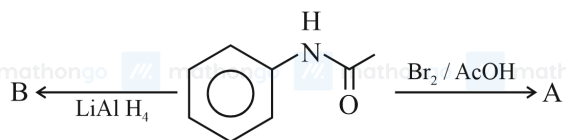
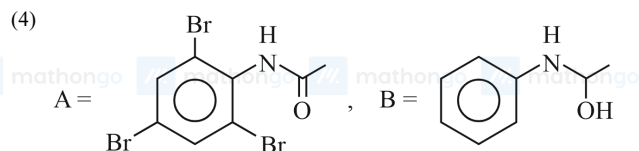
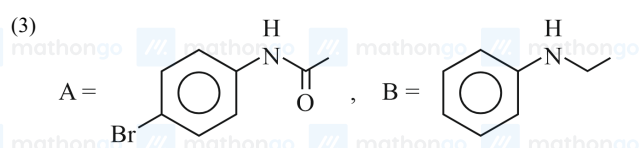
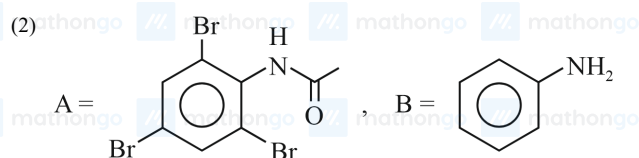
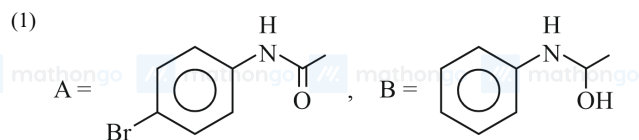


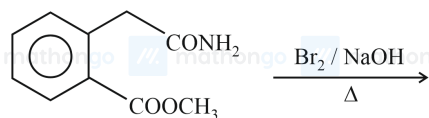
1. The major products A and B from the following reactions are :



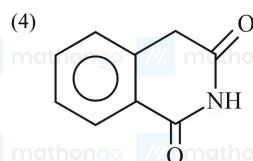
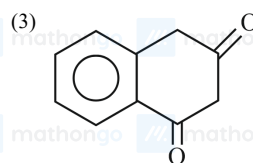
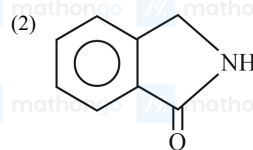
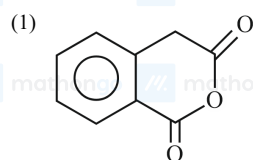
[2023 (06 Apr Shift 1)]

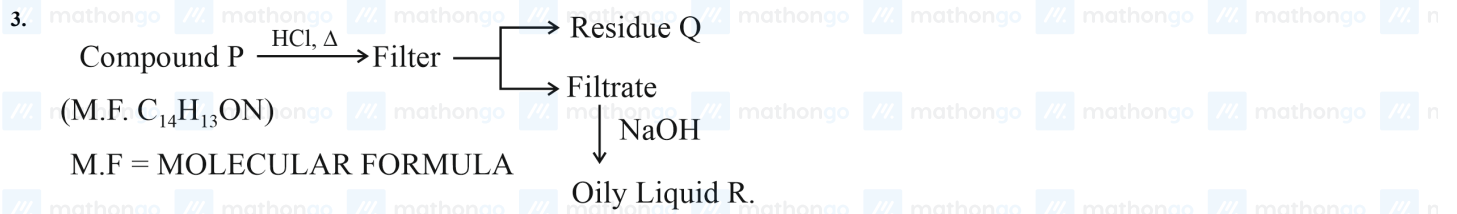


2. The major product formed in the following reaction is



[2023 (06 Apr Shift 1)]

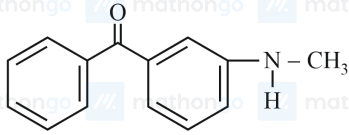




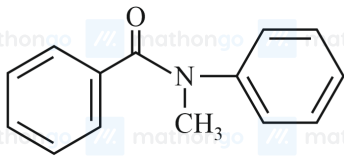
Compound P is neutral, Q gives effervescence with  $\text{NaHCO}_3$  while R reacts with Hinsberg's reagent to give solid soluble in  $\text{NaOH}$ . Compound P is

