JEE Advanced 2014 Paper-2

Chemistry

21. The product formed in the reaction of $SOCl_2$ with white phosphorous is

(A) PCl_3

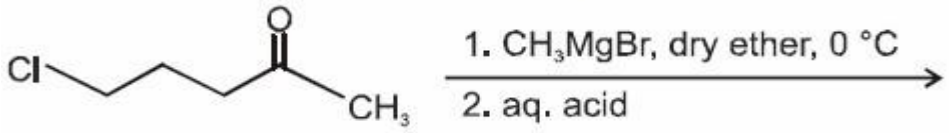
(B) SO_2Cl_2

(C) SCl_2

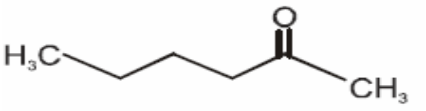
(D) $POCl_3$

22. The major product in the following reaction is

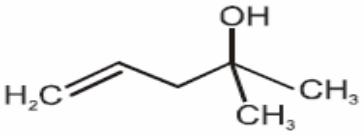
[Figure]



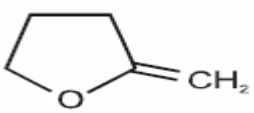
(A)



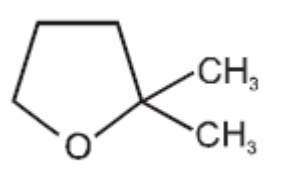
(B)



(C)



(D)



23. Hydrogen peroxide in its reaction with KIO_4 and NH_2OH respectively, is acting as a

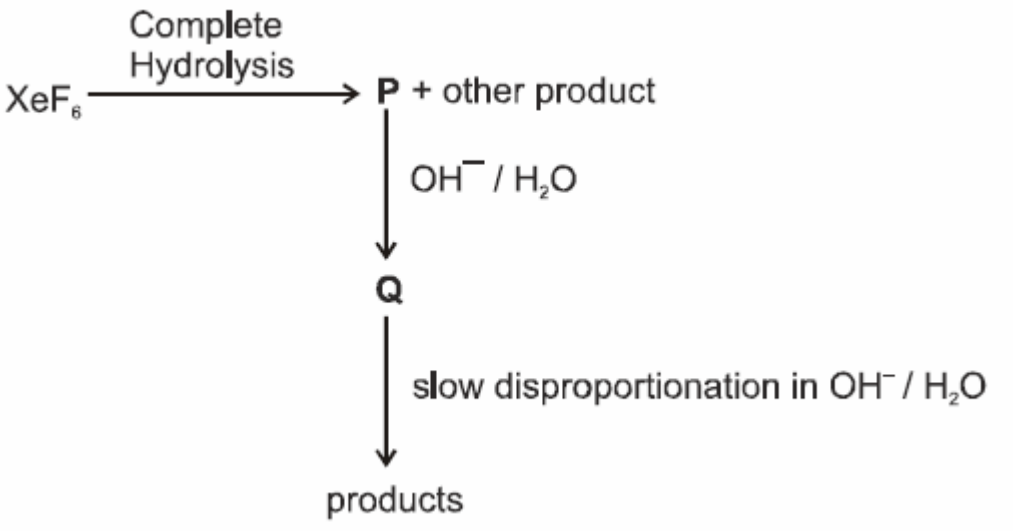
(A) reducing agent, oxidising agent

(B) reducing agent, reducing agent

(C) oxidising agent, oxidising agent

(D) oxidising agent, reducing agent

24. Under ambient conditions, the total number of gases released as products in the step of the reaction scheme shown below is



(A) 0

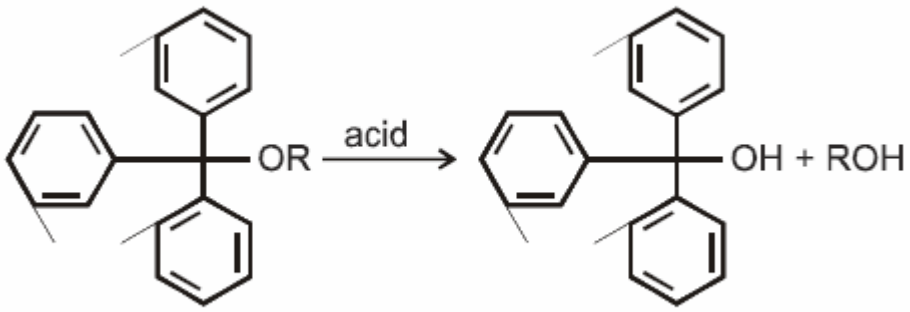
(B) 1

(C) 2

(D) 3

25. The acidic hydrolysis of ether (X) shown below is fastest when

[Figure]



[X]

(A) one phenyl group is replaced by a methyl group.

