

IIT JEE-2009 Paper-1
PART-I : CHEMISTRY
SECTION-I
Single Correct Choice Type

This section contains 8 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct.

- Q.1 Among cellulose, poly(vinyl chloride), nylon and natural rubber, the polymer in which the intermolecular force of attraction is weakest is

(A) Nylon (B) Poly (vinyl chloride)
(C) Cellulose (D*) Natural Rubber

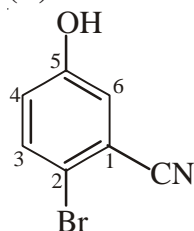
[Sol. (D)]

- (A) Nylon \rightarrow H-Bonding (Intramolecular force)
(B) Poly (vinyl chloride) \rightarrow dipole – dipole attraction
(C) Cellulose \rightarrow H-bonding
(D) Natural Rubber \rightarrow Vander Waal forces]

- Q.2 The IUPAC name of the following compound is

(A) 4-Bromo-3-cyanophenol
(B*) 2-Bromo-5-hydroxybenzonitrile
(C) 2-Cyano-4-hydroxybromobenzene
(D) 6-Bromo-3-hydroxybenzonitrile

[Sol. (B)]



2-Bromo-5-hydroxybenzonitrile]

- Q.3 Given that the abundances of isotopes ^{54}Fe , ^{56}Fe and ^{57}Fe are 5%, 90% and 5%, respectively, the atomic mass of Fe is

(A) 55.85 (B*) 55.95 (C) 55.75 (D) 56.05

[Sol. (B)]

$$\begin{aligned} & 54 \times 0.05 + 56 \times 0.90 + 57 \times 0.05 \\ &= 2.7 + 50.4 + 2.85 \\ &= 55.95 \quad \text{Ans.]} \end{aligned}$$

- Q.4 Among the electrolytes Na_2SO_4 , CaCl_2 , $\text{Al}_2(\text{SO}_4)_3$ and NH_4Cl , the most effective coagulation agent for Sb_2S_3 sol is

(A) Na_2SO_4 (B) CaCl_2 (C*) $\text{Al}_2(\text{SO}_4)_3$ (D) NH_4Cl

[Sol. (C)]

Since sulphide are negative sol hence coagulation power will be maximum for $\text{Al}_2(\text{SO}_4)_3$.]

- Q.5 The Henry's law constant for the solubility of N_2 gas in water at 298 K is 1.0×10^5 atm. The mole fraction of N_2 in air is 0.8. The number of moles of N_2 from air dissolved in 10 moles of water at 298 K and 5 atm pressure is
 (A*) 4.0×10^{-4} (B) 4.0×10^{-5} (C) 5.0×10^{-4} (D) 4.0×10^{-5}

[Sol. (A)]

$$P_{N_2} = K_H \times x_{N_2}$$

$$5 \times 0.8 = 10^5 \times x_{N_2}$$

$$x_{N_2} = 4 \times 10^{-5}$$

$$n_{N_2} = 4 \times 10^{-4} \quad \text{Ans.}]$$

- Q.6 The term that corrects for the attractive forces present in a real gas in the Vander Waals equation is

- (A) nb (B*) $\frac{an^2}{V^2}$ (C) $-\frac{an^2}{V^2}$ (D) $-nb$

[Sol. (B)]

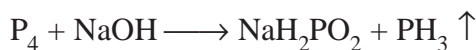
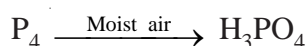
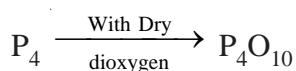
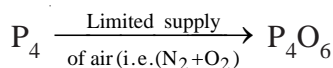
$$\text{Vander Waals equation} \left(P + \frac{an^2}{V^2} \right) (V - nb) = nRT$$

↓

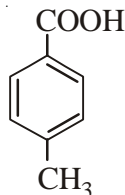
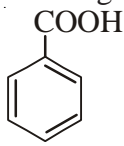
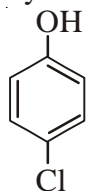
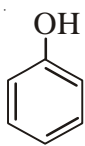
Correction term.]