[2023 (06 Apr Shift 1)]

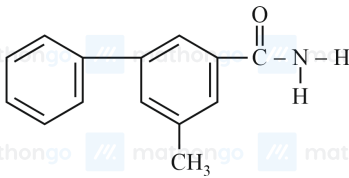
(1)



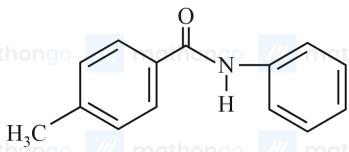
(2)



(3)



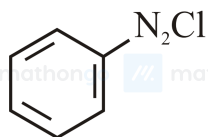
(4)



4. Number of isomeric aromatic amines with molecular formula  $\text{C}_8\text{H}_{11}\text{N}$ , which can be synthesized by Gabriel Phthalimide synthesis is \_\_\_\_\_.

[2023 (06 Apr Shift 2)]

5. Match List I with List II:



It reacts with reagents in List I to form products in List II.

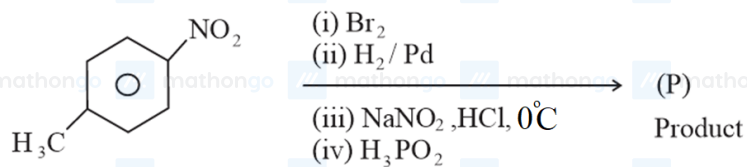
List I (Reagent)		List II (Product)	
A.	I.		
B. $\text{HBF}_4, \Delta$	II.		
C. $\text{Cu, HCl}$	III.		
D. $\text{CuCN/KCN}$	IV.		

Choose the correct answer from the options given below:

[2023 (08 Apr Shift 1)]

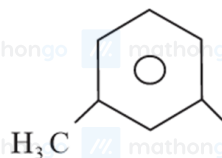
- (1) A-IV, B-III, C-II, D-I
- (2) A-III, B-I, C-II, D-IV
- (3) A-I, B-III, C-IV, D-II
- (4) A-III, B-I, C-IV, D-II

6. The product (P) formed from the following multistep reaction is:

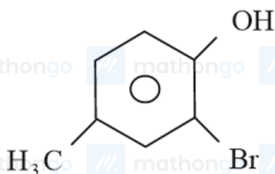


[2023 (08 Apr Shift 2)]

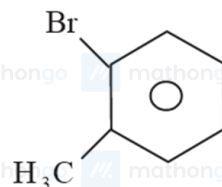
(1)



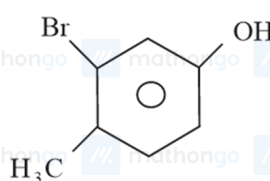
(2)



(3)



(4)





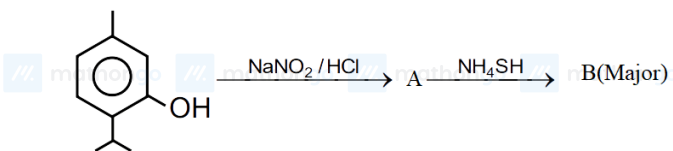
8. o-Phenylenediamine  $\xrightarrow{\text{HNO}_2}$  'X'  
Major Product

'X'

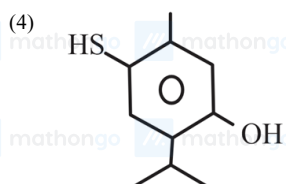
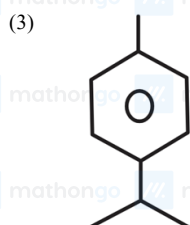
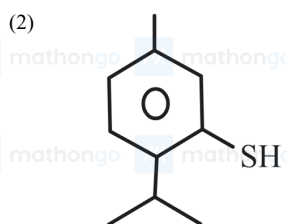
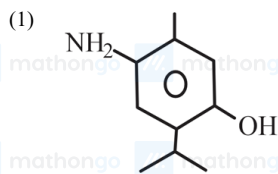
[2023 (11 Apr Shift 1)]



