Organic Chemistry II CHM 3150

Dr. Laurie S. Starkey, Cal Poly Pomona

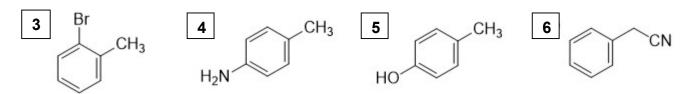




Ch. 18, Aromatic Rxns & Ch. 22 Diazonium Salts (Ch 17/18 Part 4) - Practice Problems

2 Predict the major product and provide a mechanism for the following reaction.

3-6 Prepare each of the following target molecules from **toluene**.



7-9 Prepare each of the following target molecules from **toluene**.

$$\begin{array}{c|c} & & & & \\ \hline \\ & & & \\ \hline \end{array} \begin{array}{c} & & \\ & & \\ \hline \\ & & \\ \hline \\ & & \\ \end{array} \begin{array}{c} & & \\ & \\ \\ & \\ \end{array} \begin{array}{c} & \\ & \\ \\ \end{array} \begin{array}{$$

Explain the observed regiochemistry of the mononitration product, using drawings to support your explanation. (*Hint: note the acidic reaction conditions!*) There are several possible dinitration products, but only one is observed. Propose a structure of the dinitration product, and explain why that is the only one expected to form.

Predict the major product.

1 HNO_3 $NaNO_2$ H_2 CuBr H_2SO_4 HC1 Pd AlCl₃ Вŗ Br NHAc NHAc B) A) Вr Вr NHAc C) NHAc D) Β'n Вr NHAc E)

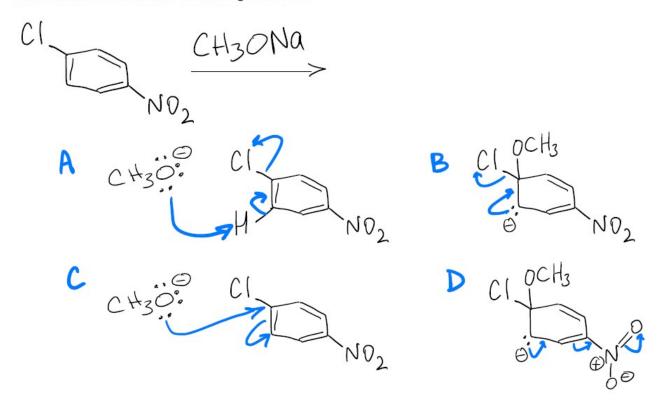
2a

Predict the major product.

A)
$$OCH_3$$
 C CI OCH_3 CH_3O OCH_3 CH_3O OCH_3 CH_3O OCH_3 OCH_3

2b

Which of the following is NOT a likely step (or likely resonance) in the mechanism of the following reaction?



3

Provide the reagents necessary to transform the given starting material into the desired product.

- A) Br_2 , $FeBr_3$
- B) 1) SO₃ H₂SO₄
- C) CuBr
- D) 1) SO₃ H₂SO₄
- E) Br_2 , hv

- 2) Br₂, FeBr₃
- 3) H_3O^+

- 2) CuBr
- 3) H_3O^+

Provide the reagents necessary to transform the given starting material into the desired product.

- A) NaNO₂, HCl
- B) 1) HNO₃ H₂SO₄ 2) H₂, Pd
- C) 1) Br₂, FeBr₃ 2) NaNH₂

C) 1) Br₂, FeBr₃

2) NaOH

D) 1) Br₂, hv 2) NaNH₂

Provide the reagents necessary to transform the given starting material into the desired product.

- A) 1) HNO₃ H₂SO₄
 - 2) NaNO2, HCl
 - 3) H_3O^+
- B) 1) HNO₃
 - H_2SO_4
 - 2) H₂, Pd
 - 3) NaNO₂, HCl
 - 4) H_3O^+

- D) 1) Br₂, hv
 - 2) NaOH

Provide the reagents necessary to transform the given starting material into the desired product.

- A) 1) Br₂, hv
 - 2) NaNO2, HCl
 - 3) CuCN
- \mathbf{B}) 1) Br_2 , FeBr_3
 - 2) NaNO₂, HCl
 - 3) CuCN
- C) 1) Br_2 , $FeBr_3$
 - 2) NaCN
- D) 1) Br₂, hv
 - 2) NaCN

D) 1) Br₂, FeBr₃

2) NaCN

Provide the reagents necessary to transform the given starting material into the desired product.

- A) 1) HNO₃ H₂SO₄
 - 2) NaNO₂, HCl
 - 3) CuCN
- B) 1) Br₂, FeBr₃
 - 2) NaNH₂
 - 3) NaNO₂, HCl
 - 4) CuCN
- C) 1) HNO₃
 - H_2SO_4
 - 2) Zn, HCl
 - 3) NaOH
 - 4) NaNO₂, HCl
 - 5) CuCN

Provide the reagents necessary to transform the given starting material into the desired product.

- A) 1) Br₂, hv
 - 2) Mg
 - 3) CO₂
 - 4) H_3O^+
 - 5) Cl₂, FeCl₃
- B) 1) Cl₂, FeCl₃
 - 2) Br₂, hv
 - 3) Mg
 - 4) CO₂
 - 5) H_3O^+
- C) 1) Na₂Cr₂O₇ H_2SO_4
 - 2) Cl₂, FeCl₃
- D) 1) Cl₂, FeCl₃
 - 2) Na₂Cr₂O₇
- H_2SO_4

9

Provide the reagents necessary to transform the given starting material into the desired product.

- A) 1) KMnO₄ H₂O, heat
 - 2) H_3O^+
 - 3) HNO₃ H_2SO_4
- B) 1) HNO₃

 H_2SO_4

2) $KMnO_4$

H₂O, heat

3) H_3O^+

C) 1) KMnO₄

H₂O, heat

- 2) H_3O^+
- 3) NaNO₂, HCl
- D) 1) NaNO₂, HCl
 - 2) KMnO₄

H₂O, heat

3) H_3O^+

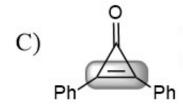
Explain the observed regiochemistry for the following reaction.

A) Ph

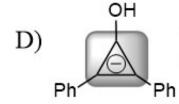
The highlighted group is an electronwithdrawing group and a meta director.

B) Ph

The highlighted group is an electronwithdrawing group and a meta director.



The highlighted group is an electrondonating group and a meta director.



The highlighted group is an electrondonating group and a meta director. Identify the structure of the observed dinitration product, and explain your choice.

$$\begin{array}{c|c} O & & O \\ \hline \\ H_2SO_4 & & \\ \end{array}$$

+ dinitration product

The nitro-substituted ring is NO₂ deactivated toward further reaction (2nd nitration also *meta* position).

The nitro-substituted ring is NO₂ deactivated toward further reaction (2nd nitration minimizes sterics).

C)
$$NO_2$$

The nitro-substituted ring is activated toward further reaction (nitro group is a *meta* director).

The dinitration product has no steric hindrance (formed fastest).