- CHEMISTRY**  
**SECTION-1 (TOTAL MARKS: 24)**  
**(SINGLE CORRECT CHOICE TYPE)**

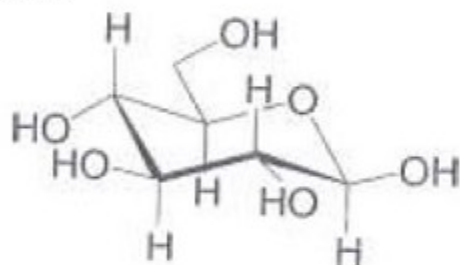
This section contains 8 multiple choice questions. Each question has four choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

1. The major product of the following reaction is  
 (a) A hemiacetal (b) An acetal (c) an ether (d) an ester

Ans : (b) product is an acetal



2. The following carbohydrate is



- (a) A ketohexose (b) An aldohexose  
 (c) An  $\alpha$  - furanose (d) An  $\alpha$  - Pyranose

Ans : (b)

3. Oxidation states of the metal in the minerals haematite and magnetite, respectively, are  
 (a) I,III in haematite and III in magnetite  
 (b) II,III in haematite and II in magnetite  
 (c) II in haematite and II, III in magnetite  
 (d) III in haematite and II, III in magnetite

Ans : (d) Haematite is  $\text{Fe}_2\text{O}_3$  where iron is in III oxidation state.  
 Magnetite is  $\text{Fe}_3\text{O}_4$  which is a mixed oxide where iron exhibits both II and III oxidation state.

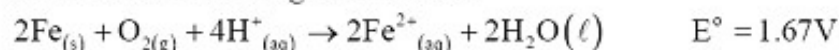
4. Among the following complexes (K-P)  
 $\text{K}_3[\text{Fe}(\text{CN})_6]$  (K),  $[\text{CO}(\text{NH}_3)_6]\text{Cl}_3$  (L),  $\text{Na}_3[\text{Co}(\text{oxalate})_3]$  (M),  $\text{Ni}(\text{H}_2\text{O})_6\text{Cl}_2$  (N),  $\text{K}_2[\text{Pt}(\text{CN})_2]$  (O)  
 and  $[\text{Zn}(\text{H}_2\text{O})_6](\text{NO}_3)_2$  (P)  
 the diamagnetic complexes are  
 (a) K,L,M,N (b) K,M,O,P (c) L,M,O,P (d) L,M,N,O

Ans : (c) K has one unpaired 'e'  
 N all octahedral complexes are outer orbital complex

5. Passing  $\text{H}_2\text{S}$  gas into a mixture of  $\text{Mn}^{2+}$ ,  $\text{Ni}^{2+}$ ,  $\text{Cu}^{2+}$  and  $\text{Hg}^{2+}$  ions in an acidified aqueous solution precipitates  
 (a)  $\text{CuS}$  and  $\text{HgS}$  (b)  $\text{MnS}$  and  $\text{CuS}$   
 (c)  $\text{MnS}$  and  $\text{NiS}$  (d)  $\text{NiS}$  and  $\text{HgS}$

Ans: (a)  $\text{CuS}$  and  $\text{HgS}$  get precipitated

6. Consider the following cell reaction:



At  $[\text{Fe}^{2+}] = 10^{-3}\text{M}$ ,  $P(\text{O}_2) = 0.1\text{atm}$  and  $\text{pH} = 3$ , the cell potential at  $25^\circ\text{C}$  is

- (a) 1.47 V (b) 1.77 V (c) 1.87 V (d) 1.57 V

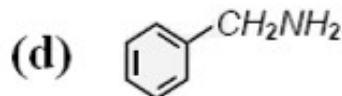
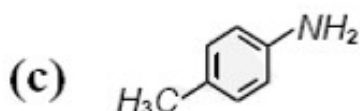
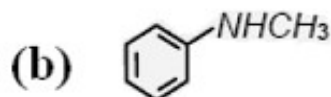
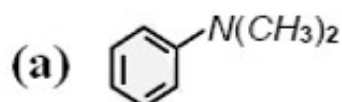
Ans: (d)  $1.67 - \frac{.06}{(2)^2} \log(\text{Fe}^{2+})^2 + \frac{.06}{4} \log \frac{(\text{O}_2)[\text{H}^+]^4}{\text{H}_2\text{O}} = 1.55\text{V}$

