

CHEMISTRY

TARGET : JEE Advanced – 2021

CAPS – 22

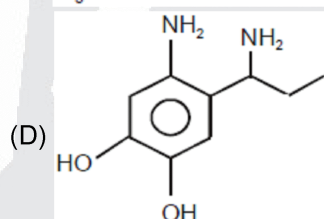
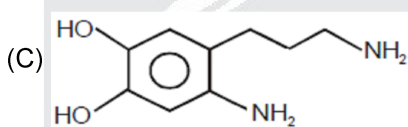
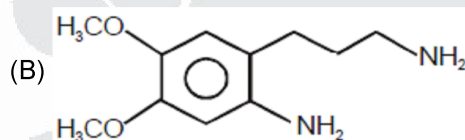
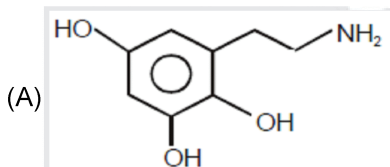
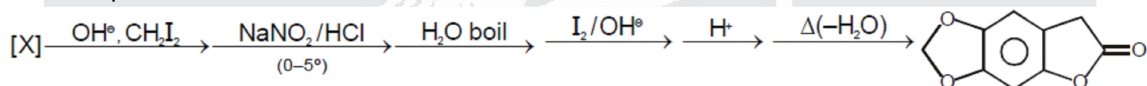
Nitrogen Containing Compounds

Answer Key

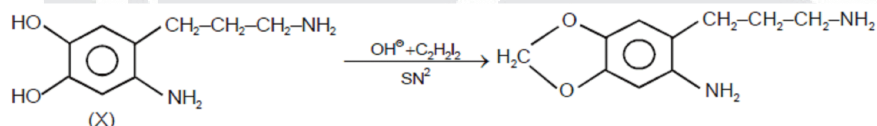
1.	(C)	2.	(D)	3.	(D)	4.	(C)	5.	(B)
6.	(B)	7.	(C)	8.	(B)	9.	(C)	10.	(C)
11.	(C)	12.	(C)	13.	(D)	14.	(D)	15.	(A)
16.	(ABC)	17.	(AB)	18.	(B)	19.	(A)	20.	(C)
21.	(B)	22.	(B)						

Solution

1. The compound 'X' can be

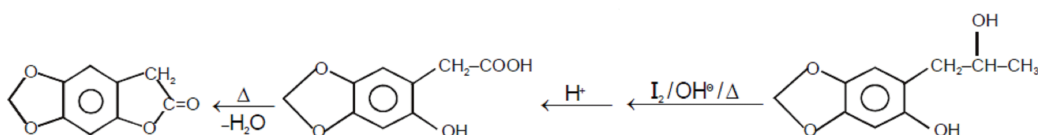


Ans. (C)
Sol.

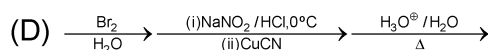
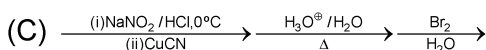
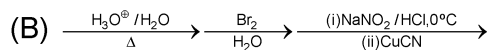
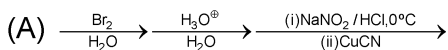


$\xrightarrow{\text{NaNO}_2/\text{HCl (0-5}^\circ\text{)}}$

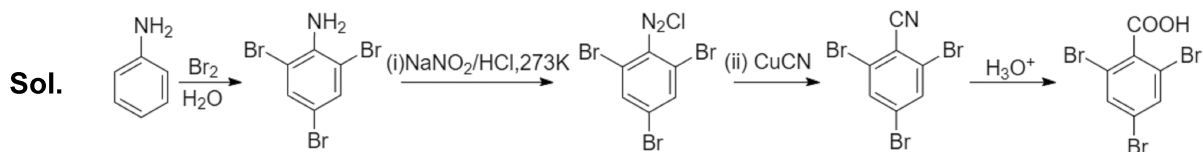
$\xrightarrow{\text{H}_2\text{O / boil}}$



2. To get 2, 4, 6- tribromobenzoic acid from aniline the correct sequence of reagents is :



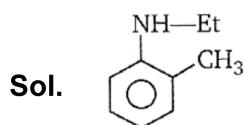
Ans. (D)



3. Which of the following arylamines will not form a diazonium salt on reaction with sodium nitrite in hydrochloric acid?