- Q.7 The reaction of P_4 with X leads selectively to P_4O_6 . The X is
 (A) Dry O_2 (B*) A mixture of O_2 and N_2
 (C) Moist O_2 (D) O_2 in the presence of aqueous NaOH

[Sol. (B)]



- Q.8 The correct acidity order of the following is



(I)

(II)

(III)

(IV)

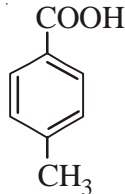
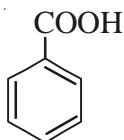
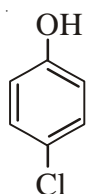
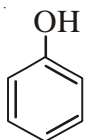
(A*) III > IV > II > I

(B) IV > III > I > II

(C) III > II > I > IV

(D) II > III > IV > I

[Sol. (A) III > IV > II > I]



(I)

(II)

(III)

(IV)

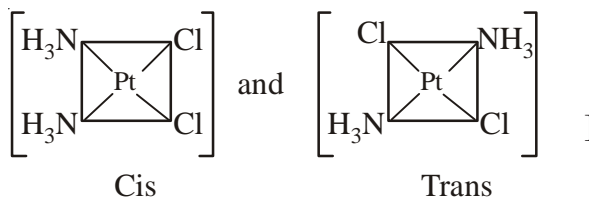
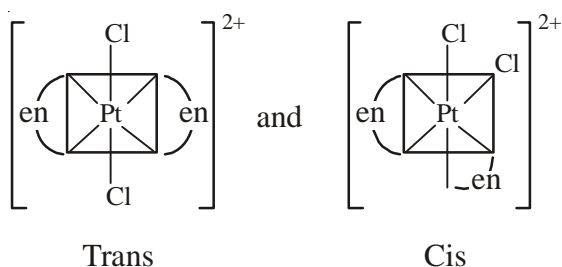
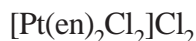
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SECTION-II

Multiple Correct Choice Types

This section contains 4 multiple correct answer(s) type questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE** is/are correct.

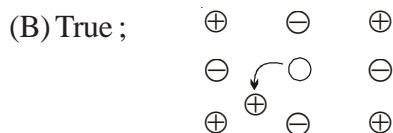
- Q.9 The compound(s) that exhibit(s) geometrical isomerism is(are)
 (A) $[\text{Pt}(\text{en})\text{Cl}_2]$ (B) $[\text{Pt}(\text{en})_2]\text{Cl}_2$
 (C*) $[\text{Pt}(\text{en})_2\text{Cl}_2]\text{Cl}_2$ (D*) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$
 [Sol. (C) & (D)]



- Q.10 The correct statement(s) regarding defects in solid is (are)
 (A) Frenkel defect is usually favoured by a very small difference in the sizes of cation and anion.
 (B*) Frenkel defect is a dislocation defect
 (C*) Trapping of an electron in the lattice leads to the formation of F-center.
 (D) Schottky defects have no effect on the physical properties of solids.

[Sol. (B) & (C)]

(A) False ; because favoured by large difference in size.

