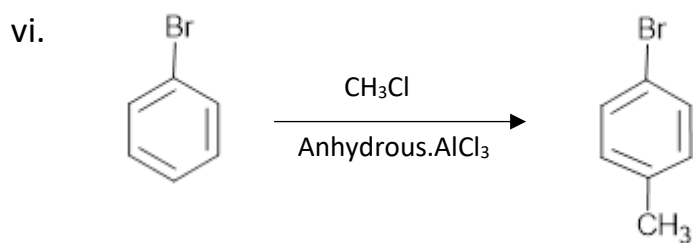
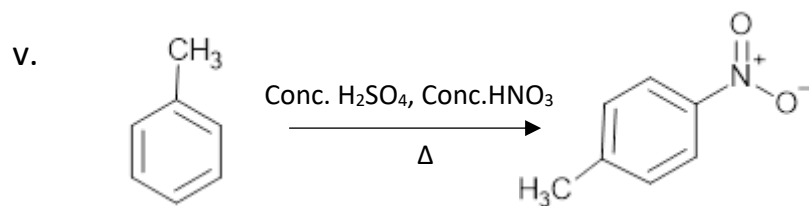
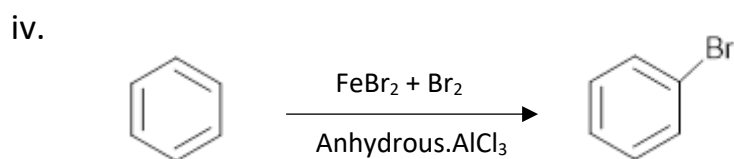
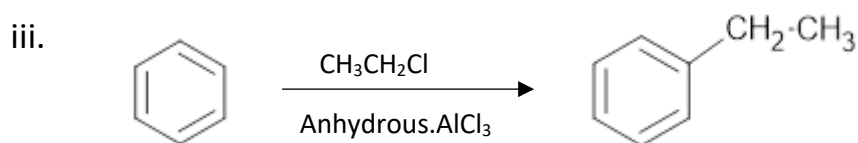
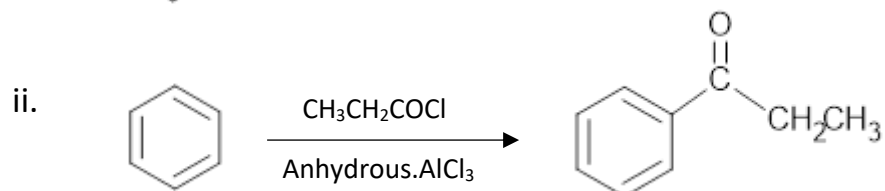
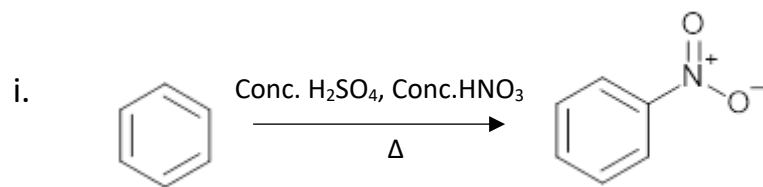
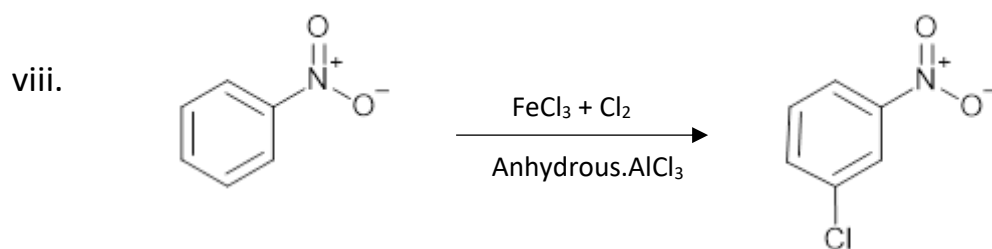
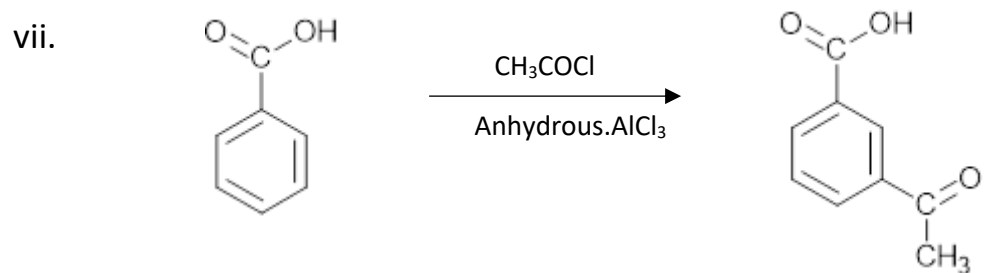