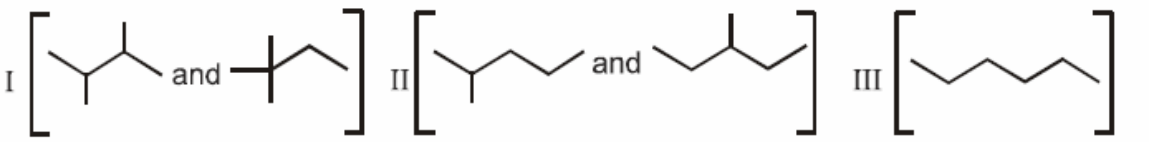
(B) one phenyl group is replaced by a *para*-methoxyphenyl group.

(C) two phenyl groups are replaced by two *para*-methoxyphenyl groups

(D) no structural change is made to X

26. Isomers of hexane, based on their branching, can be divided into three distinct classes as shown in the figure.

[Figure]



The correct order of their boiling point is

(A) I > II > III

(B) III > II > I

(C) II > III > I

(D) III > I > II

27. For the identification of β-naphthol using dye test it is necessary to use

(A) dichloromethane solution of β-naphthol.

(B) acidic solution of β-naphthol.

(C) neutral solution of β-naphthol.

(D) alkaline solution of β-naphthol.

28. Assuming 2s-2p mixing is NOT operative, the paramagnetic species among the following is :

(A) Be_2

(B) B_2

(C) C_2

(D) N_2

29. For the elementary reaction M N, the rate of disappearance of M increases by a factor of 8 upon doubling the concentration of M. The order of the reaction with respect to M is :

(A) 4

(B) 3

(C) 2

(D) 1

30. For the process

At $T = 100°C$ and 1 atmosphere pressure, the correct choice is :

(A) $\Delta S_{system} > 0$ and $\Delta S_{surrounding}$

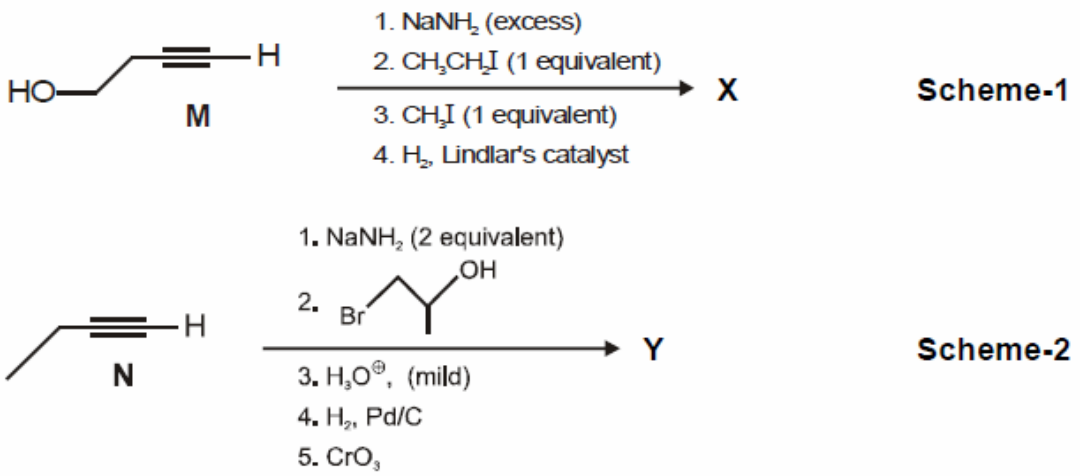
(B) $\Delta S_{system} > 0$ and $\Delta S_{surrounding} < 0$

(C) $\Delta S_{system} < 0$ and $\Delta S_{surrounding}$

(D) $\Delta S_{system} < 0$ and $\Delta S_{surrounding} < 0$

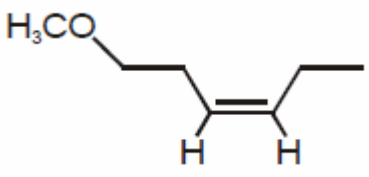
Paragraph For Question 31 and 32

Schemes 1 and 2 describe sequential transformation of alkynes M and N. Consider only the **major products** formed in each step for both the schemes.