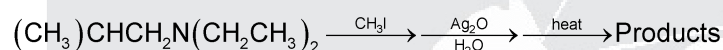
- (A) m-Ethylaniline (B) p-Aminoacetophenone
(C) 4-Chloro-2-nitroaniline (D) N-Ethyl-2-methylaniline

Ans. (D)



2° amine will not form diazonium salt

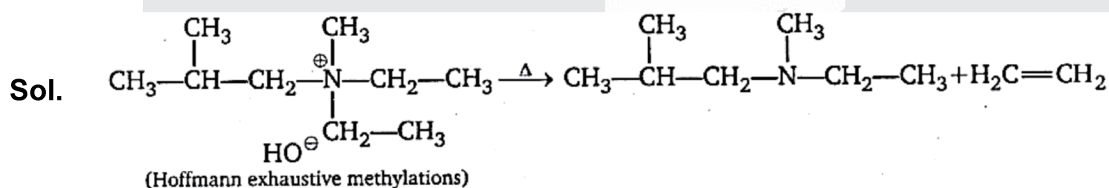
4. The major products obtained from the following sequence of reactions are:



- (A) $(\text{CH}_3)_2\text{CHCH}_2\text{NH}_2 + \text{H}_2\text{C} = \text{CH}_2$ (B) $(\text{CH}_3)_2\text{NCH}_2\text{CH}_3 + \text{H}_2\text{C} = \text{C}(\text{CH}_3)_2$

- (C) $(\text{CH}_3)_2\text{CHCH}_2 - \overset{\text{CH}_3}{\underset{\text{CH}_2\text{CH}_3}{\text{N}}} + \text{H}_2\text{C} = \text{CH}_2$ (D) $(\text{CH}_3)_3\text{N}^+\text{CH}_2\text{CH}_3 + \text{H}_2\text{C} = \text{CH}_2$

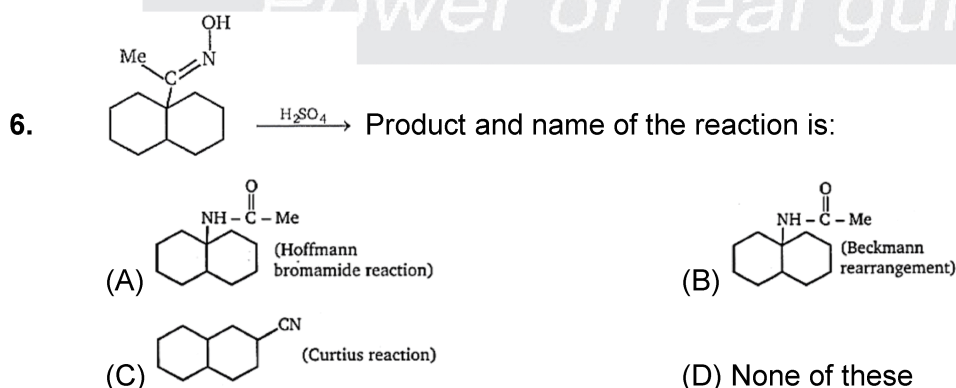
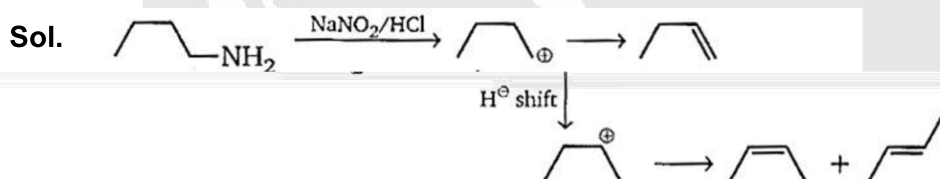
Ans. (C)



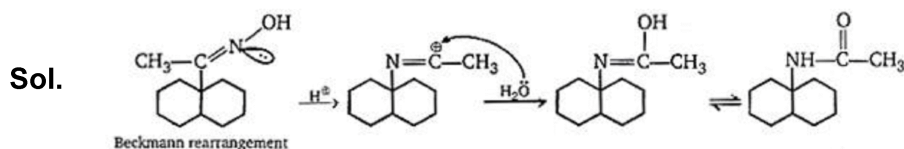
5. Deamination (or) diazotization of n-Bu-NH₂/HCl gives.....isomeric butene.