9. Compound 'B' is

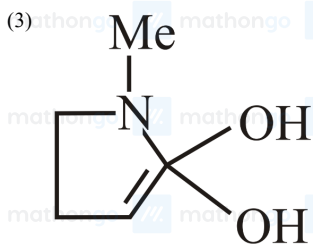
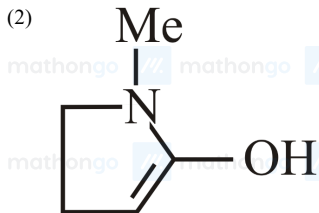
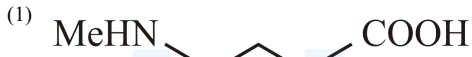


[2023 (11 Apr Shift 2)]

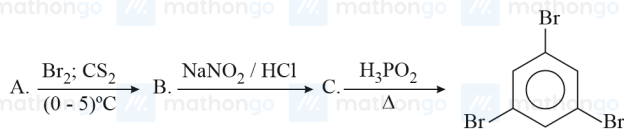




[2023 (13 Apr Shift 1)]



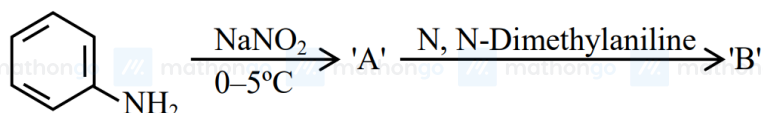
11. Compound A from the following reaction sequence is :



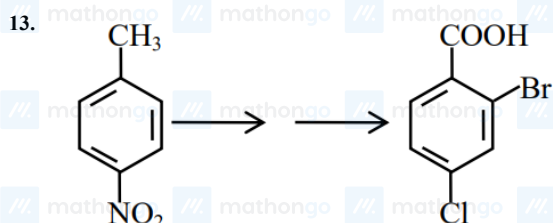
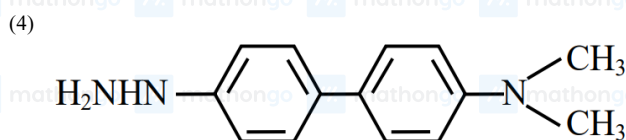
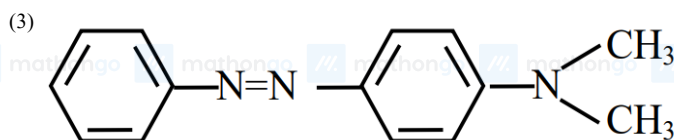
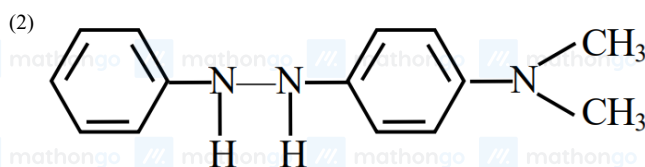
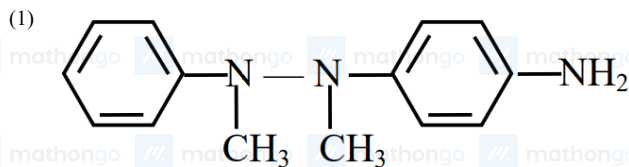
[2023 (13 Apr Shift 2)]

- (1) Benzoic Acid
- (2) Aniline
- (3) Salicylic Acid
- (4) Phenol

12. Consider the following sequence of reactions



The product 'B' is  
[2023 (15 Apr Shift 1)]



In the above conversion the correct sequence of reagents to be added is  
[2023 (15 Apr Shift 1)]