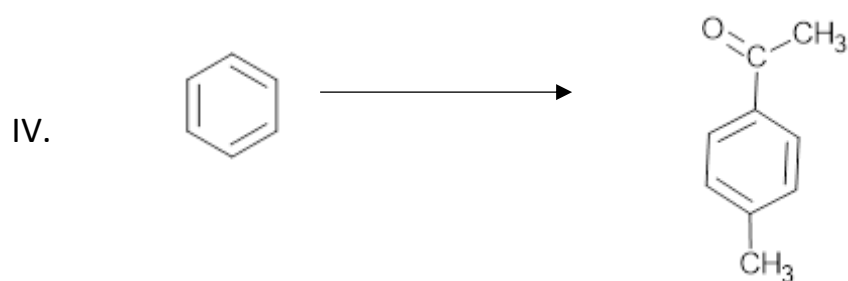
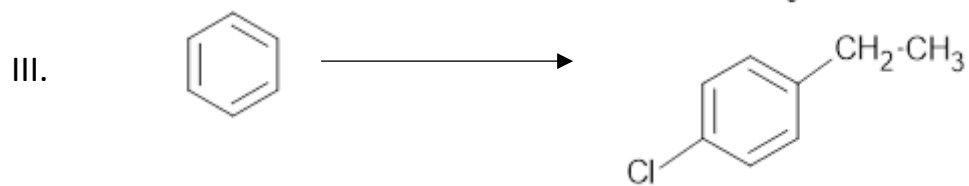
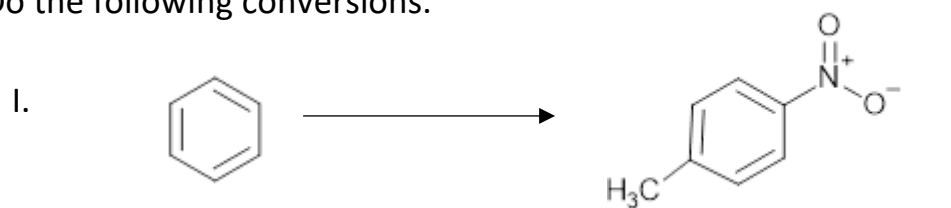
Benzene