- (A) 2 (B) 3 (C) 4 (D) 5

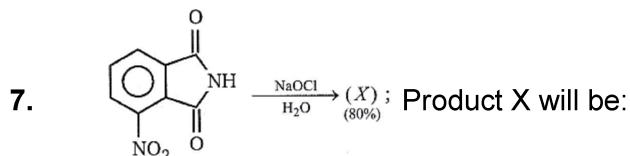
Ans. (B)



Ans. (B)

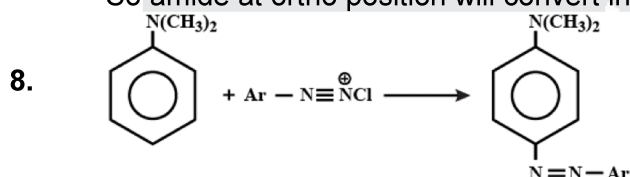


anti-group will migrate with respect of OH.



Ans. (C)

Sol. Nucleophile attack of the hydroxy group takes place at that carbonyl carbon of amide where electrophilicity is high. $-\text{NO}_2$ group decreases electron density at its -ortho and -para position. So amide at ortho position will convert into carboxylic acid while other will convert in to amine.



Above (C-N) coupling reaction take place at:

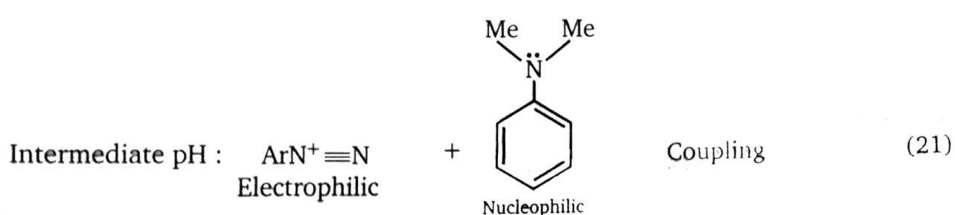
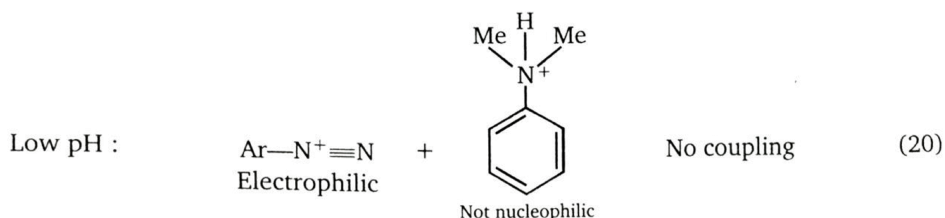
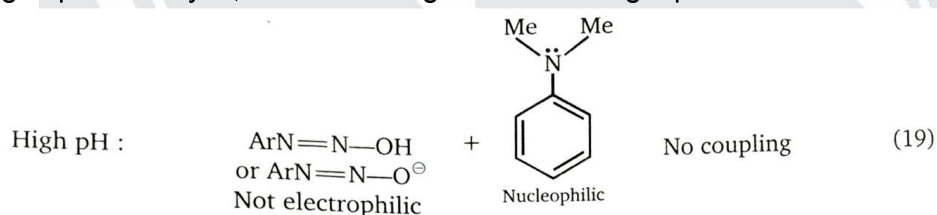
- (A) low pH (B) Intermediate pH (C) high pH (D) any pH

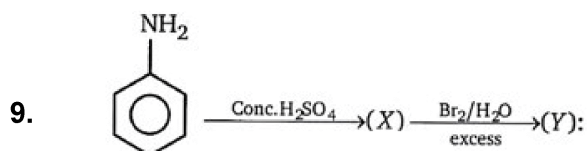
Ans. (B)

Sol. Effect of pH on the coupling reaction :

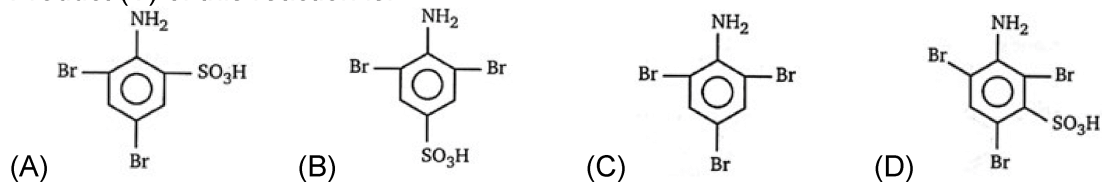
Coupling is best carried out in solutions that are neither too strongly acidic nor alkaline. The reasons for this can be seen if we examine a typical case, the coupling of benzenediazonium chloride with dimethylaniline.