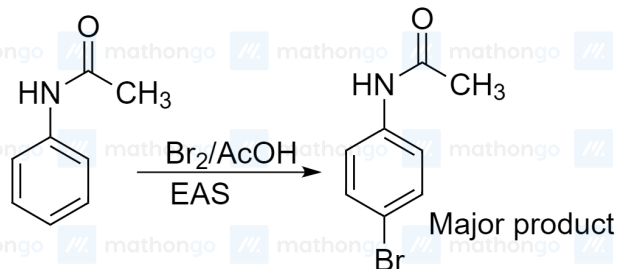
- (1) (i)  $\text{KMnO}_4$ , (ii)  $\text{Br}_2/\text{Fe}$ , (iii)  $\text{Fe}/\text{H}^+$ , (iv)  $\text{Cl}_2$
- (2) (i)  $\text{Br}_2/\text{Fe}$ , (ii)  $\text{Fe}/\text{H}^+$ , (iii)  $\text{KMnO}_4$ , (iv)  $\text{Cl}_2$
- (3) (i)  $\text{Fe}/\text{H}^+$ , (ii)  $\text{HONO}$ , (iii)  $\text{CuCl}$ , (iv)  $\text{KMnO}_4$  (v)  $\text{Br}_2$
- (4) (i)  $\text{Br}_2/\text{Fe}$ , (ii)  $\text{Fe}/\text{H}^+$ , (iii)  $\text{HONO}$ , (iv)  $\text{CuCl}$  (v)  $\text{KMnO}_4$

ANSWER KEYS

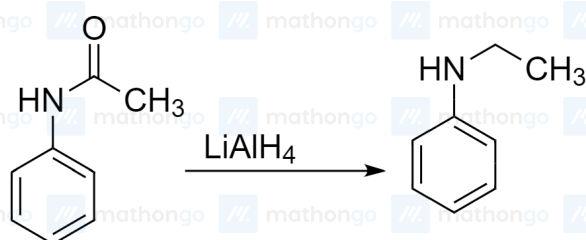
1. (3)      2. (2)      3. (4)      4. (5)      5. (4)      6. (3)      7. (4)      8. (1)  
9. (1)      10. (1)      11. (4)      12. (3)      13. (4)

1. (3)

Acetanilide undergoes electrophilic bromination with bromine in acetic acid. p-bromoacetanilide is the major product in this reaction.

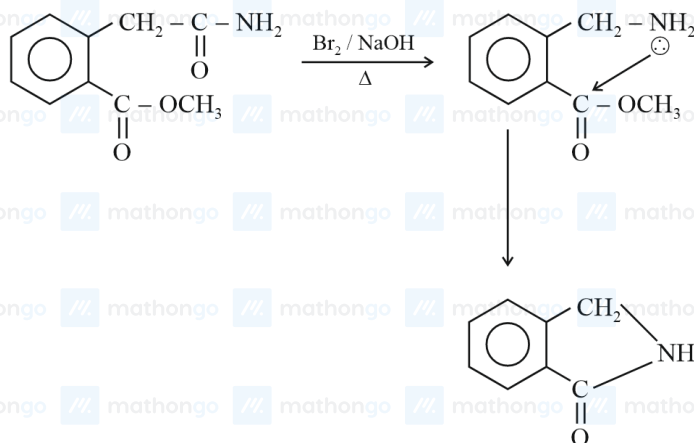


Acetanilide undergoes reduction reaction with lithium aluminium hydride.



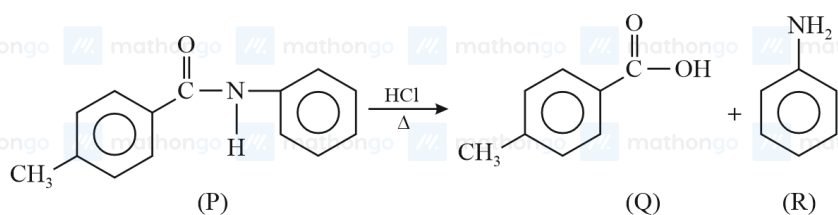
2. (2)

When an amide is treated with bromine in an aqueous or ethanolic solution of sodium hydroxide, degradation of amide takes place leading to the formation of primary amine. This reaction involves the degradation of amide and is popularly known as Hoffmann bromamide degradation reaction. In the given molecule, amide part converts to amine with bromine in sodium hydroxide. Now, nucleophilic acyl substitution reaction takes place to get the final product as shown below.



