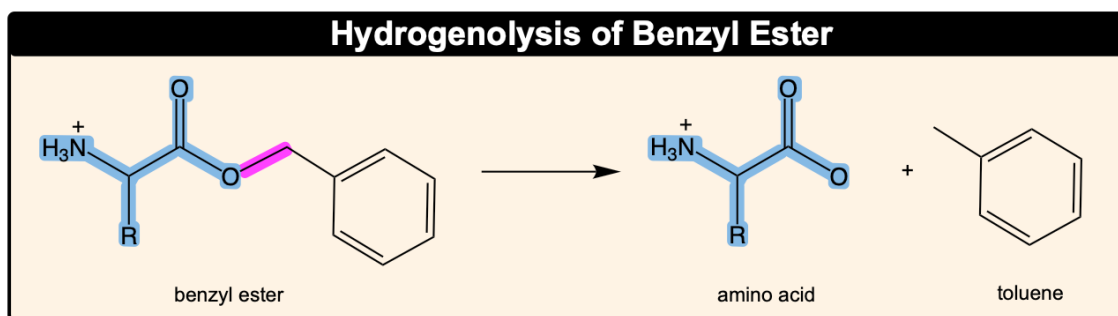


CONCEPT: REACTIONS OF AMINO ACIDS: HYDROGENOLYSIS

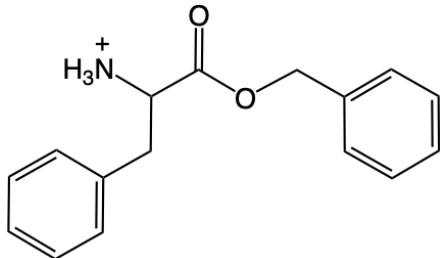
- Benzyl esters and *N*-benzyloxycarbonyl derivatives can be broken down by *hydrogenolysis*.
 - **Hydrogenolysis:** cleavage of _____ through catalytic hydrogenation.

Hydrogenolysis of Benzyl Esters

- The _____ bond is cleaved to produce amino acid and toluene.

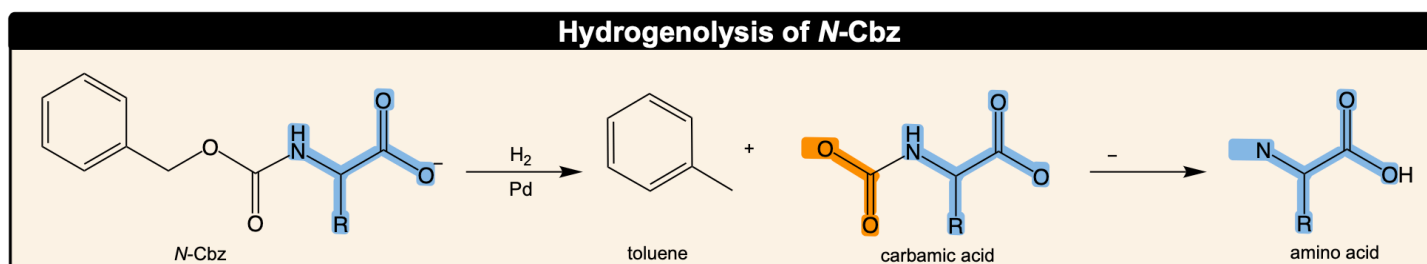


EXAMPLE: Write a reaction of hydrogenolysis of phenylalanine benzyl ester.



Hydrogenolysis of *N*-benzyloxycarbonyl

- *N*-benzyloxycarbonyl (_____) is first cleaved into toluene and _____ carbamic acid.
 - Carbamic acid is then immediately _____ carboxylated to produce amino acid.



CONCEPT: REACTIONS OF AMINO ACIDS: HYDROGENOLYSIS

EXAMPLE: Provide all products, including the intermediate, of hydrogenolysis of N-benzyloxycarbonyl aspartate.