At high pH, the diazonium ion is present in very low concentration, since most of it has been converted to $\text{ArN}=\text{N}-\text{OH}$ and $\text{ArN}=\text{N}-\text{O}^-$. Neither $\text{ArN}=\text{NOH}$ (the diazohydroxide) nor $\text{ArN}:\text{N}-\text{O}^-$ (the diazotate ion) is electrophilic, and does not couple with the amine. At low pH, the dimethylaniline will be largely protonated to $\text{ArN}^+\text{Me}_2\text{H}$, and thus the activating effect of the $-\text{NMe}_2$ group is destroyed, since the nitrogen atom no longer possesses an unshared pair of electrons:

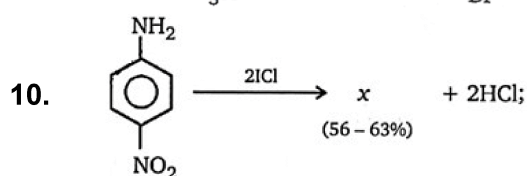
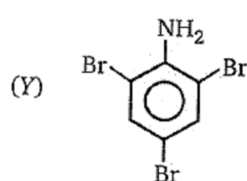
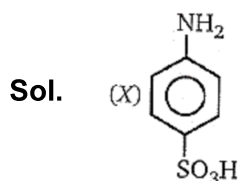




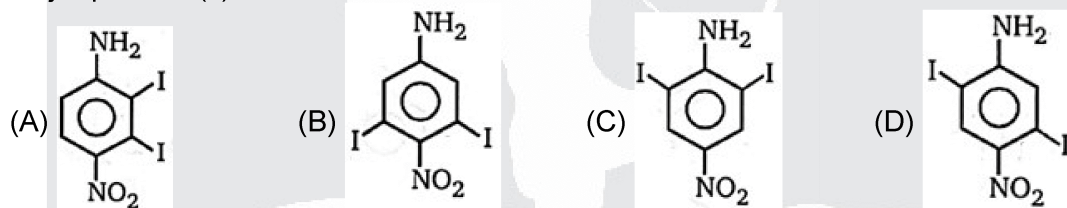
Product (Y) of this reaction is:



Ans. (C)

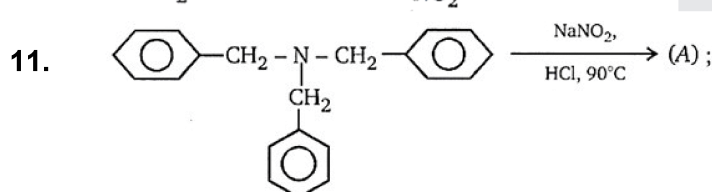
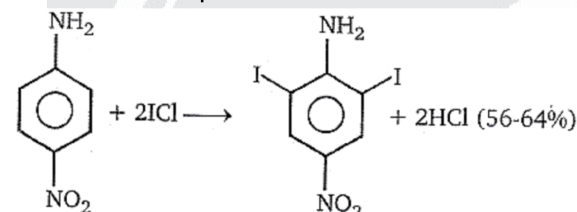


Major product (x) in this reaction is:

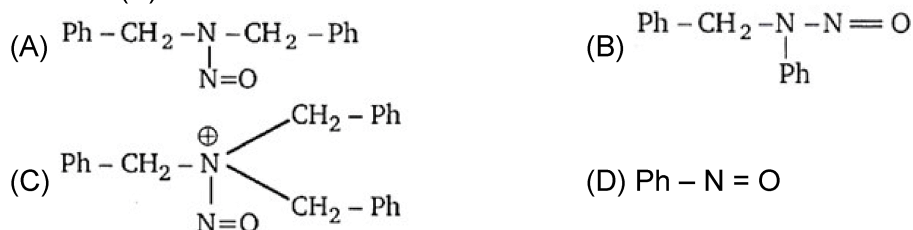


Ans. (C)

Sol. In the given reaction ICl gives I^+ and Cl^- so both -ortho position of the nitro-aniline is occupied by the electrophile I^+ .



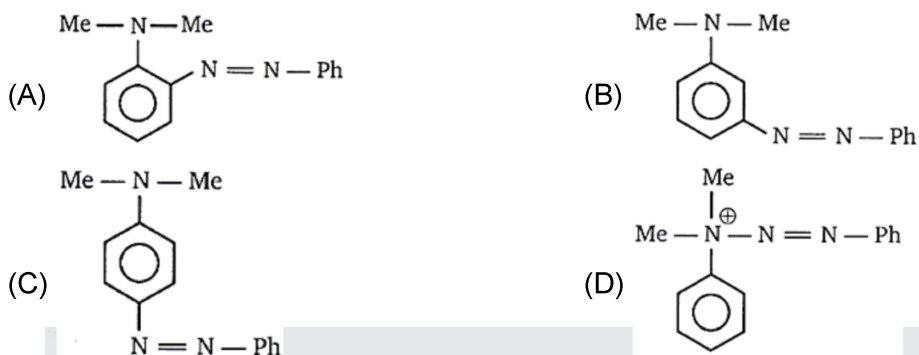
Product (A) is:



Ans. (C)

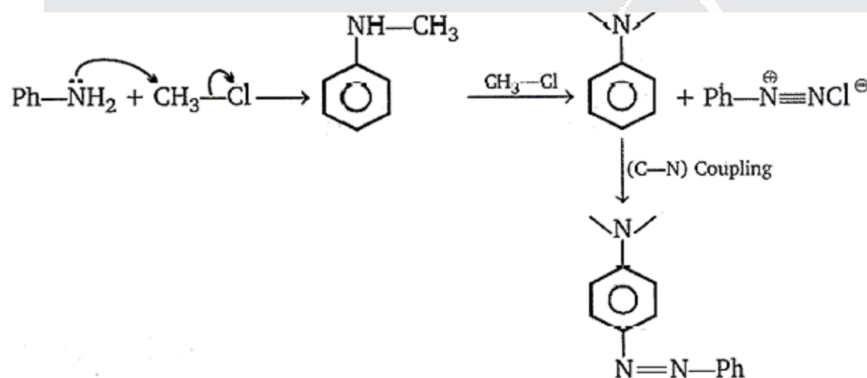
Sol. An interesting example of an internal coupling reaction is provided by the diazotisation of o-diaminobenzene:

12. $\text{Ph}-\text{NH}_2 \xrightarrow{\text{CH}_3-\text{Cl} (2 \text{ mole})} (\text{A}) \xrightarrow{\text{Ph}-\text{N}_2^+\text{Cl}^-} (\text{B})$ (major) Product of the above reaction is:
Butter yellow

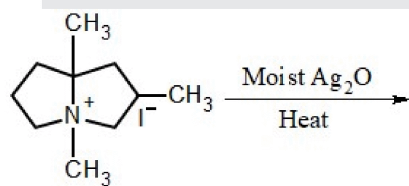


Ans. (C)

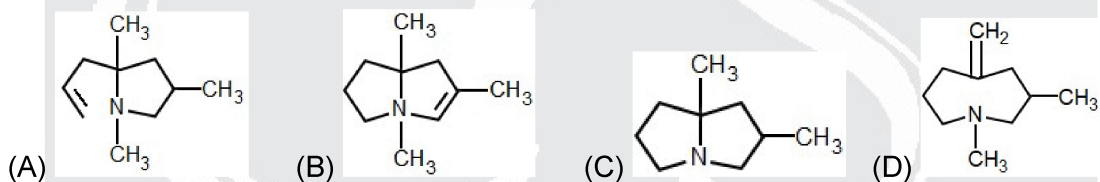
Sol.



- 13.



Product, the main product is :



Ans. (D)

Sol. Hoffmann's elimination.

14. During the Hinsbergs Test, which of the following primary amines is most likely to be detected as a secondary amine?

(A) MeNH_2

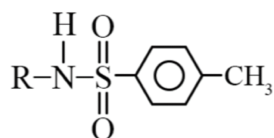
(B)

(C)

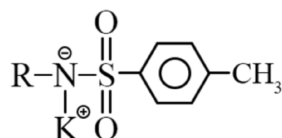
(D)

Ans. (D)

Sol. After formation of N substituted sulphonamide



With the Hinsbergs peagent, then solubility of the salt



Depends on the length of hydrophobic portion. A very long chain may cause non-dissolutions and the amine may therefore appear as secondary.

15. Statement-1: $\text{R}-\text{CO}-\text{NH}_2$ and $\text{R}-\text{CO}-\text{ND}_2$ on treating with KOH produce the same product $\text{R}-\text{NH}_2$

Statement-2: In both the reactions the intermediate is $\text{R}-\text{N}=\text{C}=\text{O}$

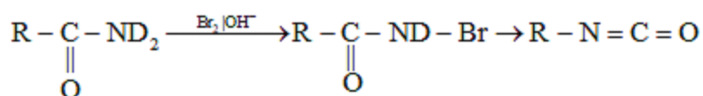
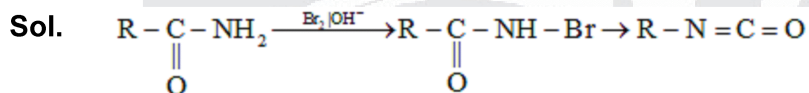
(A) Statement 1 is True, Statement 2 is True; Statement 2 is a correct explanation for Statement 1

(B) Statement 1 is True, Statement 2 is True; Statement 2 is NOT a correct explanation for Statement 1.