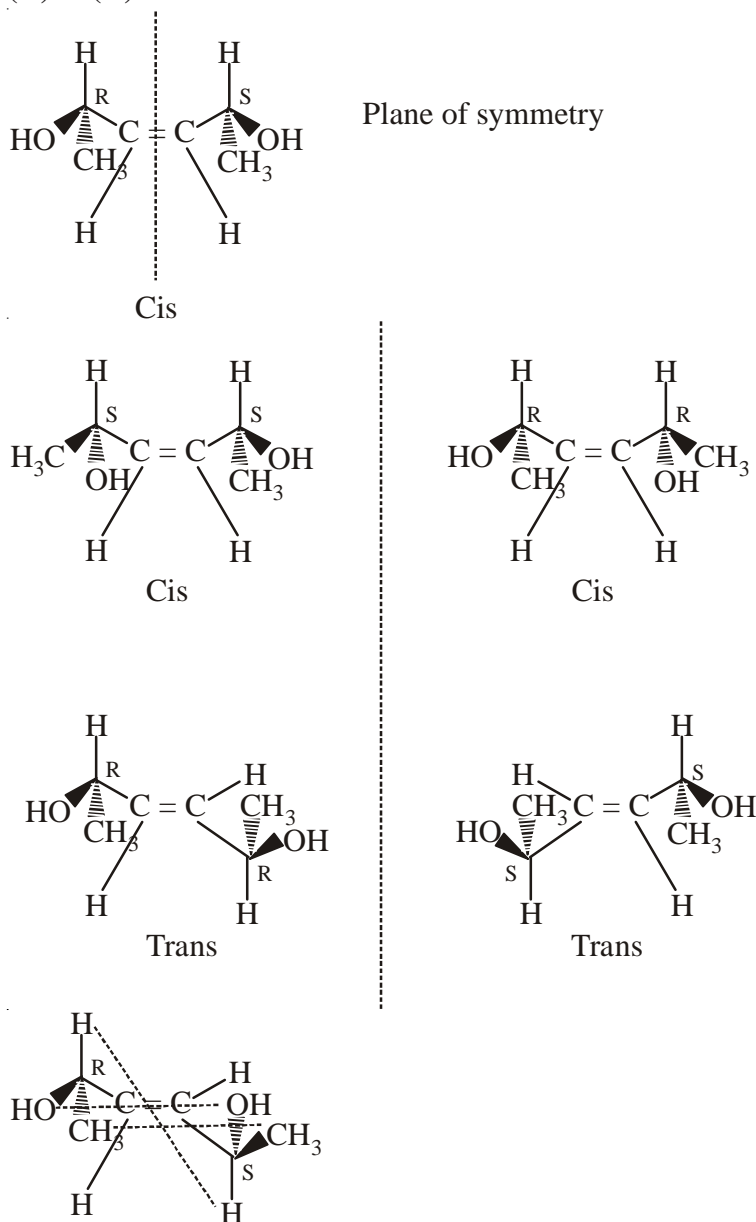


(C) fact

(D) False ; it decreases the density]

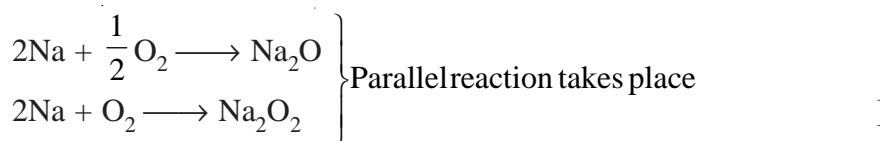
- Q.11 The correct statement(s) about the compound $\text{H}_3\text{C}(\text{HO})\text{HC}=\text{CH}-\text{CH}(\text{OH})\text{CH}_3$ (X) is (are)
- (A*) The total number of stereoisomers possible for X is 6
- (B) The total number of diastereomers possible for X is 3
- (C) If the stereochemistry about the double bond in X is trans, the number of enantiomers possible for X is 4
- (D*) If the stereochemistry about the double bond in X is cis, the number of enantiomers possible for X is 2

[Sol. (A) & (D)]



- (A) Total stereoisomer = 6
- (B) Number of Diastereomers = 6
- (C) Number of enantiomer about Trans = 2
- (D) Number of enantiomer about Cis = 2]

- Q.12 The compound(s) formed upon combustion of sodium metal in excess air is (are)
 (A*) Na_2O_2 (B*) Na_2O (C) NaO_2 (D) NaOH
 [Sol. (A) & (B)]



SECTION-III

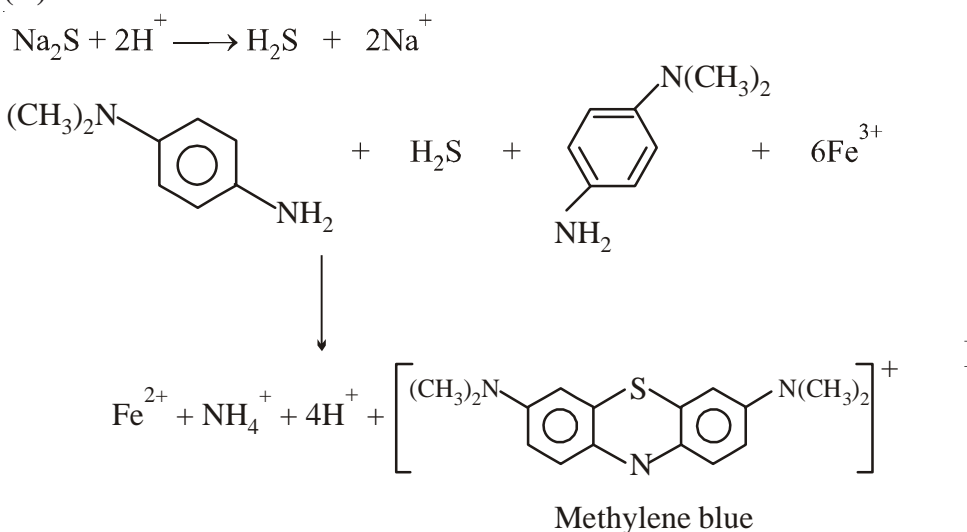
Comprehension Type

This section contains 2 groups of questions. Each group has 3 multiple choice questions based on a paragraph. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** is correct.

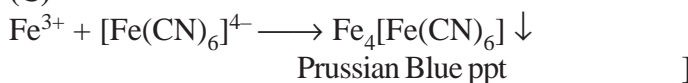
Paragraph for Question Nos. 13 to 15

p-Amino-N, N-dimethylaniline is added to a strongly acidic solution of **X**. The resulting solution is treated with a few drops of aqueous solution of **Y** to yield blue coloration due to the formation of methylene blue. Treatment of the aqueous solution of **Y** with the reagent potassium hexacyanoferrate(II) leads to the formation of an intense blue precipitate. The precipitate dissolves on excess addition of the reagent. Similarly, treatment of the solution of **Y** with the solution of potassium hexacyanoferrate(III) leads to a brown coloration due to the formation of **Z**.