7. The freezing point (in  $^\circ\text{C}$ ) of a solution containing 0.1g of  $\text{K}_2[\text{Fe}(\text{CN})_6]$  (Mol.Wt.329) in 100g of water ( $K_f = 1.86\text{K kg mol}^{-1}$ ) is

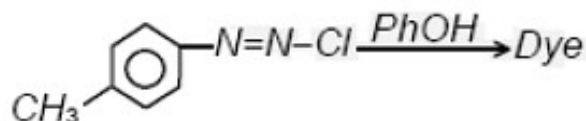
- (a)  $-2.3 \times 10^{-2}$  (b)  $-5.7 \times 10^{-2}$  (c)  $-5.7 \times 10^{-3}$  (d)  $-1.2 \times 10^{-2}$

Ans: (a)  $\Delta T_f = (1.86 \times 0.1 \times 20 \times 4) / 329 = 2.3 \times 10^{-2}$

8. Amongst the compound given, the one that would form a brilliant colored dye on treatment with  $\text{NaNO}_2$  in dil.  $\text{HCl}$  followed by addition to an alkaline solution of  $\beta$ -naphthol is



Ans: (c)



**SECTION –II (TOTAL MARKS: 16)**  
**(MULTIPLE CORRECT ANSWER(S) TYPE)**

This section contains **4 multiple choice questions**. Each question has four choices (a),(b),(c) and (d) out of which **ONE OR MORE** may be correct.

9. For the first reaction  
 $2\text{N}_2\text{O}_5(\text{g}) \rightarrow 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$   
 (a) The concentration of the reactant decreases exponentially with time.  
 (b) The half-life of the reaction decreases with increasing temperature.  
 (c) The half-life of the reaction depends on the initial concentration of the reactant.  
 (d) The reaction proceeds to 99.6% completion in eight half-half duration.

Ans: **(abc)**  $\frac{-693}{t_{1/2}} = \frac{2.3}{8 \times t_{1/2}} \log \frac{100}{[\text{A}]_t}$   
 $2.4 = \log \frac{100}{[\text{A}]_t}$   
 $\therefore [\text{A}]_t = 100 / 250 = 0.4$   
 $\therefore 99.6\%$

10. The correct functional group X and the reagent / reaction conditions Y in the following scheme are  
 (a) X = COOCH<sub>3</sub>, Y = H<sub>2</sub> / Ni / heat  
 (b) X = CONH<sub>2</sub>, Y = H<sub>2</sub> / Ni / heat  
 (c) X = CONH<sub>2</sub>, Y = Br<sub>2</sub> / NaOH  
 (d) X = CN, Y = H<sub>2</sub> / Ni / heat

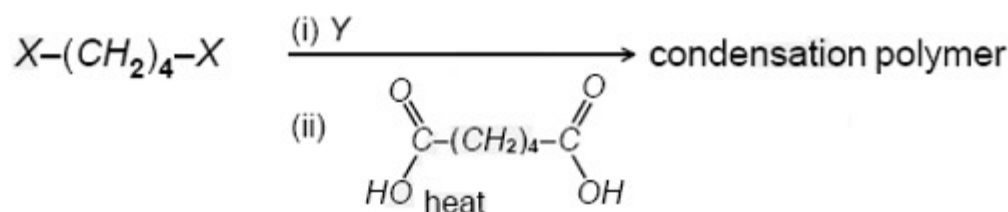
Ans: **(abcd)** Alcohol gives polyester  
 NH<sub>2</sub> group gives polyamide

11. The equilibrium  
 $2\text{Cu}^{\text{I}} \rightleftharpoons \text{Cu}^{\text{0}} + \text{Cu}^{\text{II}}$   
 In aqueous medium at 25° C shifts towards the left in the presence of  
 (a) NO<sub>3</sub><sup>-</sup> (b) Cl<sup>-</sup> (c) SCN<sup>-</sup> (d) CN<sup>-</sup>

Ans: **(bcd)** Cl<sup>-</sup>, SCN<sup>-</sup> and CN<sup>-</sup> form insoluble compound of CuCl, CuSCN and CuCN which drags the equilibrium reaction in backward direction.