(C) Statement – 1 is True, Statement – 2 is False

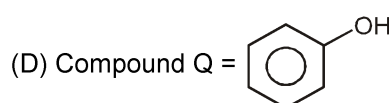
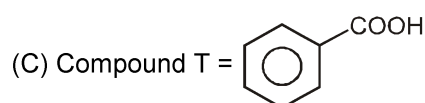
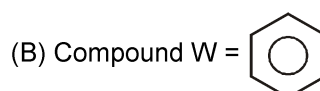
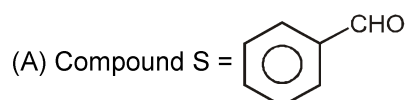
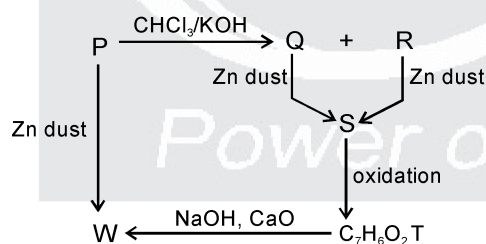
(D) Statement – 1 is False, statement – 2 is True.

Ans. (A)



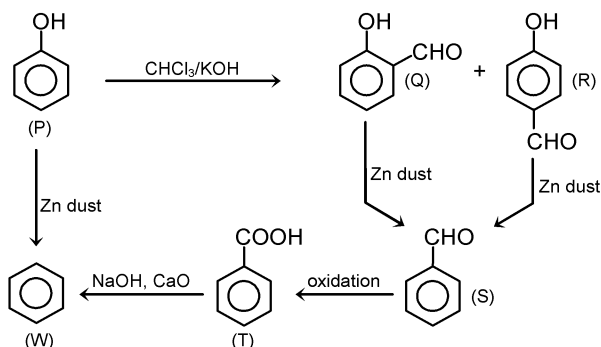
MCQ

16.

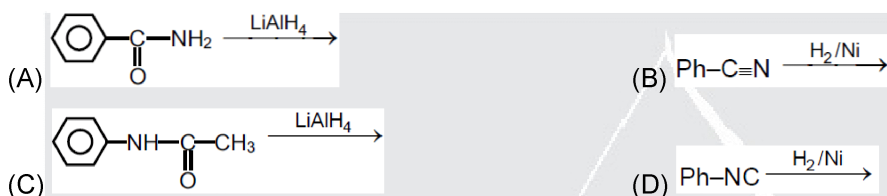


Ans. (ABC)

Sol.

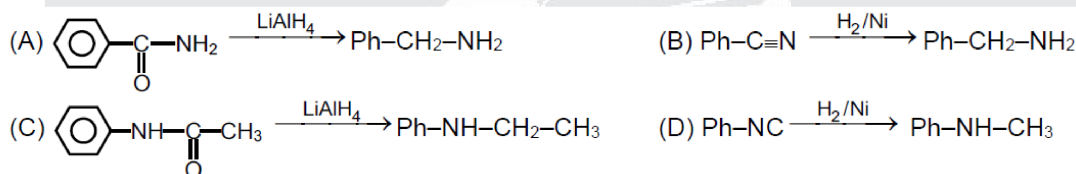


17. Find out the reaction in which obtained product will give positive isocyanide test :



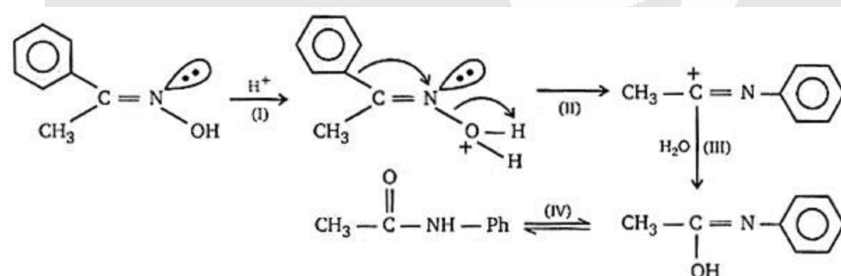
Ans. (AB)

Sol.