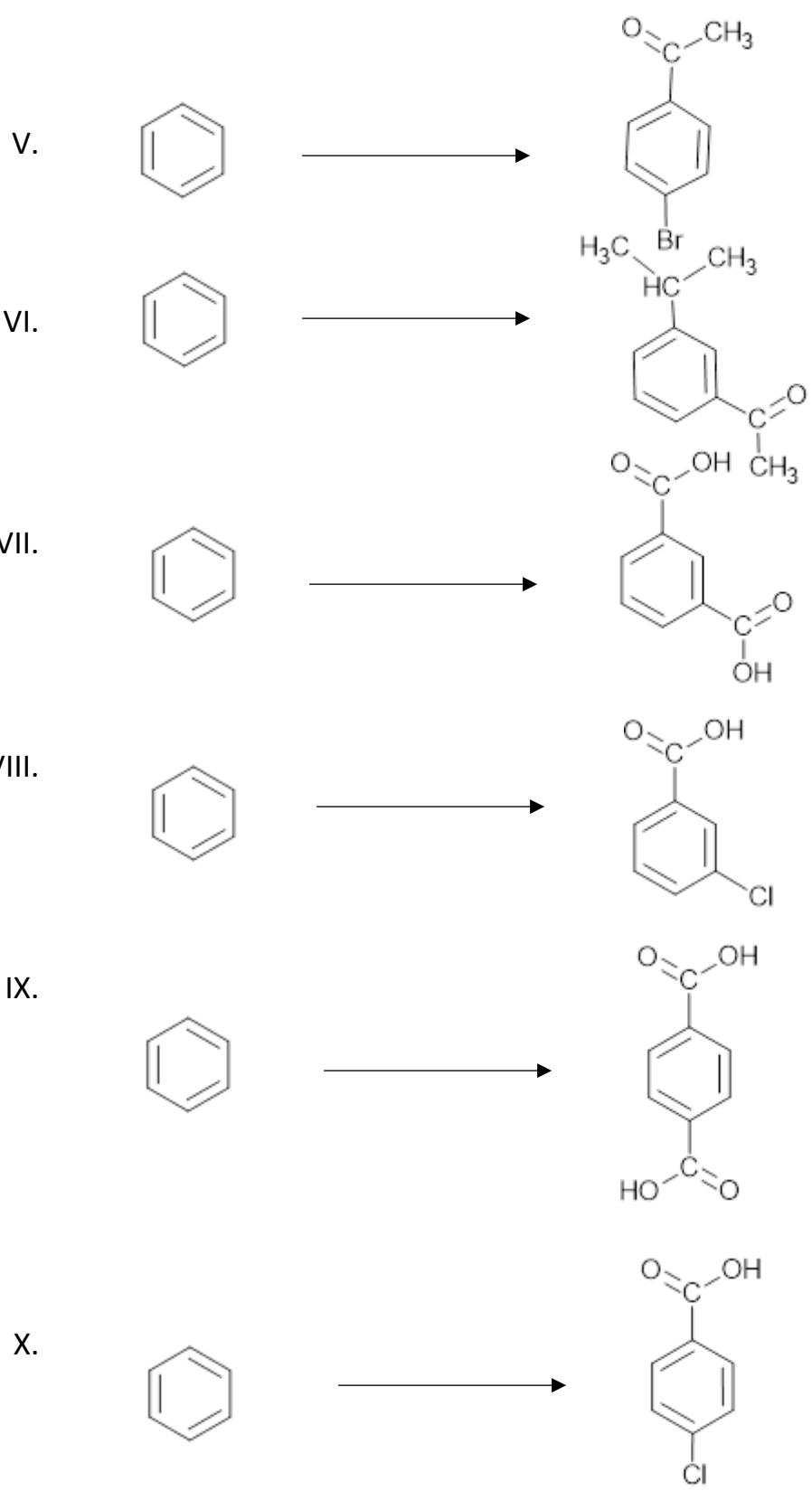
(1) Write mechanisms for the following reactions.