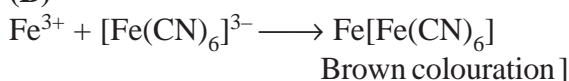
- Q.13 The compound **X** is
 (A) NaNO_3 (B) NaCl (C) Na_2SO_4 (D*) Na_2S
 [Sol. (D)]



- Q.14 The compound **Y** is
 (A) MgCl_2 (B) FeCl_2 (C*) FeCl_3 (D) ZnCl_2
 [Sol. (C)]

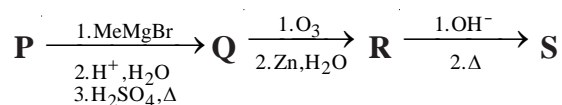


- Q.15 The compound **Z** is
 (A) $\text{Mg}_2[\text{Fe(CN)}_6]$ (B*) $\text{Fe}[\text{Fe(CN)}_6]$ (C) $\text{Fe}_4[\text{Fe(CN)}_6]_3$ (D) $\text{K}_2\text{Zn}_3[\text{Fe(CN)}_6]_2$
 [Sol. (B)]

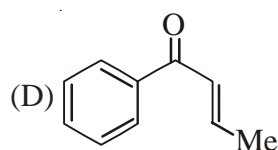
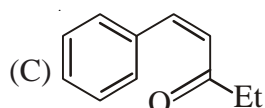
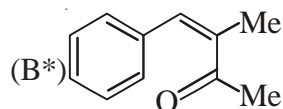
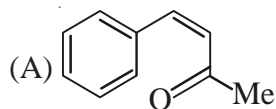


Paragraph for Question Nos. 16 to 18

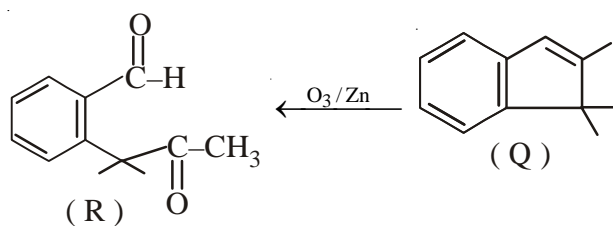
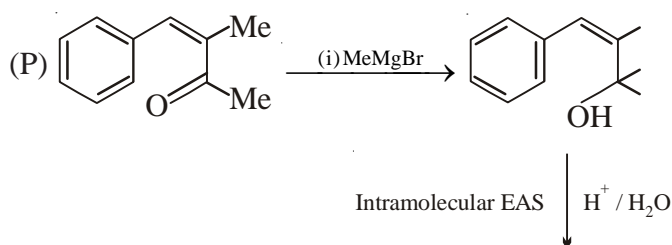
A carbonyl compound **P**, which gives positive iodoform test, undergoes reaction with MeMgBr followed by dehydration to give an olefin **Q**. Ozonolysis of **Q** leads to a dicarbonyl compound **R**, which undergoes intramolecular aldol reaction to give predominantly **S**.



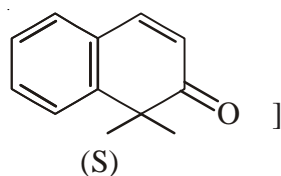
Q.16 The structure of the carbonyl compound **P** is