3. (4)

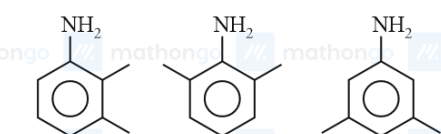
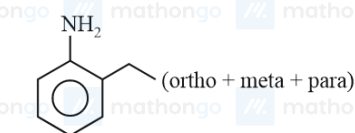
Q is giving effervescence with sodium bicarbonate, it means Q contain carboxylic acid functional group. The compound R is reacting with Hinsberg's reagent and giving solid which soluble in sodium hydroxide means R contain primary amine functional group. Hence, The compound P can be a secondary amide. The overall reaction is shown below.



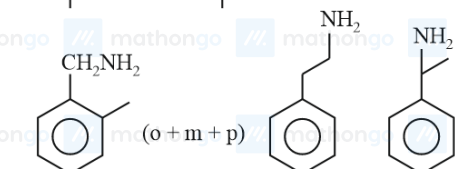
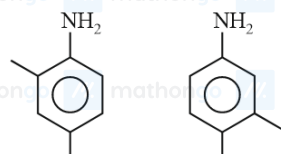
4. (5)



Degree of unsaturation = 4, The degree of unsaturation indicates the total number of pi bonds and rings within a molecule which makes it easier for one to figure out the molecular structure



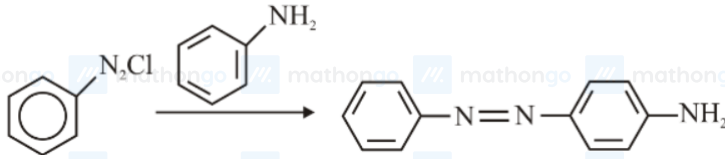
Aniline derivatives cannot be prepared by Gabriel phthalimide synthesis



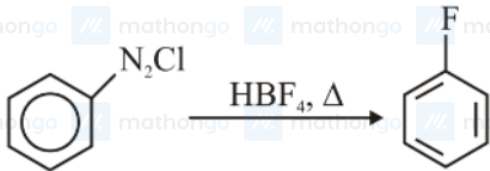
So, number of aromatic amines = 5

5. (4)

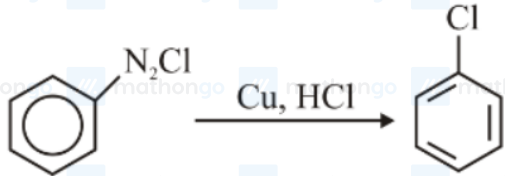
Coupling reaction between benzene diazonium chlorides with aniline in acidic medium takes place to give yellow colour. In this reaction the nitrogen  $N_2$  in the diazonium ion is lost and forms the bridge between two benzene rings forming an electrophilic substitution reaction.



Fluoro benzene is prepared by treating benzene diazonium chloride with fluoro boric acid. This reaction produces diazonium fluoroborate which on heating produces fluorobenzene. This reaction is called Balz-Schiemann reaction.



Gattermann reaction is used for obtaining chlorobenzene from benzenediazonium chloride by treating it with  $Cu/HCl$  respectively.

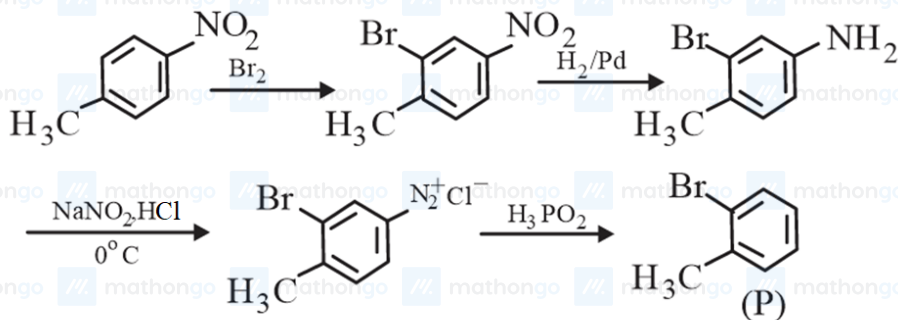


Similarly, Benzene diazonium chloride solution on reaction with cuprous cyanide and potassium cyanide gives benzonitrile. This reaction is known as Sandmeyer's reaction.