Comprehension

18. Given is mechanism of Beckmann rearrangement.



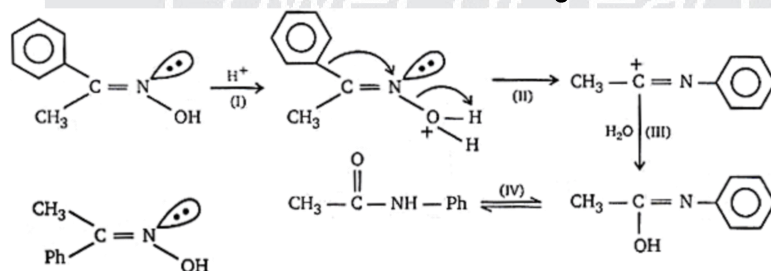
Rate determining step in Beckmann rearrangement:

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

Ans. (B)

Sol. Alkyl group anti migration is RDS

19. Given is mechanism of Beckmann rearrangement.



On treatment H_2SO_4 followed by hydrolysis in acidic medium above compound gives.

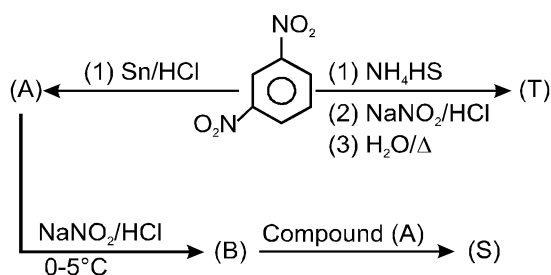
(A) $\text{CH}_3\text{-CO}_2\text{H}$, Ph-NH_2 (B) $\text{CH}_3\text{-NH}_2$, $\text{Ph-CO}_2\text{H}$
 (C) $\text{Ph-CH}_2\text{-NH}_2$ + $\text{Ph-CO}_2\text{H}$ (D) $\text{Ph-CO}_2\text{H}$ + $\text{CH}_3\text{-CO}_2\text{H}$

Ans. (A)

Paragraph for Question Nos. 20 to 22

Observe the following reactions and answer the following questions.

(Aromatic, T)



20. The Product S can be :

- (A) White compound (B) Blue compound
(C) Red Brown compound (D) Colourless liquid

Ans. (C)

21. For Product (T), The correct statement is :

- (A) Turns Red litmus blue (B) Turns FeCl_3 (Neutral) into coloured solution
(C) Gives Friedel-Craft-Alkylations reaction (D) Contains two 'N' atoms

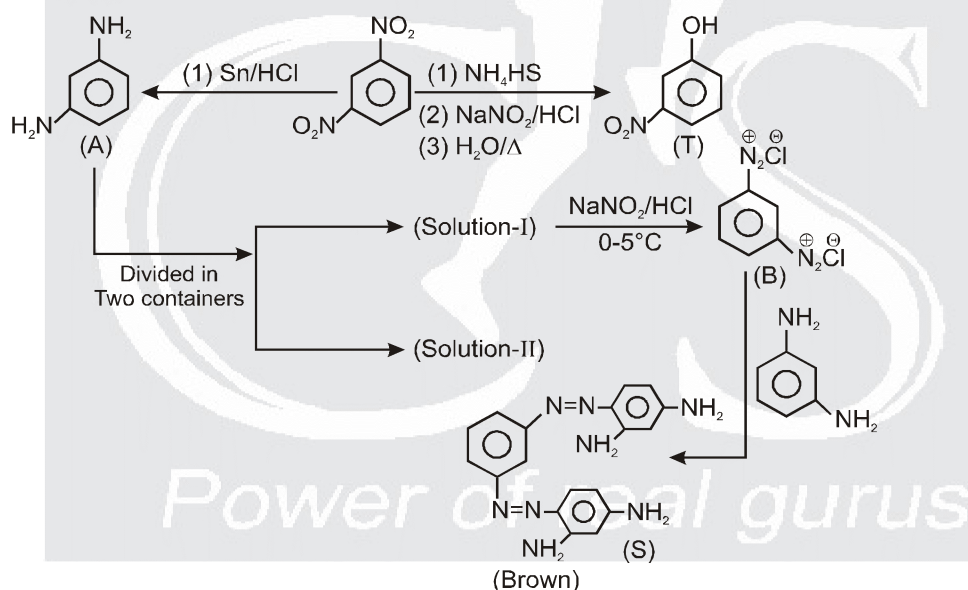
Ans. (B)