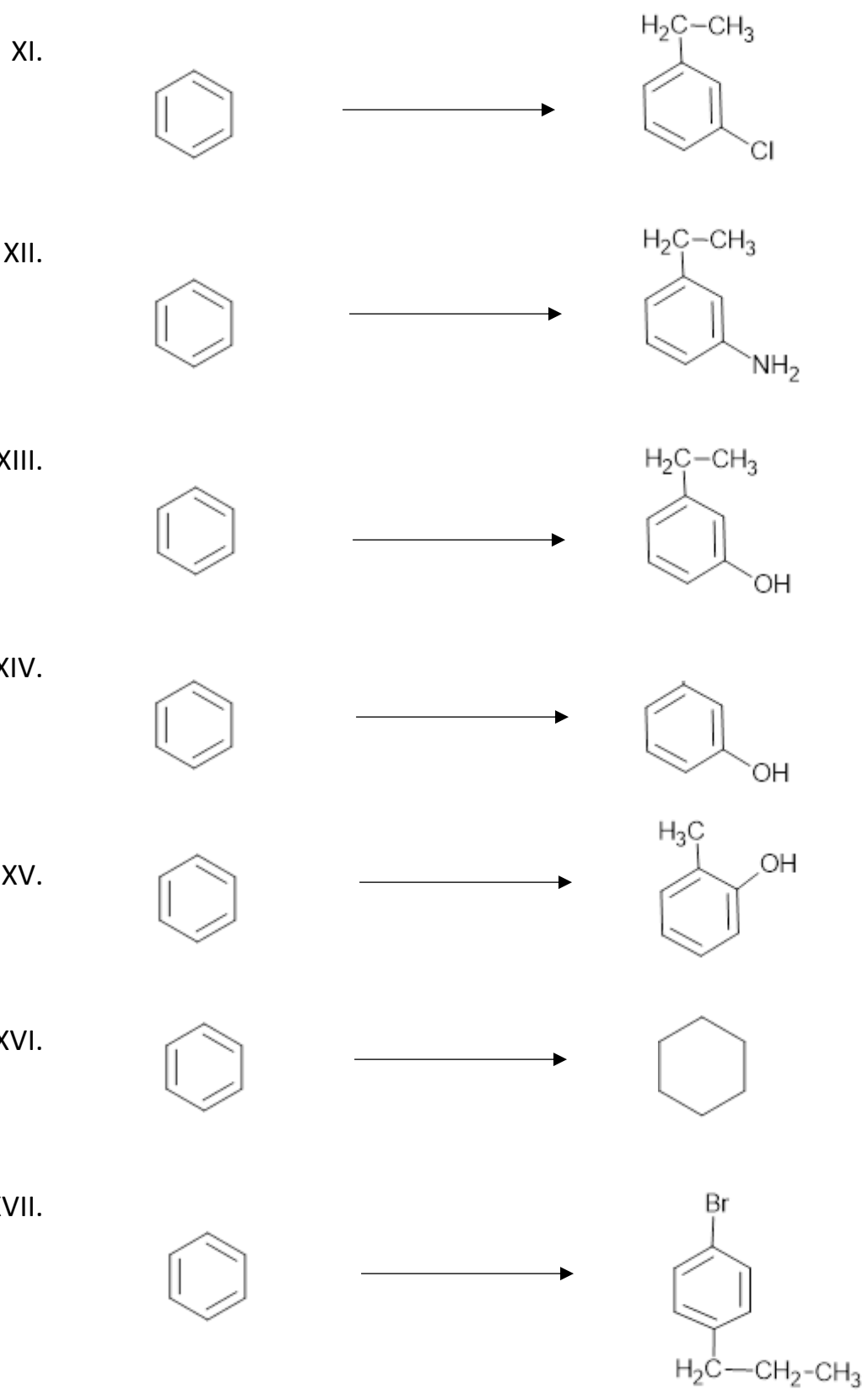


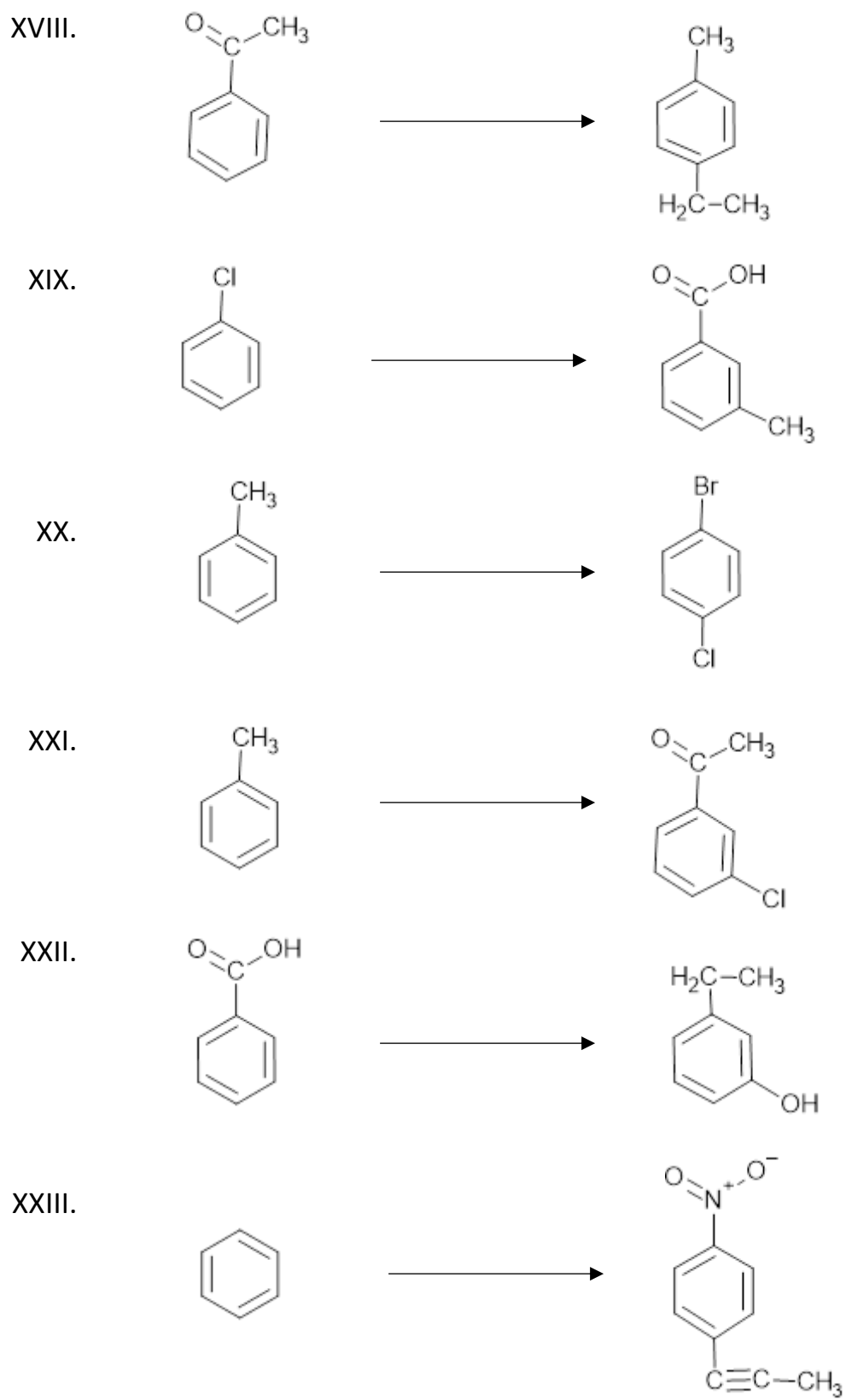


