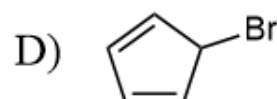
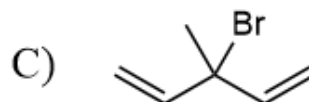
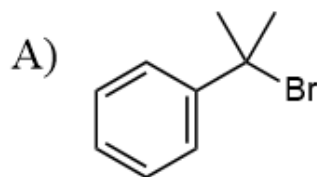
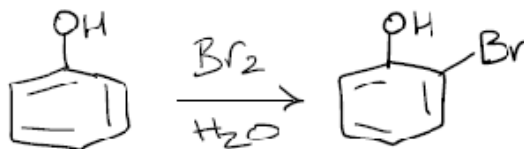




- 1 Of the following, which is LEAST likely to undergo an  $S_N1$  reaction with ethanol?

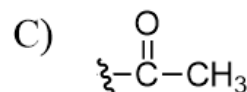
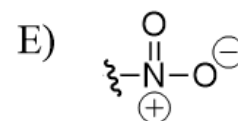
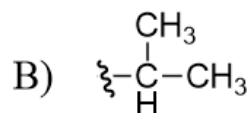
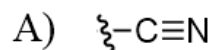


- 2 Provide a mechanism for the following reaction.



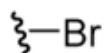
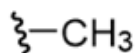
- 3 What effect on reactivity toward the Electrophilic Aromatic Substitution reaction would you expect if an **electron-withdrawing group** was placed on the aromatic ring?

- 4 For the Electrophilic Aromatic Substitution reaction, which of the following does NOT act as an **electron-withdrawing group**?

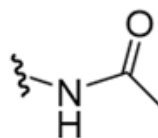
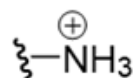
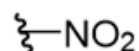
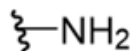


Categorize each of the following groups as an **ortho/para director** or a **meta director**.

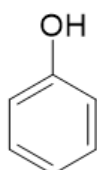
5



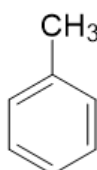
6



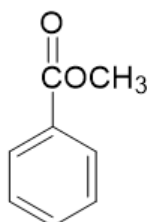
7



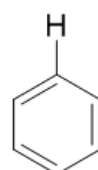
1



2



3

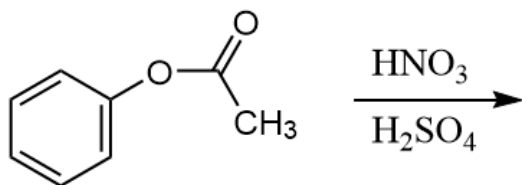


4

Arrange the molecules shown above in order of **INCREASING** reactivity toward electrophilic aromatic substitution, from least reactive to most reactive?

8

Predict the major product of the following nitration reaction and explain the regiochemistry.



9