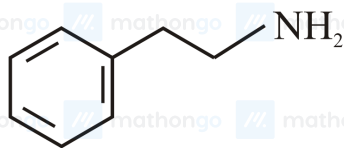
6. (3)

The first step of the sequence is involved with electrophilic substitution reaction. Nitro group is deactivating group and methyl group is activating group, hence, the substitution reaction takes place with respect to methyl group. In the second step nitro group is reduced to amine group with hydrogen in the presence of palladium metal. The aniline undergo diazotisation in the third step. The diazonium salt loses nitrogen gas in the presence of  $H_3PO_2$ .

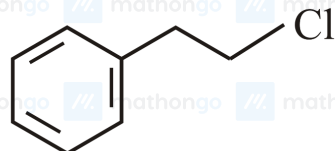


7. (4)

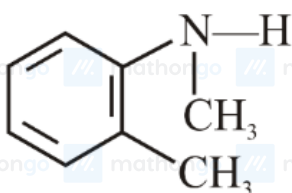
The isomers of  $C_8H_{11}N$ , that can be prepared by Gabriel phthalimide synthesis are primary amines.



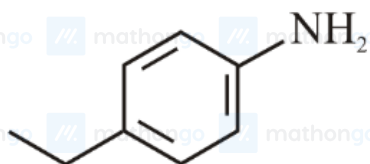
can be prepared by Gabriel phthalimide synthesis because  $S_N2$  is possible in



Secondary amines react with Hinsberg's reagent to give solid insoluble in NaOH. Hence, Q is the secondary amine

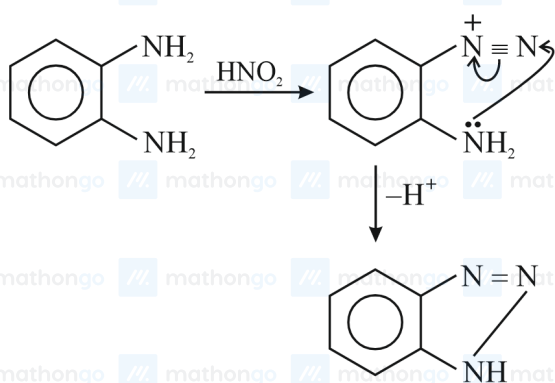


Aromatic amines like aniline give diazonium salts. The diazonium salt used in diazo coupling to get red dye with beta Naphthol in sodium hydroxide. Hence, R is aromatic amine as shown below.



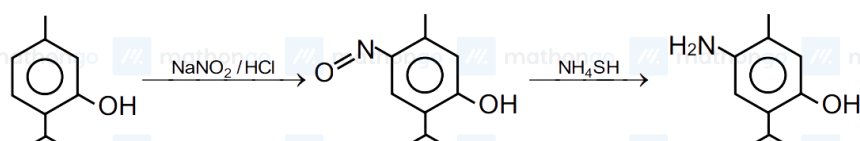
8. (1)

Benzotriazole can be prepared by treating o-phenylenediamine with nitrous acid (liberated during the reaction between sodium nitrite and acetic acid) to form mono-diazonium salt that follows spontaneous intramolecular cyclization reaction to produce benzotriazole.



