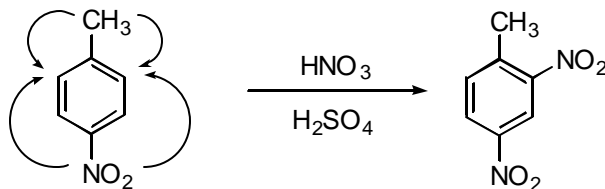


## TRISUBSTITUTED BENZENES: ADDITIVITY EFFECTS

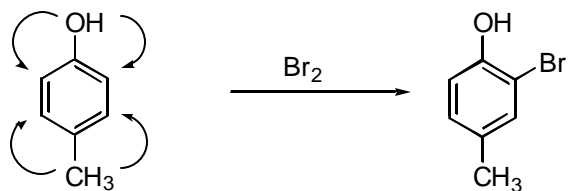
The further pattern of substitution of disubstituted benzene derivatives could be quite complex, but there are a few simple rules, which prove sufficient in most of the cases:

- RULE # 1:** If the directing effects of the two groups reinforce each other, there is no problem. The next substituent is placed as directed by both groups already present. Typical case is the nitration of *p*-nitrotoluene: CH<sub>3</sub> is an *ortho,para* directing group, while NO<sub>2</sub> is a *meta* directing group. The position of the electrophilic attack is determined unambiguously and the product is 2,4-dinitrotoluene:



Both groups direct to the same position!!

- RULE # 2:** If the directing effects of the two groups oppose each other, then the more powerful activating group has the dominant influence (but mixtures of products could result!!). Example: Bromination of *p*-methylphenol. Both CH<sub>3</sub> and OH are *ortho,para* directors, but OH is a more powerful one. The predominant product is 2-bromo-4-methylphenol.

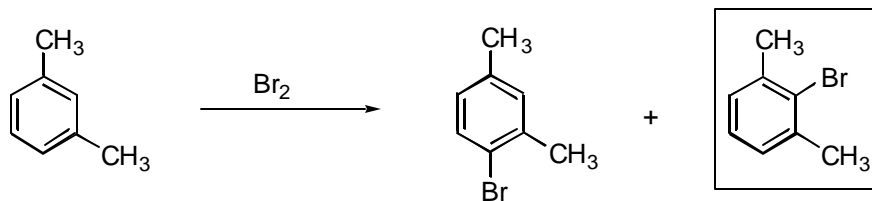


The two groups direct to different positions!!

(major product)

**OH** is a more powerful activating group!!

- RULE # 3:** Introduction of a third substituent between the two groups of a meta-substituted derivative is very unlikely, due to steric repulsion. Example: Bromination of *m*-xylene. The sole product is 2,4-dimethylbromobenzene. 2,6-dimethylbenzene IS NOT formed.



NOT FORMED!!