12. Reduction of the metal centre in aqueous permanganate ion involves  
 (a) 3 electrons in the neutral medium  
 (b) 5 electrons in neutral medium  
 (c) 3 electrons in alkaline medium  
 (d) 5 electrons in acidic medium

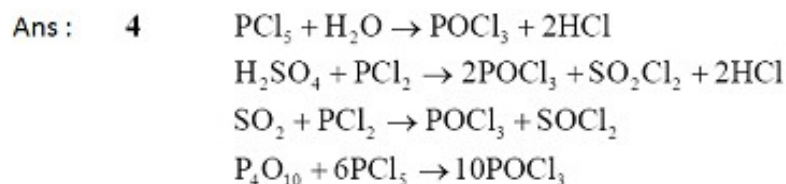
Ans: **(ad)**



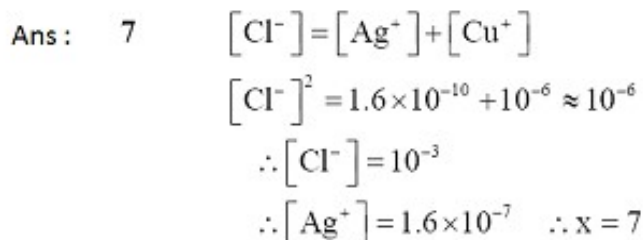
**SECTION-III (TOTAL MARKS: 24)**  
**(INTEGER ANSWER TYPE)**

This section contains **6 questions**. The answer to each of the questions is a **single-digit integer**, ranging from 0 to 9. The bubble corresponding to the correct answer is to be darkened in the ORS.

13. Among the following, the number of compounds that can react with  $\text{PCl}_5$  to give  $\text{POCl}_3$  is  $\text{O}_2, \text{CO}_2, \text{SO}_2, \text{H}_2\text{O}, \text{H}_2\text{SO}_4, \text{P}_4\text{O}_{10}$



14. In 1 L saturated solution of  $\text{AgCl}$  [ $K_{sp}(\text{AgCl}) = 1.6 \times 10^{-10}$ ], 0.1 mol of  $\text{CuCl}$  [ $K_{sp}(\text{CuCl}) = 1.0 \times 10^{-6}$ ] is added. The resultant concentration of  $\text{Ag}^+$  in the solution is  $1.6 \times 10^{-x}$ . The value of "x" is



15. The number of hexagonal faces that are present in truncated octahedron is

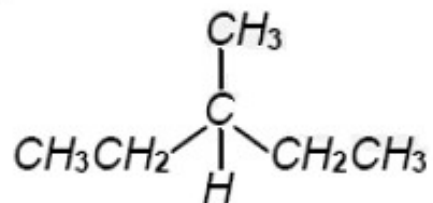
Ans: **(8)**



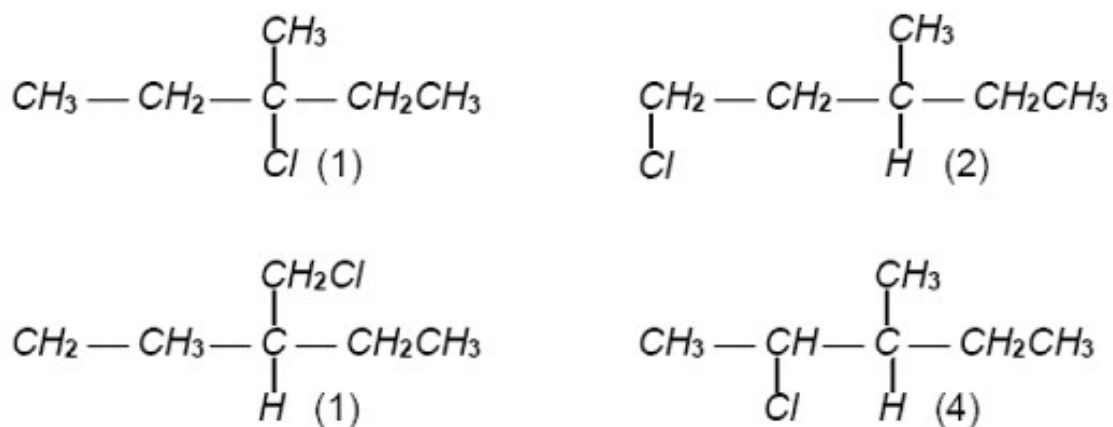
16. The total number of contributing structures showing hyperconjugation (involving C-H bonds) for the following carbocation is

Ans: **6** There are six  $\alpha$ -hydrogens.