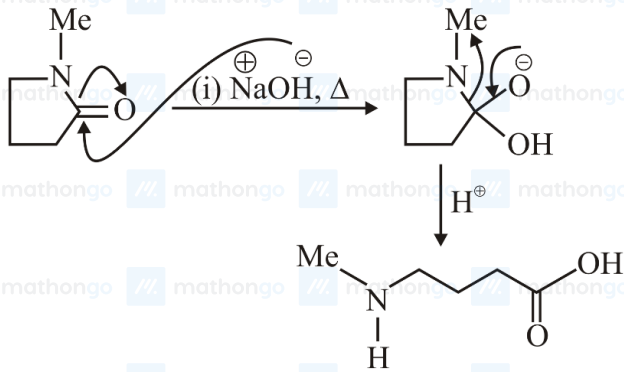
9. (1)

Nitrous acid gives nitrosonium ion as electrophile ( $NO^+$ ) which attacks phenol at less hindered p-position of form p-nitrosophenol. The nitroso group undergo reduction and forms amine in the presence of  $NH_4SH$ .



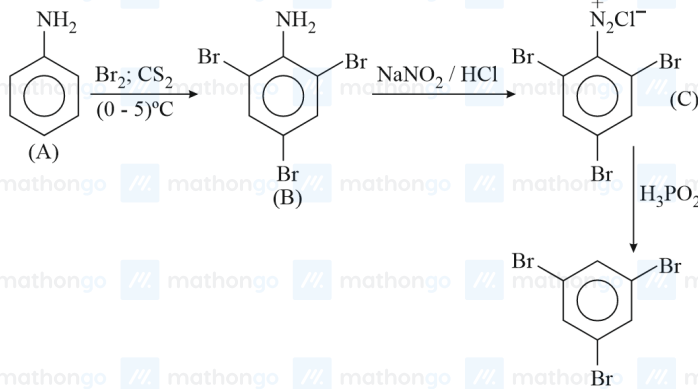
10. (1)

The mechanism of basic amide hydrolysis begins with the nucleophilic addition of a hydroxide ion at the carbonyl carbon creating a tetrahedral alkoxide intermediate. In the given case ring opening reaction takes place. On acidification, we get a secondary amino acid.



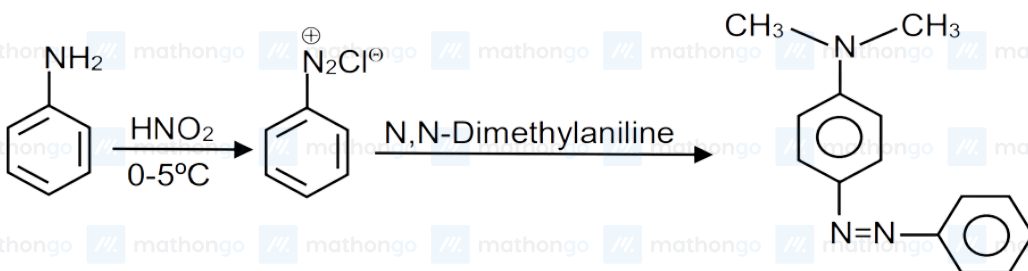
11. (4)

When aniline treated with bromine, the reaction results in the formation of 2,4,6-tribromo phenylamine. This reaction is an example of bromination. The process of conversion of a primary aromatic amino compound into a diazonium salt is known as diazotization. This process is carried out by adding an aqueous solution of sodium nitrite to a solution of primary aromatic amine (e.g., aniline) in excess of HCl at a temperature below 5 °C. Benzene diazonium chloride reacts with  $H_3PO_2$  in aqueous medium to form benzene.



12. (3)

The reaction of aniline (aromatic amine) with nitrous acid results in the diazonium salt formation which is benzene diazonium chloride. When benzene diazonium chloride reacts with N, N - dimethyl aniline at ice cold condition gives p - dimethyl aminoazobenzene. It is an example of coupling reaction.



13. (4)

The required product can be obtained by the following method. In this method nitro toluene is subjected to bromination, bromo group is substituted at ortho position to the methyl as it is more activating group. Then nitro group is reduced to amine group with iron metal in acid. The amine group undergoes diazotisation with nitrous acid. The diazonium group is replaced with chloro group in the presence of cuprous chloride. Finally, methyl group is oxidised in the presence of potassium permanganate.