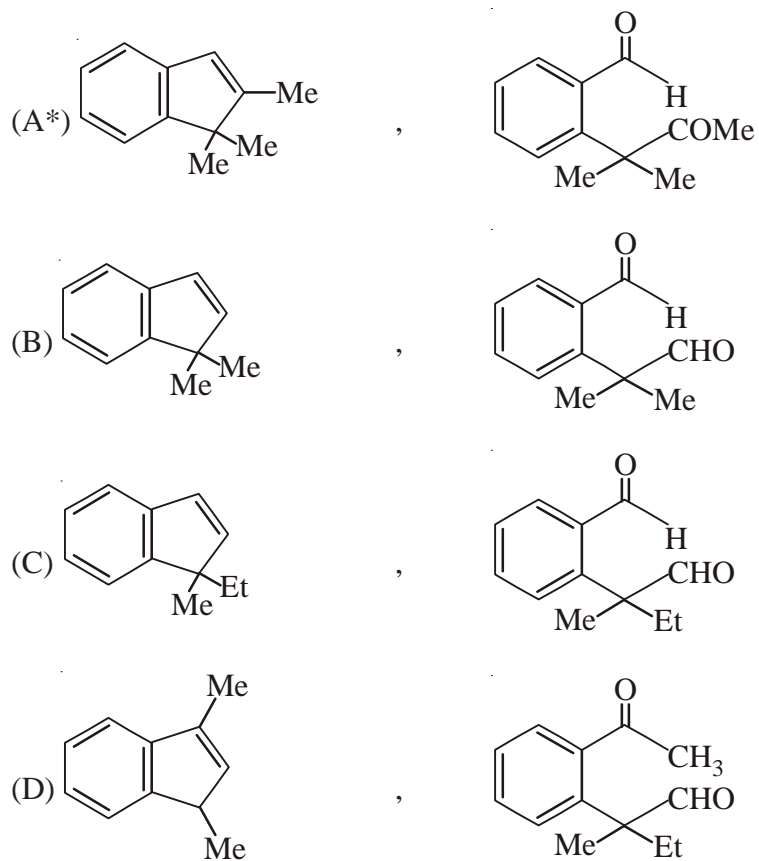
[Sol. (B)]



Intramolecular Aldol condensation \downarrow OH^- / Δ

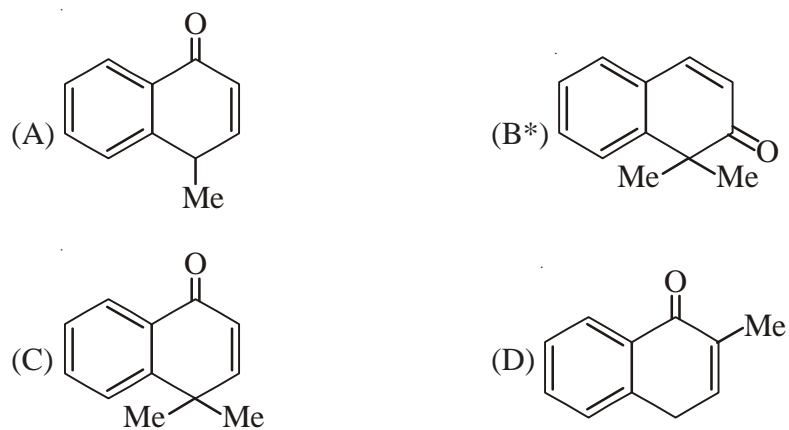


Q.17 The structure of the products **Q** and **R**, respectively, are



[Sol. (A)]

Q.18 The structure of the product **S** is



[Sol. (B)]

SECTION-IV

Matric - Match Type

This section contains 2 questions. Each question contains statements given in two columns, which have to be matched. The statements in **Column I** are labelled A, B, C and D, while the statements in **Column II** are labelled p, q, r, s and t. Any given statement in **Column I** can have correct matching with **ONE OR MORE** statement(s) in **Column II**. The appropriate bubbles corresponding to the answers to these questions have to be darkened as illustrated in the following examples:

If the correct matches are A – p, s and t; B – q and r; C – p and q; and D – s and t; then the correct darkening of bubbles will look like the following.

	p	q	r	s	t
A	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
B	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
C	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
D	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

Q.19 Match each of the diatomic molecules in Column I with its property / properties in Column II.

Column I	Column II
(A) B_2	(p) Paramagnetic
(B) N_2	(q) undergoes oxidation
(C) O_2^-	(r) Undergoes reduction
(D) O_2	(s) Bond order ≥ 2
	(t) Mixing of 's' and 'p' orbitals

[Ans. (A) p,q,r, t (B) q, r, s, t (C) p, q, r (D) p,q,r, s]

Q.20 Match each of the compound in Column I with its characteristic reaction(s) in Column II.

Column I	Column II
(A) $CH_3CH_2CH_2CN$	(p) Reduction with $Pd-C / H_2$
(B) $CH_3CH_2OCOCH_3$	(q) Reduction with $SnCl_2 / HCl$
(C) $CH_3 - CH = CH - CH_2OH$	(r) Development of foul smell on treatment with chloroform and alcoholic KOH
(D) $CH_3CH_2CH_2CH_2NH_2$	(s) Reduction with diisobutylaluminium hydride (DIBAL – H)
	(t) Alkaline hydrolysis

[Ans. (A) p,q,s,t (B) p,s,t (C) p (D) r]

[Sol. (A) p,q,s,t (B) p,s,t (C) p (D) r

Ref.: – Warren → Pg. No. 626

Ref.: – I.L. Finar → Pg.No. 179

Ref. : – Jerry March → Pg No. 1208]