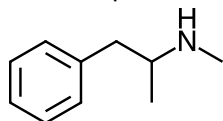


Chem 12B Objective 15. Apply acid-base, substitution, and elimination principles to amines.

1. Methamphetamine is a stimulant.



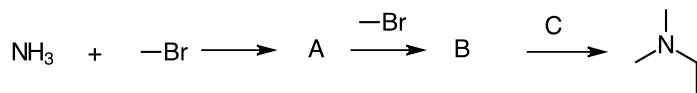
methamphetamine

- Draw the conjugate acid of methamphetamine.
- Estimate the  $pK_a$  of the conjugate acid of methamphetamine.
- At physiological pH of 7.4, does methamphetamine have a charge of 0 or +1? Give reasons.

2. Methyl amine is a stronger base than aniline ( $C_6H_5NH_2$ ). Remember from Objective 11 that "A weak base is more stable and less reactive (does not want to donate its  $H^+$ ) than a strong base." Explain why aniline is more stable than methyl amine.

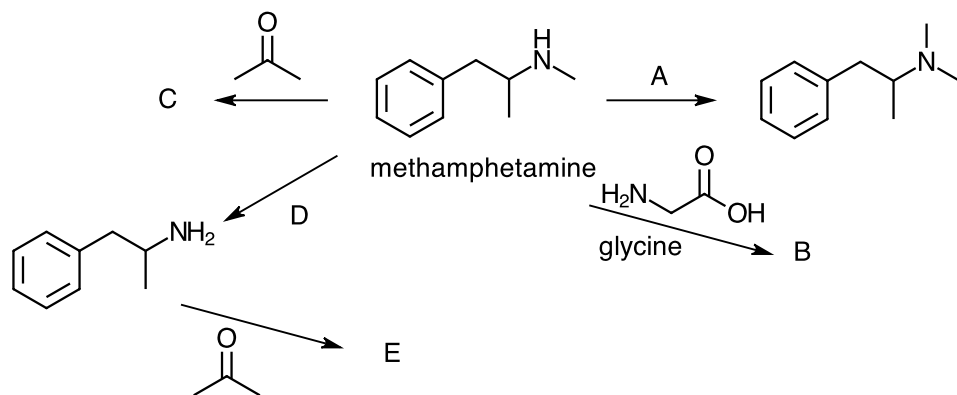
3. Dimethyl amine smells like fish. Why is lemon juice used on fish? Could you use vinegar to do the same thing? Show what happens with a chemical reaction. Identify the reaction type.

4. Draw the structures of A, B, and C. Use curved arrows to show how A, B, and the  $3^\circ$  amine form.

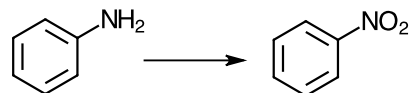


5. Methamphetamine has two alpha carbons.

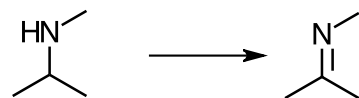
- Circle each alpha carbon.
- Identify Reagent A.
- (i) Methamphetamine reacts with glycine. Draw the structure of B.  
(ii) This reaction is faster with an acid catalyst. Use curved arrows to show how the acid catalyst participates in this reaction.
- (i) Methamphetamine reacts with acetone. Draw the structure of C.  
(ii) This reaction is faster with an acid catalyst. Use curved arrows to show how the acid catalyst participates in this reaction.
- Methamphetamine is a  $2^\circ$  amine. Show how you would convert this  $2^\circ$  amine to a  $1^\circ$  amine (D). Hint: make a better leaving group and then do a substitution reaction.
- Show how the  $1^\circ$  amine reacts with acetone and an acid catalyst to form E.



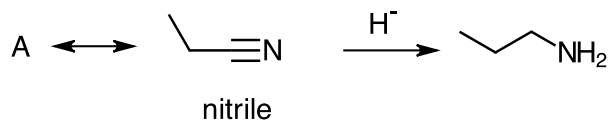
6. a. Is this reaction an oxidation or reduction? Suggest a reagent for this reaction.



b. Is this reaction an oxidation or reduction? Determine the number of H's and O's gained/lost to support your answer.



c. Nitriles (RCN) can be reduced with  $\text{LiAlH}_4$  (but not the weaker reducing agent  $\text{NaBH}_4$ ) to an amine. If you have used nitrile gloves, you've used a nitrile.

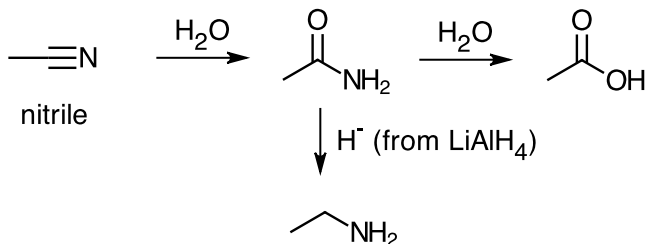


a. The C triple bonded to N is like a carbonyl carbon and acts like a \_\_\_\_\_. This means nitriles undergo nucleophilic \_\_\_\_\_ reactions.

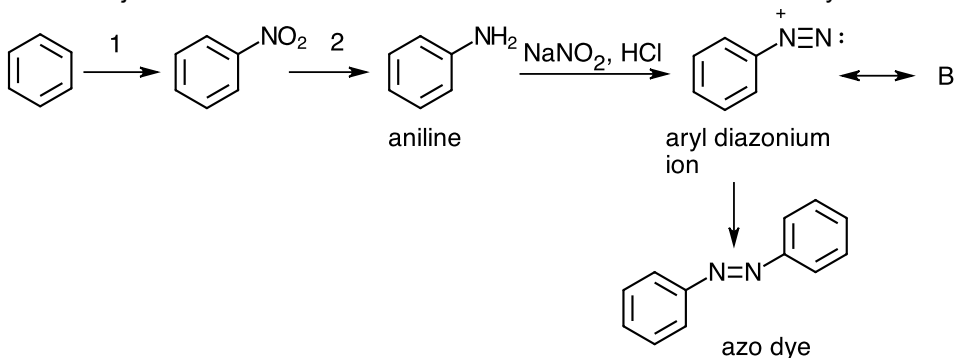
b. Draw resonance structure A to support your answer to part a.

c. The hydride part ( $\text{H}^-$ ) of  $\text{LiAlH}_4$  is the reducing agent part of this reducing agent. Use curved arrows to show how hydride reacts with the nitrile shown to form the amine.

d. Use curved arrows to show how each compound forms. Use  $\text{H}_3\text{O}^+$  as needed. What is the leaving group in each reaction?



7. See Objective 15 Lecture Slides 15 and 16 on aromatics and the aryl diazonium ion.



a. Determine Reagent 1.

b. Determine Reagent 2.

c. What reaction type is aniline  $\rightarrow$  aryl diazonium ion? What type of reagent is  $\text{NaNO}_2$ ?

d. Draw resonance structure B. (This structure will help you with 7e.)

e. The aryl diazonium ion reacts with benzene to form an azo dye. Use curved arrows to show how benzene reacts with the aryl diazonium ion to form the azo dye.

8. The aryl diazonium ion is an intermediate to make phenol,  $\text{C}_6\text{H}_5\text{OH}$ .

a. Starting from benzene, propose a synthesis of phenol.

b. Starting from phenol, propose a synthesis of salicylic acid.