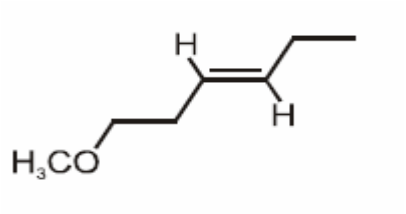


31. The product X is

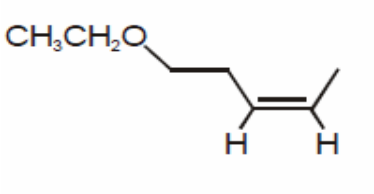
(A)



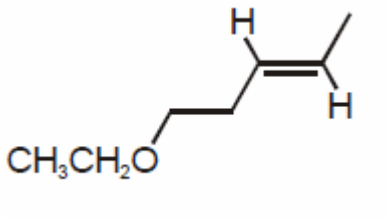
(B)



(C)



(D)



32. The correct statement with respect to product Y is

(A) it gives a positive Tollens test and is a functional Isomer of x

(B) it gives a positive Tollens test and is a geometrical Isomer of x

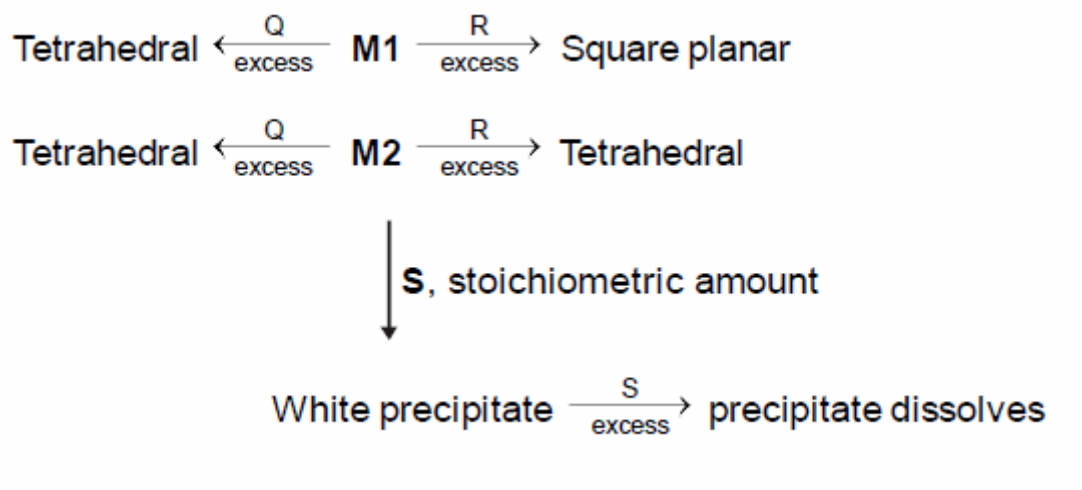
(C) it gives a positive iodoform test and is a functional Isomer of x

(D) it gives a positive iodoform test and is a geometrical Isomer of x

Paragraph For Questions 33 and 34

An aqueous solution of metal ion $M1$ reacts separately with reagents Q and R in excess to give tetrahedral and square planar complexes, respectively An aqueous sclut.cn, another metal ion $M2$ always forms tetrahedral complexes with these reagents. Aqueous solution of $M2$ on reaction with reagent S gives white precipitate which dissolves in excess of S. The reactions are summarized in the scheme given below

SCHEME:



33. $M1$, Q and R, respectively are

(A) Zn^{2+}, KCN and HCl

(B) Ni^{2+}, HCl and KCN

(C) Cd^{2+}, KCN and HCl

(D) Co^{2+}, HCl and KCN

34. Reagent **S** is

(A) $K_4\left[Fe(CN)_6\right]$

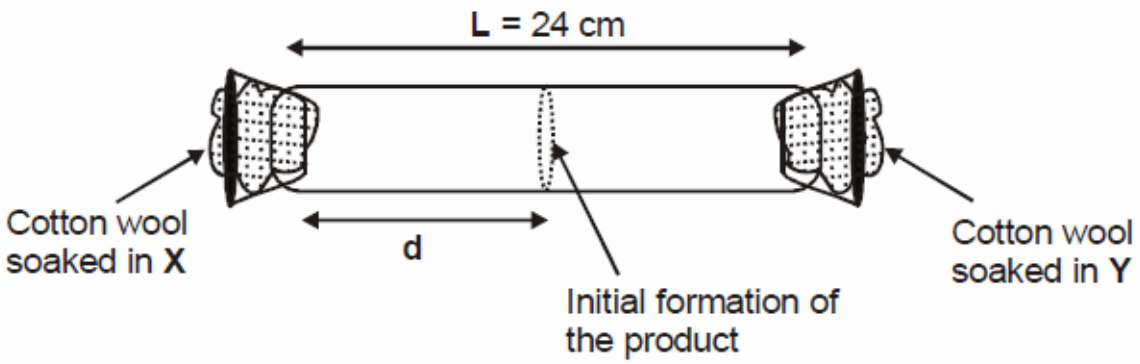
(B) Na_2HPO_4

(C) K_2CrO_4

(D) KOH

Paragraph For Questions 35 and 36

X and Y are two volatile liquids with molar weights of 10g mol^{-1} and 40g mol^{-1} respectively Two cotton plugs, one soaked in X and the other soaked in Y are simultaneously placed at the ends of a tube of length $L = 24\text{cm}$, as shown in the figure. The tube is filled with an inert gas at 1 atmosphere pressure and a temperature of 300K. Vapours of X and Y react to form a product which is first observed at a distance $d\,\text{cm}$ from the plug soaked in X. Take X and Y to have equal molecular diameters and assume ideal behaviour for the inert gas and the two vapours.



35. The value of d in cm (shown in the figure), as estimated from Graham's law, is

(A) 8

(B) 12

(C) 16

(D) 20

36. The experimental value of d is found to be smaller than the estimate obtained using Graham's law. This is due to

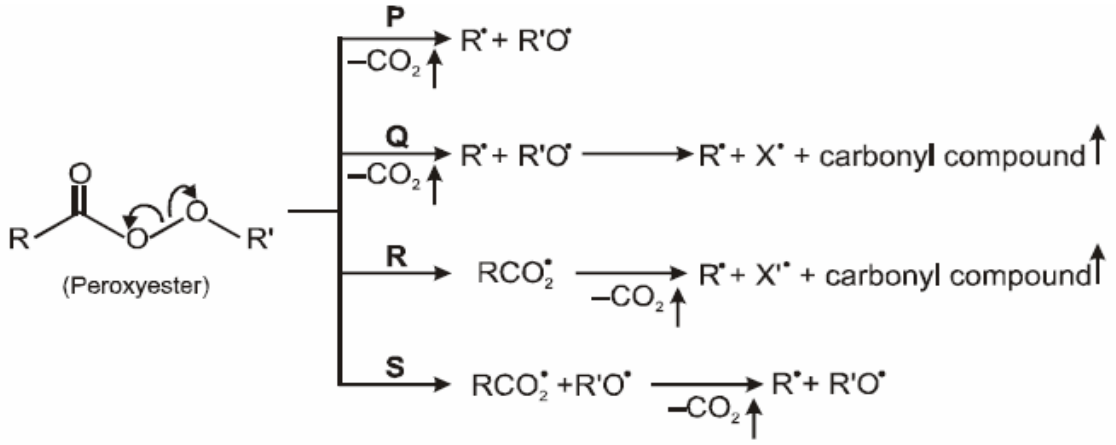
(A) larger mean free path for X as compared to that of Y.

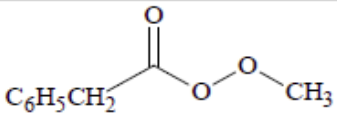
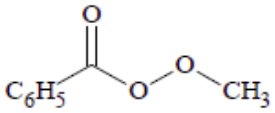
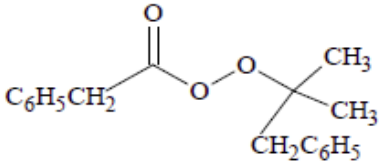
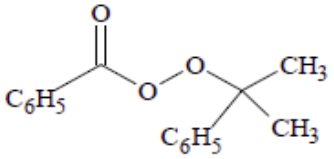
(B) larger mean free path for Y as compared to that of X.

