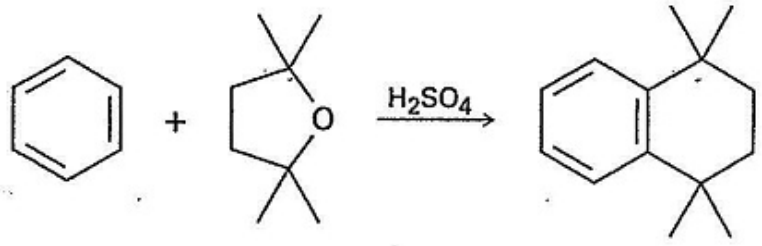
Problem 16.40

The *N,N,N*-trimethylammonium group, $-\overset{+}{N}(CH_3)_3$, is one of the few groups that is a meta-directing deactivator yet has no electron-withdrawing resonance effect. Explain.

Problem 16.64

Propose a mechanism to account for the reaction of benzene with 2,2,5,5-tetramethyltetrahydrofuran.



Problem 16.71

Use your knowledge of directing effects, along with the following data, to deduce the directions of the dipole moments in aniline and bromobenzene.

$\mu = 1.53$ D $\mu = 1.52$ D $\mu = 2.91$ D

Problem 16.73

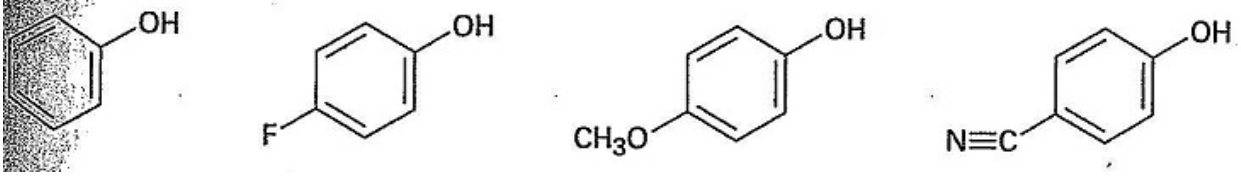
Phenols (ArOH) are relatively acidic, and the presence of a substituent group on the aromatic ring has a large effect. The pK_a of unsubstituted phenol, for example, is 9.89, while that of *p*-nitrophenol is 7.15. Draw resonance structures of the corresponding phenoxide anions and explain the data.

Problem 16.74

Would you expect *p*-methylphenol to be more acidic or less acidic than unsubstituted phenol? Explain. (See Problem 16.73.)

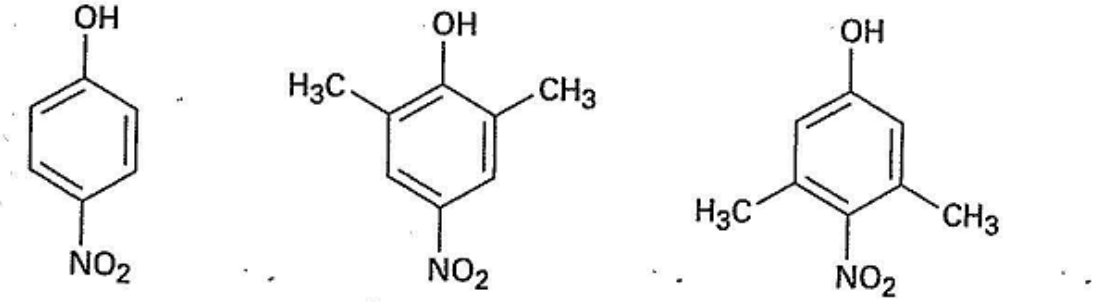
Problem 17.52

Rank the following substituted phenols in order of increasing acidity, and explain your answer:



Problem 17.57

p-Nitrophenol and 2,6-dimethyl-4-nitrophenol both have $pK_a = 7.15$, but 3,5-dimethyl-4-nitrophenol has $pK_a = 8.25$. Why is 3,5-dimethyl-4-nitrophenol so much less acidic?



$pK_a = 7.15$ $pK_a = 7.15$ $pK_a = 8.25$