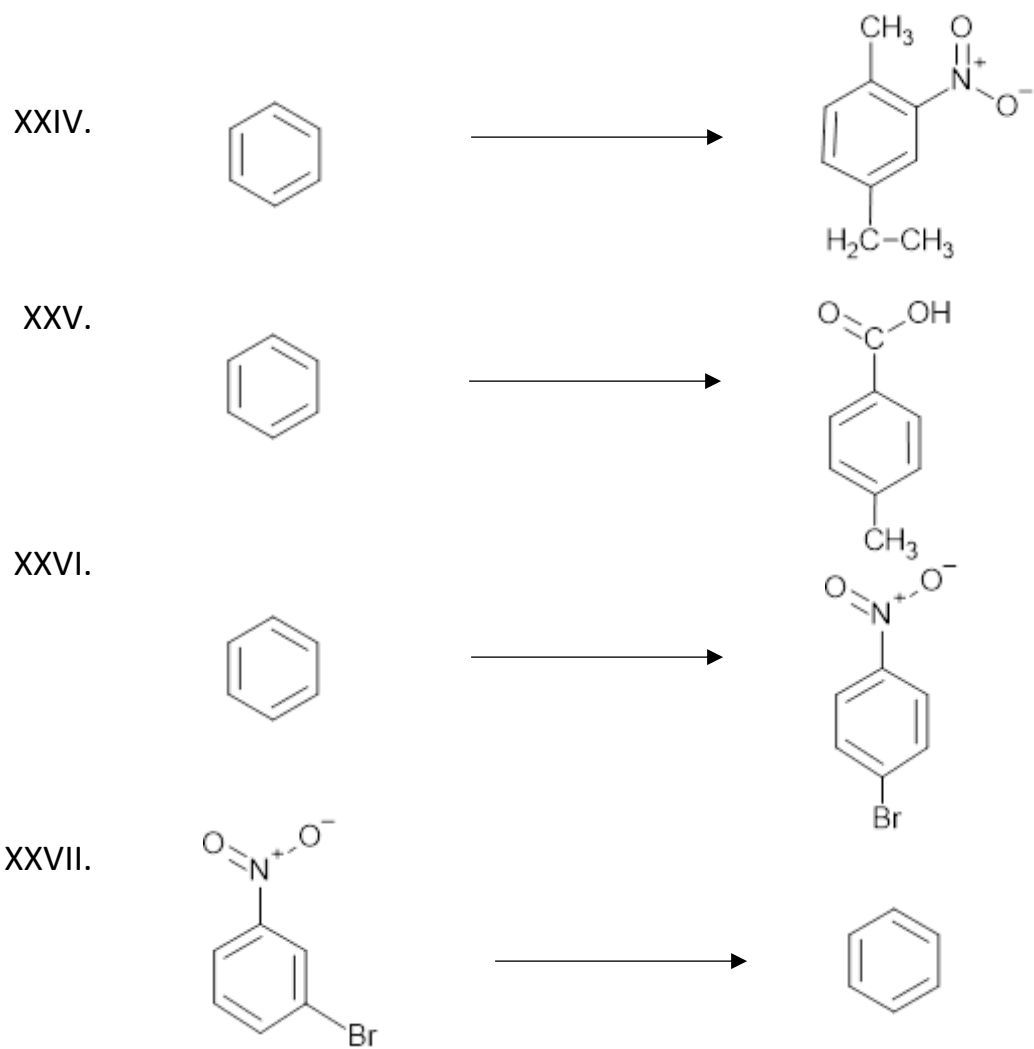
(2) Do the following conversions.