(C) increased collision frequency of Y with the inert gas as compared to that X with the inert gas.

(D) increased collision frequency of X with the inert gas as compared to that Y with the inert gas.

37. Different possible **<u>thermal</u>** decomposition pathways for peroxyesters are shown below. Match each pathway from **List I** with an appropriate structure from **List II** and select the correct answer using the code given below the lists.



List – I		List – II
P.	Pathway **P**	1. 
Q.	Pathway **Q**	2. 
R.	Pathway **R**	3. 
S.	Pathway **S**	4. 

Codes:

(A)

P	*Q*	*R*	*S*
1	3	4	2

(B)

P	*Q*	*R*	*S*
2	4	3	1

(C)

P	*Q*	*R*	*S*
4	1	2	3

(D)

P	*Q*	*R*	*S*
3	2	1	4

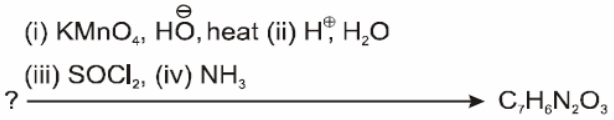
38. Match the four starting materials **(P,Q,R,S)** given in **List I** with the corresponding reaction schemes **(I,II,III,IV)** provided in **List II** and select the correct answer using the code given below the list.

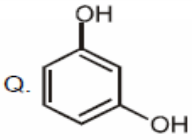
List-I

P. 

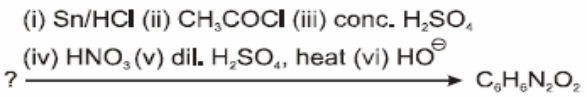
List-II

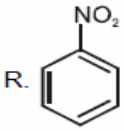
1. Scheme I



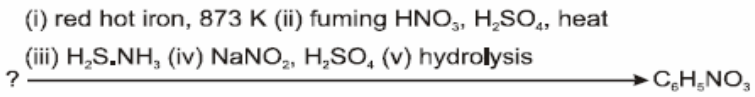
Q. 

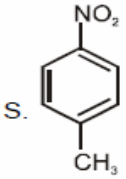
2. Scheme II



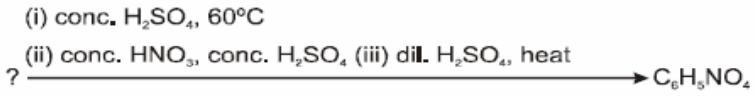
R. 

3. Scheme III



S. 

4. Scheme IV



Codes:

(A)

P	Q	R	S
1	4	2	3

(B)

P	Q	R	S
3	1	4	2

(C)

P	Q	R	S
3	4	2	1

(D)

P	Q	R	S
4	1	3	2

39. Match each coordination compound in **List-I** with an appropriate pair of characteristics from **List-II** and select the correct answer using the code given below the list.

List-I	List-II
$P.\left[Cr\left(NH_3\right)_4 Cl_2\right]Cl$	1. Paramagnetic and exhibits ionisation isomerism
$Q.\left[Ti\left(H_2O\right)_5 Cl\right]\left(NO_3\right)_2$	2. Diamagnetic and exhibits cis-trans isomerism
$R.\left[Pt\left(en\right)\left(NO_3\right)Cl\right]NO_3$	3. Paramagnetic and exhibits cis-trans isomerism
$S.\left[Co\left(NH_3\right)\left(NO_3\right)_2\right]NO_3$	4. Diamagnetic and exhibits ionisation isomerism

Codes:

(A)

P	Q	R	S
4	2	3	1

(B)

P	Q	R	S
3	1	4	2

(C)

P	Q	R	S
2	1	3	4

(D)

P	Q	R	S
1	3	4	2

40. Match the orbital overlap figures shown in **List-I** with the description given in **List-II** and select the correct answer using the code given below the lists.

	List-I		**List-II**
P.		1.	*p*–*d* π antibonding
Q.		2.	*d*–*d* σ bonding
R.		3.	*p*–*d* π bonding
S.		4.	*d*–*d* σ antibonding

Codes:

	P	*Q*	*R*	*S*
(A)	2	1	3	4
(B)	4	3	1	2
(C)	2	3	1	4
(D)	4	1	3	2