17. The maximum number of isomers (including stereoisomers) that are possible on monochlorination of the following compound, is



Ans : 8



Maximum number of isomers = 8

18. The volume (in mL) of 0.1M  $\text{AgNO}_3$  required for complete precipitation of chloride ions present in 30mL of 0.01 M solution of  $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2$  as silver chloride is close to

Ans : 6       $30 \times 0.01 \times 2 = 0.1 \times V$   
 $\therefore V = 6 \text{ ml}$

**SECTION –IV (TOTAL MARKS: 16)**  
**(MATRIX-MATCH TYPE)**

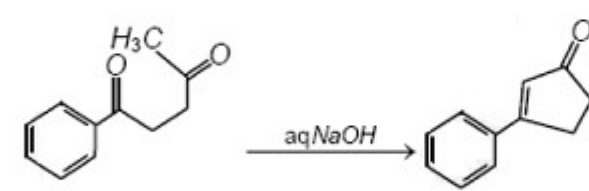
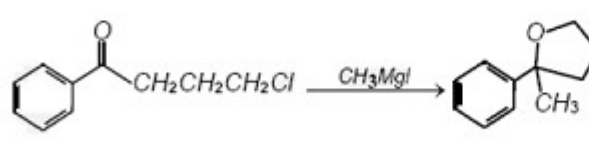
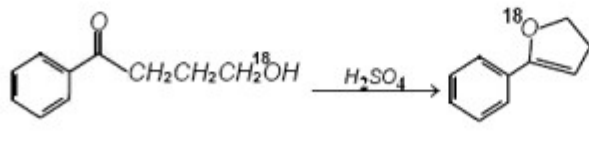
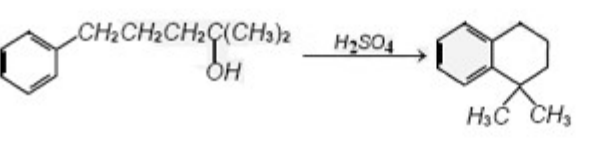
This section contains **2 questions**. Each question has **four statements** (a, b, c and d) given in **Column I** and five statements (p, q, r s and t) in **Column II**. Any given statement in **Column I** can have correct matching with **ONE** or **MORE** statement(s) given in **Column II**. For example, if for a given question, statement B matches with the statements given in q and r, then for the particular question, against statement B, darken the bubbles corresponding to q and r in the ORS.

19. Match the transformations in Column I with appropriate options in Column II

Column I	Column II
(a) $\text{CO}_2(\text{s}) \rightarrow \text{CO}_2(\text{g})$	(p) Phase transition
(b) $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$	(q) Allotropic change
(c) $2\text{H}_2 \rightarrow \text{H}_2(\text{g})$	(r) $\Delta H$ is positive
(d) $\text{P}_{(\text{white, solid})} \rightarrow \text{P}_{(\text{red, solid})}$	(s) $\Delta S$ is positive
	(t) $\Delta S$ is negative

Ans : a  $\rightarrow$  (p, r, s)    b  $\rightarrow$  (r, s)    c  $\rightarrow$  (t)    d  $\rightarrow$  (q, r)

20. Match the reactions in Column I with appropriate types of steps/ reactive intermediate involved in these reactions as given in Column II.

Column- I	Column- II
(a) 	(p) Nucleophilic substitution
(b) 	(q) Electrophilic substitution
(c) 	(r) Dehydration
(d) 	(s) Nucleophilic addition
	(t) Carbanion

Ans : a  $\rightarrow$  (r, s, t)    b  $\rightarrow$  (s, p)    c  $\rightarrow$  (s, r)    d  $\rightarrow$  (q, r)