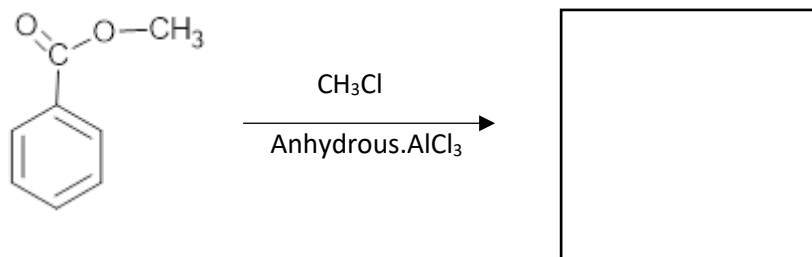


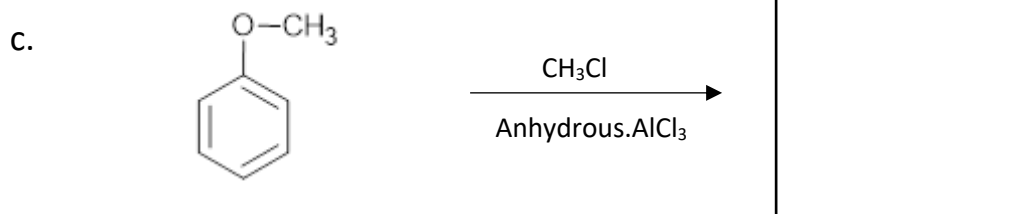
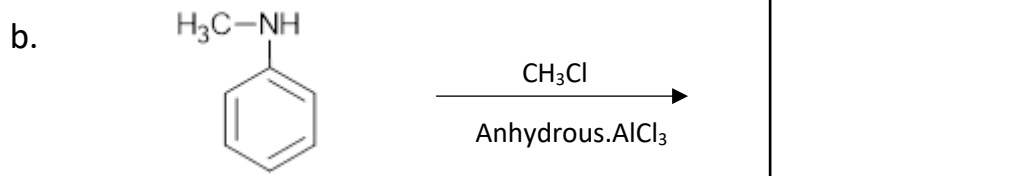




(3) Write the corresponding structure in the boxes given below.

a.





(4) State whether the following statements are true or false.

- a. The structure proposed for benzene by Kekulé contained a six-membered ring of carbon atoms with alternating three double and three single bonds. (.....)
- b. Six carbon atoms in benzene are not equivalent. (.....)
- c. The bond length between any two adjacent carbon atoms in benzene are not same. (.....)
- d. The carbon-carbon bond length of benzene is in-between the length of a carbon-carbon double bond and the length of a carbon-carbon single bond. (.....)
- e. All C atoms of benzene are sp^2 hybridized. (.....)
- f. Benzene has a cyclic delocalized electron cloud common to all six carbon atoms. (.....)
- g. Under normal conditions benzene answer the tests for unsaturation. (.....)

- h. Benzene is a planar molecule. (.....)
- i. Benzene ring is electron rich and hence it is reactive toward electrophiles, similar to alkenes. (.....)
- j. The characteristic reactions of benzene are electrophilic addition reactions. (.....)
- k. The Friedel - Crafts alkylation does not take place in mono substituted benzenes such as nitrobenzene where the substituent group has a stronger electron attracting ability than halogen. (.....)
- l. Benzene can get oxidized by normal oxidizing agents like $\text{H}^+ / \text{KMnO}_4$. (.....)
- m. Alkyl substituted benzene can be oxidized by $\text{H}^+ / \text{KMnO}_4$ to a carboxylic acid group. $\text{H}^+ / \text{K}_2\text{Cr}_2\text{O}_7$ can also be used for this oxidation. (.....)
- n. All primary, secondary and tertiary alkyl groups that are attached to the benzene ring can be oxidized by $\text{H}^+ / \text{KMnO}_4$. (.....)
- o. Although benzene does not undergo electrophilic addition reactions, like alkenes, it can undergo addition of hydrogen in the presence of suitable catalysts at higher temperatures. (.....)
- p. $-\text{OH}$, $-\text{R}$, $-\text{NH}_2$, $-\text{NHR}$, $-\text{OCH}_3$, halogens are ortho para directing groups. (.....)
- q. All the ortho para directing groups activate the benzene ring. (.....)
- r. Meta directing groups deactivate the benzene ring towards electrophilic substitution by withdrawing electrons from it. (.....)