22. The product B on heating with H_2O produces :

- (A) m-cresol (B) Resorcinol (C) Salicylic acid (D) Salicylaldehyde

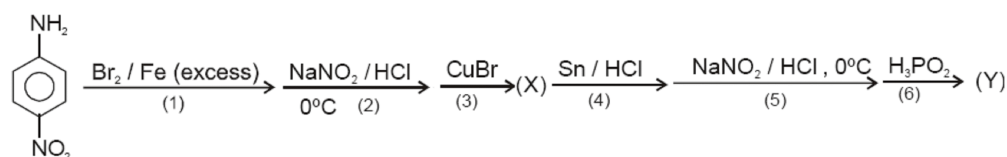
Ans. (B)

Sol. (20 to 22)

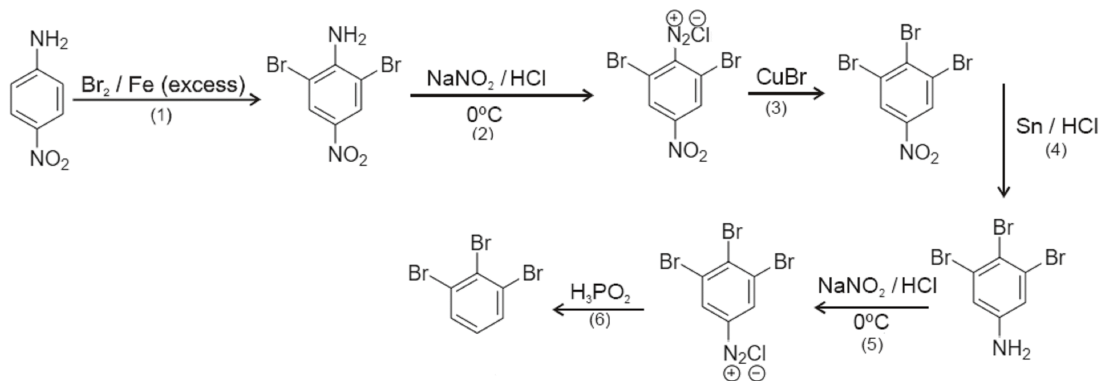


Subjective

23. Observe the following synthesis

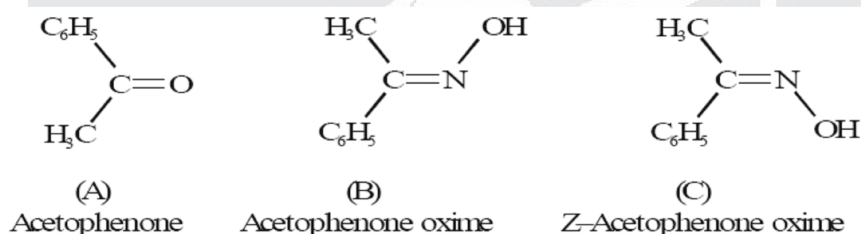


Sol.



24. Compound (A) having M.F. C_8H_8O on treatment with $NH_2OH.HCl$ gives (B) and (C). (B) and (C) rearrange to give (D) and (E), respectively on treatment with acid. Compounds (B), (C), (D) and (E) are all isomers of molecular formula C_8H_9NO . When (D) is boiled with alcoholic KOH, an oil (F) C_6H_7N separated out. (F) reacts rapidly with CH_3COCl to give back (D). On the other hand, (E) on boiling with alkali followed by acidification gives a white solid (G), $C_7H_6O_2$. Identify the compounds (A) to (G).

Sol.

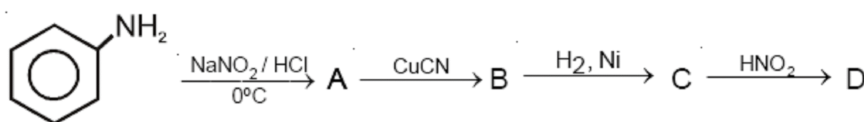


25. Two isomeric compounds (A) and (B) have $C_4H_{11}N$ as molecular formula. Both on separately treating with HNO_2 lose their N_2 producing two isomeric alcohols (C) and (D) respectively of molecular formula $C_4H_{10}O$. (C) reacts with Lucas reagent immediately and on oxidation. (D) does not react with Lucas reagent in cold but can be easily oxidized. Complete methylation of either (A) or (B) is made which on decomposition does not produce 1-butene. Identify A to D.

Sol. A = $(CH_3)_3C-NH_2$, B = $(CH_3)_2CH-CH_2-NH_2$

C = $(CH_3)_3C-OH$, D = $(CH_3)_2CHCH_2OH$

26. Aniline in a set of reaction yield a product D. The structure of products A, B, C, D would be:



Sol. A: $C_6H_5N_2^+Cl^-$ B: C_6H_5CN C: $C_6H_5CH_2NH_2$ D: $C_6H_5CH_2OH$